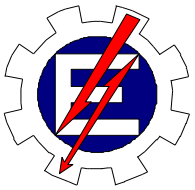

Universidade Federal de Itajubá

A INFLUÊNCIA DE VARIÁVEIS DE ENERGIA E DE MERCADO NO PREÇO MÉDIO DAS AÇÕES DE EMPRESAS DO SETOR ELÉTRICO: UM ESTUDO DE 2010 A 2016

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RESUMO

É sabido que o comportamento do preço das ações das empresas inseridas em bolsas de valores está sujeito ao comportamento do mercado financeiro que por sua vez se relaciona com acontecimentos que afetam a economia como um todo. Percebe-se que também podem haver influências setoriais e de gestão empresarial. O presente estudo procura avaliar a influência setorial de grandes empresas de capital aberto do setor elétrico. A análise pondera, através de métodos computacionais, o grau de previsão do preço médio das ações das empresas no dia t, quando utilizados como dados de entrada variáveis de mercado e de energia. As empresas analisadas foram: ELETROBRAS, CEMIG, CESP, a ISA CTEEP e COELCE. Nos dados de entrada, para as variáveis de mercado adotou-se como relevantes para o estudo o histórico do preço médio das ações das empresas em análise e o histórico do índice do mercado financeiro brasileiro, o Ibovespa. Como variáveis de energia foram escolhidos Preço de Liquidação das diferenças – PLD, a Energia Armazenada – EAR e o Consumo de Energia Elétrica – CEE. Ao observar os resultados, percebeu-se que para intervalos pequenos, a inserção das variáveis de energia (Conjunto 3 de entradas) melhora o grau de acerto dos modelos J48 e Random Forest (Métodos 6 e 9) para intervalos de saída de 1 em 1 real (Análise 3) com atraso de 8 dias (Atraso C). Na análise mais ampla de cada método aplicado é percebido que, apesar da melhoria no resultado global, o que mais influencia o resultado final é o dado de entrada do preço da ação no dia anterior, logo não é possível afirmar que as variáveis de energia possuem influência no preço das ações de empresas do setor elétrico.

Palavras Chave: setor elétrico, mercado financeiro, preço de ações.

ABSTRACT

It is well known that stock price performance of companies listed on stock exchanges is subject to the comportment of the financial market which in turn relates to events affecting the economy as a whole. It can be noted that there can also be sectorial and business management influences. The present study seeks to evaluate the sectorial influence of large public sector companies in the electricity sector. The analysis weighs, by means of computational methods, the degree of forecast of the average stock price of companies on day t, when used as market and energy variable input data. The companies investigated were ELETROBRAS, CEMIG, CESP, ISA CTEEP and COELCE. In the input data, for the market variables, the historical average price of the shares of the companies under analysis and the historical index of the Brazilian financial market, Ibovespa, were adopted as relevant for the study. As energy variables, the Settlement Price of the differences - PLD, the Stored Energy - EAR and the Electric Energy Consumption - CEE were chosen. By observing the results, it was observed that for small intervals, the insertion of the energy variables (Set 3 of entries) improves the degree of accuracy of the J48 and Random Forest models (Methods 6 and 9) for 1-in-1 output intervals (Analysis 3) with a delay of 8 days (Delay C). In the broader analysis of each applied method it is noticed that, despite the improvement in the overall result, what influences the final result is the input data of the stock price on the previous day, it is therefore not possible to state that the energy variables have influence on the share price of companies in the electricity sector.

Keywords: electric sector, financial market, stock price.

Capítulo 1

INTRODUÇÃO

Grandes empresas do setor elétrico brasileiro possuem capital aberto e estão inseridas no mercado financeiro, logo sujeitas ao risco imposto pela adesão dessa prática. O mercado financeiro percebe as variações da economia e, uma vez inseridas em tal mercado, estas empresas sofrem flutuações no preço de suas ações e influência de eventos e variáveis financeiras.

É sabido que o comportamento do preço das ações das empresas inseridas em bolsas de valores está sujeito ao comportamento do mercado financeiro que por sua vez se relaciona com acontecimentos que afetam a economia como um todo. Por outro lado, percebe-se que também podem haver influências setoriais e de gestão empresarial.

Motivado pela investigação da relação entre as variáveis de energia e de mercado e o comportamento do preço das ações do setor elétrico, o presente estudo tem como objetivo a avaliação da influência setorial de grandes empresas de capital aberto do setor elétrico. A análise pondera, através de métodos computacionais, o grau de previsão do preço médio das ações das empresas no dia *t*, quando utilizados como dados de entrada variáveis de mercado e de energia.

O estudo tenta perceber se somente o comportamento do mercado financeiro possui influência na flutuação de preço dessas empresas ou se, uma vez inseridas na análise, as variáveis de energia possuem papel representativo na previsão do preço das ações de empresas significativas do setor elétrico.

A significância das empresas escolhidas no setor elétrico foi medida pelo fato de comporem a carteira para cálculo do respectivo índice setorial na bolsa de valores nacional, a BM&FBovespa. Também foi levado em conta o segmento de atuação das

empresas, sendo escolhidas empresas de atuação mista[1], geração, transmissão e distribuição de energia elétrica.

As empresas selecionadas para análise foram: as Centrais Elétricas Brasileiras S.A. – ELETROBRAS, a Companhia Energética de Minas Gerais S.A. CEMIG, a Companhia Energética de São Paulo – CESP, a Companhia de Transmissão de Energia Elétrica Paulista – ISA CTEEP e a Enel Distribuição Ceará – COELCE.

No que diz respeito a escolha dos dados de entrada da modelagem, para representar as variáveis de mercado adotou-se como relevantes para o estudo o histórico do preço médio das ações das empresas em análise e o histórico do índice do mercado financeiro brasileiro, o Ibovespa.

No intuito de avaliar a influência setorial, foram escolhidas para a modelagem variáveis de energia de impacto global no setor elétrico, sendo elas: o Preço de Liquidação das diferenças – PLD, a Energia Armazenada – EAR e o Consumo de Energia Elétrica – CEE.

No capítulo 1, é apresentado o contexto do trabalho, bem como sua motivação e objetivos. No capítulo 2 são expostos os trabalhos similares que serviram de base para execução do presente trabalho, bem como a definição e contextualização de conceitos pertinentes ao estudo.

Os dados de entrada para as análises foram obtidos e tratados conforme explanado no Capítulo 3, onde consta a metodologia desenvolvida. O capítulo 4 apresenta os resultados para a ativo ELET6, base do estudo e no capítulo 5 os resultados para os demais ativos.

No capítulo 6 são discutidos os resultados consolidados para todas as empresas da análise e por fim é apresentada a conclusão. As especificações técnicas dos métodos de análise aos quais os dados de entrada foram submetidos estão expostos no Apêndice.

[1]Atuação Mista: Investimentos em Geração, Transmissão, Distribuição e Comercialização de Energia Elétrica.

Capítulo 2

REVISÃO BIBLIOGRÁFICA

2.1 TRABALHOS SIMILARES

Muitos estudiosos têm procurado investigar as variações de preço no mercado. Em 2012, foram avaliadas altas e baixas no mercado financeiro no período de 1990 a 2011. Tal estudo concluiu que existe uma coincidência temporal nos momentos de maiores quedas e altas na bolsa de valores [1].

A análise anteposta mostra que nos primeiros anos nota-se a preponderância dos fatores internos; nos últimos anos, os fatores externos destacam-se, em razão do aumento dos investimentos estrangeiros na Bovespa [1].

Também foi avaliada a situação econômico financeira das empresas listadas na BM&FBovespa à luz do Modelo dinâmico de Fleuriet. Os resultados obtidos demonstraram o quanto a situação financeira das empresas é influenciada pelos fatores econômicos externos, dependendo muito da conjuntura econômica [2].

Ainda foi analisado se a publicação e a legibilidade de atos ou fatos relevantes provocam impacto no preço da ação das empresas brasileiras de capital aberto. Os estudos indicaram que os fatos relevantes do período estudado são em média de difícil leitura e que os mesmos vêm aumentando de tamanho com o passar dos anos [3].

Em 2003, avaliaram-se os efeitos das decisões de investimento das empresas sobre os preços de suas ações no mercado de capitais. Os resultados indicaram que existe relação entre a variação do ativo permanente e a variação do valor da ação da empresa no mercado, ou seja, os mesmos estão de acordo com as evidências empíricas e com o que é previsto pela teoria da decisão de investimento [4].

Neste contexto, percebe-se o esforço da Academia em entender as diversas influências sofridas pelo preço das ações em empresas de capital aberto. Nessa mesma linha, este estudo procura avaliar uma linha mais técnica do setor de energia elétrica sobre o preço das ações das empresas do setor elétrico.

2.2 DEFINIÇÕES PERTINENTES

Para melhor compreensão do trabalho, é importante o estabelecimento de alguns conceitos que serão explanados nesta seção.

2.2.1 Mercado Financeiro, Ações e Empresa de capital aberto

O mercado financeiro desempenha um papel importante nas finanças corporativas, já que ele amplia significativamente as duas principais vantagens da forma corporativa de organização: a facilidade e rapidez da transferência de propriedade e a facilidade de captação de fundos [5].

Uma organização corporativa pode levantar fundos através da emissão de títulos no mercado financeiro. A bolsa de valores é o agente de mercado que disponibiliza uma plataforma de negociação desses títulos para as empresas de capital aberto [6].

Define-se bolsas de valores como sociedades anônimas ou associações civis, com o objetivo de manter sistema adequado ao encontro de seus membros e à realização entre elos de transações de compra e venda de títulos e valores mobiliários, em mercado livre e aberto, especialmente organizado e fiscalizado por seus membros e pela Comissão de Valores Mobiliários. Possuem autonomia financeira, patrimonial e administrativa [7].

Um tipo de título são ações, que podem ser ordinárias ou preferenciais. São definidas como ações ordinárias aquelas que não possuem prioridade para recebimento de dividendos ou em caso de falência. Já para uma ação preferencial, o recebimento dos dividendos e a distribuição do ativo em caso de liquidação se antepõem ao das ações ordinárias [5].

Ainda sobre os tipos de ações, alega-se que a principal diferença entre elas é que as ordinárias dão ao seu detentor direito de voto nas assembleias de acionistas, enquanto as preferenciais permitem o recebimento de dividendos em valor superior ao das ações ordinárias, bem como a prioridade no recebimento de reembolso do capital [8].

Existem critérios mínimos, determinados por cada bolsa, para que seja permitida a negociação das ações das empresas [5]. Sendo a única bolsa de valores em operação no Brasil, a própria BM&FBovespa estabelece os requisitos para admissão de títulos de empresas para negociação em bolsa.

Atualmente, o Regulamento de Registro de Emissores e de Valores Mobiliários da BM&FBovespa determina que empresas que fazem distribuição pública de ações pela primeira vez (IPO) e se listam em bolsa, devem aderir pelo menos ao Nível 1 de Governança Corporativa[2] [9].

As empresas consideradas nesse estudo possuem capital aberto, ou seja, possuem títulos negociáveis na BM&FBovespa. Primeiramente os títulos são vendidos pela empresa no chamado mercado primário e posteriormente são negociados no mercado secundário entre investidores [5].

As ações são negociadas no pregão, ou seja, no período regular ou especial para realização de operações [11]. A BM&FBovespa disponibiliza as cotações históricas das ações negociadas na companhia. Nos arquivos são acessíveis as informações relativas à negociação de todos os papéis-mercado no período de um ano, classificado pelos campos Tipo de registro, Data do pregão, Código de BDI, Nome da empresa e Código de Negociação [12].

Neste estudo, das cotações históricas, foram utilizados os valores de preço médio do papel-mercado no pregão, que consiste na média dos preços: de abertura, máximo, mínimo e do último negócio do papel-mercado no pregão. O preço médio da ação responde bem pela movimentação do pregão diário, além de ser um bom indicador das transações da empresa.

[2]De acordo com regulamento da BM&FBovespa que estabelece as premissas e regras para adesão ao Nível 1 de Governança Corporativa [10].

2.2.2 Índice Ibovespa - IBOV

Sendo um indicador do desempenho médio das cotações dos ativos de maior negociabilidade e representatividade da BM&FBovespa [13], o Ibovespa (IBOV) representa bem o comportamento do mercado de ações brasileiro.

O índice Ibovespa é um índice amplo[3] de retorno total[4], resultado de uma carteira teórica de ativos contendo apenas companhias que atendam a alguns critérios, como por exemplo: ter presença em pregão de 95% e ter participação em termos de volume financeiro maior ou igual a 0,1% no mercado a vista[5], no período de vigência das 3 carteiras anteriores.

É importante explanar que as empresas que compõem o IBOV, são empresas que possuem relevância no mercado financeiro brasileiro, sendo assim esse indicador, um bom parâmetro para o desempenho do mercado brasileiro de ações.

2.2.3 Índice de Energia Elétrica - IEE

Na mesma linha que o IBOV, o IEE é um indicador do desempenho médio das cotações dos ativos de maior negociabilidade e representatividade do setor de energia elétrica. O IEE também é um índice de retorno total composto por uma carteira teórica de ativos, que precisam obedecer aos seguintes critérios [14]:

- Ter participação em termos de volume financeiro maior ou igual a 0,01% no mercado a vista no período de vigência das três carteiras anteriores.
- Ter presença em pregão de 80% no período de vigência das três carteiras anteriores.

[3]Índice amplo: representam o mercado como um todo. Podem ser compostos por todas as ações listadas naquele mercado, ou por um grupo de ações que têm significativa participação na negociação total e, assim, refletem de modo acurado o desempenho médio de todas as ações (ex. o Ibovespa representa, no mínimo, 80% do número de negócios e do volume financeiro transacionados no mercado à vista, e também aproximadamente 70% da capitalização das empresas negociadas) [15].
[4]Índice de retorno total: valor do índice de preços acrescido do reinvestimento de dividendos e outros proventos distribuídos pelas empresas emissoras. Os proventos são reinvestidos no índice na data "ex-provento" (data em que a ação começa a ser negociada com o provento já descontado do seu valor). Assim, esse é um índice que mede o retorno total das ações componentes de sua carteira [15].
[5]O Mercado à Vista representa o conjunto de operações de compra das ações negociadas em bolsa a preços estabelecidos em pregão [16].

- Ter apresentado no mínimo 2 negócios por dia em pelo menos 80% dos pregões em que foi negociada.
- Não ser classificado como "Penny Stock[6]".
- Pertencer ao setor de energia elétrica.

Cada empresa participa somente com seu ativo mais líquido, ou seja, o que apresentar o maior índice de negociabilidade no período [14].

2.2.4 Energia Armazenada - EAR

Definida de uma maneira geral como a energia potencialmente disponível nos reservatórios de hidrelétricas, a Energia Armazenada (EAR) é um dos principais parâmetros para o planejamento da operação do Sistema Interligado Nacional – SIN.

O cálculo da energia armazenada de uma determinada usina leva em conta o volume de água armazenado em seu reservatório, bem como a capacidade de geração da usina. De acordo com [17], define-se por EAR a energia disponível em um sistema de reservatórios, calculada a partir da energia produzível pelo volume armazenado nos reservatórios em seus respectivos níveis operativos.

A partir das produtibilidades[7] dos aproveitamentos hidroelétricos e dos volumes armazenados nos reservatórios, a EAR é calculada por bacia e por subsistema, levando em consideração os desvios de água para reservatórios e aproveitamentos da mesma bacia ou de outras por meio de canais, etc. [18]. O cálculo da EAR também leva em conta que alguns reservatórios distribuem água armazenada em dois subsistemas em suas cascatas.

O histórico de EAR fornecidos pelo Operador Nacional do Sistema - ONS são oriundos da Base de Dados Técnica da ONS e são dados em unidade de energia (MWmês) e porcentagem.

[6]Ativos cuja cotação seja inferior a R$ 1,00.
[7] Produtibilidade: Potência (MW) / Vazão (m³/s).

2.2.5 Carga de Energia

A carga de energia é definida como a carga equivalente a integral das cargas de demanda em um determinado período de tempo, expressa em unidade de energia (MWh) [17]. O histórico de carga de energia do SIN é originário da base de dados técnica da ONS e refletem as grandezas supervisionadas e programadas pelo operador.

2.2.6 Consumo de Energia

O consumo de energia elétrica consiste em toda a energia elétrica extraída da rede pelos consumidores. O histórico de consumo de energia elétrica na rede (MWh) é disponibilizado pela Empresa de Pesquisa Energética – EPE, tanto a nível nacional, quanto segmentado por região geográfica, quanto por subsistema elétrico [19].

Os dados também estão disponíveis por classe de consumo, todos em base mensal, sendo atualizados pela Superintendência de Estudos Econômicos e Energéticos – SEE da Diretoria de Estudos Econômico-Energéticos e Ambientais – DEA [19]. Para o estudo realizado foram utilizados os dados de consumo nacional de energia elétrica na rede em base mensal.

2.2.7 Preço de Liquidações das Diferenças – PLD

Com um complexo sistema elétrico em constante mudança, o Brasil utiliza ferramentas que tornam mais transparente e práticas as transações do mercado elétrico. Uma delas é o Mercado de Curto Prazo, onde são liquidadas as diferenças dos contratos de compra e venda de energia ao Preço de Liquidação das Diferenças (PLD) [20].

Definido como o "preço para valoração dos montantes liquidados no Mercado de Curto Prazo - MCP" e apurado pela Câmara de Comercialização de Energia Elétrica – CCEE, o PLD utiliza como base o resultado de modelos matemáticos, cujo objetivo é encontrar a solução ótima na geração hidrotérmica[8] do Sistema Interligado Nacional (SIN) [21] [22].

[8] Sistema Hidrotérmico: é um sistema de geração composto por usinas hidrelétricas e termelétricas [23].

Sujeito a decisões da agência reguladora na definição de limites máximo e mínimo, o PLD também depende do processamento de modelos de otimização na CCEE e do NOS, que fornece os dados de entrada utilizados pela Câmara na aplicação dos modelos [24] [25]. A formulação do PLD também pode estar sujeita a questões políticas, que influenciam o órgão regulador, a Câmara e o Operador do Sistema.

2.3 CARACTERÍSTICAS DAS EMPRESAS ESCOLHIDAS

2.3.1 ELETROBRAS

Sendo a empresa mais significativa do setor elétrico brasileiro e a maior companhia do setor elétrico da América Latina, a Eletrobras possui 31% da capacidade instalada de geração de energia elétrica e 47% das linhas de transmissão do país [26] [27]. A empresa também possui investimentos no segmento de distribuição de energia elétrica, sendo designada pelo governo federal como operadora de seis distribuidoras de energia da região Norte e Nordeste.

A Companhia possui capital aberto e tem como acionista majoritário o governo federal, que detêm 40,99% das ações ordinárias. A participação governamental não se restringe a União, visto que os Fundos do Governo detêm 3,45% das ações ordinárias e o Banco Nacional do Desenvolvimento - BNDES, banco governamental, detêm 15,99% das ordinárias e 2,37% das preferenciais de acordo com o relatório de posição acionária referente a fevereiro de 2018 [28].

2.3.2 CEMIG

Sendo controlada por uma *holding*, a CEMIG tem atuação mista no setor elétrico brasileiro. O grupo CEMIG é constituído por 200 empresas e 17 consórcios e possui ativos e negócios em vários estados do Brasil [29].

A Cemig é uma empresa mista de capital aberto, controlado pelo Governo do Estado de Minas Gerais, que possui a maior parte das ações ordinárias da companhia

(50,97%). Contudo, a participação estatal não se resume ao governo estadual, uma vez que o governo federal detém 11,14% do capital da empresa [29] [30].

2.3.3 CESP

A Companhia Energética de São Paulo é uma sociedade anônima de capital aberto controlada pelo Governo do Estado de São Paulo, que tem como atividade principal a geração de energia elétrica [31].

A CESP opera três usinas hidrelétricas, localizadas na região Sudeste. Juntas, as usinas hidrelétricas da CESP somam 1,6GW de potência instalada. A Fazenda do Estado de São Paulo é detentora de 94,08% das ações ordinárias da companhia.

2.3.4 ISA CTEEP

A ISA CTEEP é uma das principais concessionárias privadas de transmissão de energia elétrica do país, transmitindo cerca de 24% da energia produzida no Brasil e 60% da energia consumida na região Sudeste [32].

A empresa possui ações listadas na BM&FBovespa e integra, desde 2002, o Nível 1 de Governança Corporativa [32]. A ISA Capital Brasil possui 89,5% das ações ordinárias da companhia sendo, portanto, sua controladora [33].

2.3.5 COELCE

Tendo sido adquirida pelo grupo Enel, a COELCE agora é Enel Distribuição Ceará e distribui energia para 3,9 milhões de clientes do estado. A concessionária é a terceira maior do Nordeste em volume distribuído [34].

Sendo uma sociedade anônima de capital aberto, a COELCE é controlada pela Enel Brasil, que detém, diretamente, 74,05% do capital total e 97,91% do capital votante. O restante das ações, negociadas na Bolsa de Valores - B3 [35].

Capítulo 3

METODOLOGIA

3.1 ESCOLHA DAS EMPRESAS

Incialmente determinou-se que a análise seria por segmento: geração, transmissão e distribuição. Como existem empresas relevantes do setor elétrico que possuem ativos em todos os segmentos, também se fez interessante incluir no estudo empresas que possuem atuação mista[9].

Buscando uma análise significativa, considerou-se importante que as empresas escolhidas como base para a modelagem possuíssem relevância no setor elétrico. Conforme já mencionado na revisão bibliográfica, para composição do Índice de Energia Elétrica - IEE são levados em conta os ativos de maior representatividade do setor de energia elétrica, desta maneira a escolha baseou-se na composição da carteira teórica do IEE do segundo quadrimestre de 2016.

Na Tabela 1 estão listadas as empresas e os ativos das mesmas que compõem o IEE no período considerado. É observável que existem empresas que atuam em mais de um segmento do setor e, para uma análise efetiva a respeito de cada segmento, é importante que as empresas atuem puramente nos mesmos. Analogamente, para a análise de atuação mista é importante que as empresas atuem em todos os segmentos.

[9] Atuação Mista: Investimentos em Geração, Transmissão, Distribuição e Comercialização de Energia Elétrica.

Tabela 1 - Carteira teórica IEE 2Q/2016 [36]

Empresa	Ativo	Atuação			
		G	T	D	C
Eletrobras	ELET66	x	x	x	x
CEMIG	CMIG4	x	x	x	x
CPFL Energia	CPFE3	x		x	x
COPEL	CPLE6		x	x	x
Eletropaulo	ELPL4			x	
EDP	ENBR3	x	x	x	x
Light	LIGT3	x		x	x
Equatorial Energia	EQTL3	x		x	
Engie Brasil	EGIE3	x		x	x
COCE	COCE5			x	
CESP	CESP6	x			
AES Tietê	TIET11	x			
Alupar	ALUP11	x	x		x
TAESA	TAEE11		x		
Isa CTEEP	TRPL4		x		

Levadas em conta essas considerações, as ações escolhidas para basear a análise pertencem as empresas listadas na Figura 1. As ações escolhidas de todas as empresas selecionadas são ações preferenciais.

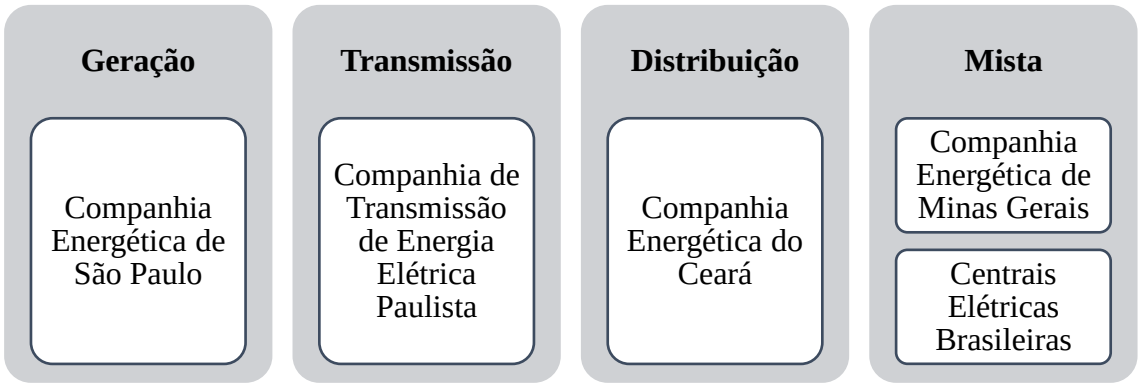

Figura 1 - Empresas selecionadas para análise

3.2 OBTENÇÃO DOS DADOS

Depois da escolha das empresas, foi necessária a definição e obtenção dos dados que seriam utilizados na modelagem. Nesta seção será explanado como tais dados foram obtidos.

3.2.1 Cotações históricas – Preço médio e IBOV

A plataforma da BM&FBovespa disponibiliza as cotações históricas desde 1986 para cada dia de pregão, podendo-se os dados em base anual, mensal ou até mesmo as séries diárias do ano corrente. Para o estudo, os dados em base diária de 01/01/2010 até 31/12/2016 foram obtidos [37].

Cada arquivo contempla as principais informações dos ativos, como: nome e código da empresa, código da ação, código ISIN, tipo de mercado (a vista, termo, opções), especificação (ON/PN), preços (anterior, abertura, mínimo, médio, máximo, fechamento), quantidade de negócios e volume negociado com o papel, dentre outros dados disponíveis para cada dia de pregão [38]. A BM&FBovespa também disponibiliza sua cartilha [38] para melhor compreensão do layout e conteúdo do arquivo.

De acordo com [5], o comportamento do preço é um reflexo de mudanças potenciais ou ocorridas, logo o preço médio diário foi adotado como variável para a presente análise. Foram então tabelados os valores de preço médio para todos os dias de pregão dos ativos CESP6, TRPL4, COCE5, ELET6 e CMIG4 para o período adotado.

Na Figura 2 pode ser observado o comportamento do preço médio das ações da ELET6, que serviu de base para a modelagem desse estudo. Na Figura 3 é observável o comportamento dos demais ativos.

Conforme já mencionado no Capítulo 2, os índices da bolsa de valores têm por objetivo simular o comportamento do mercado como um todo, sendo o mais notável no mercado financeiro brasileiro o Índice Ibovespa – IBOV [39].

Desta maneira o IBOV foi adotado para avaliar a influência do mercado financeiro no preço dos ativos das empresas pertinentes ao estudo. Também no banco de dados da BM&FBOVESPA estão disponíveis as séries históricas do índice IBOV [40]. Os dados foram extraídos para o mesmo período. O comportamento gráfico do IBOV pode ser observado na Figura 4.

Figura 2 - Comportamento gráfico do preço médio do ativo ELET6 (2010-2016)

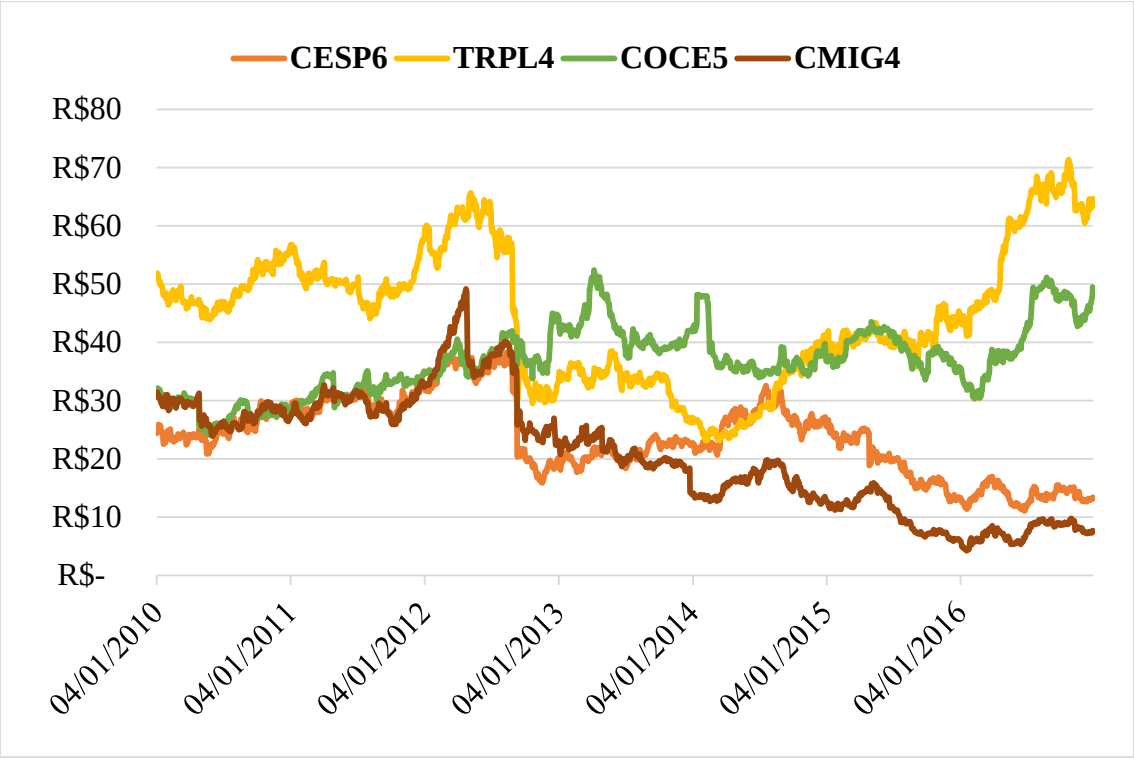

Figura 3 - Comportamento gráfico do preço médio dos ativos CESP6, TRPL4, COCE5 e CMIG4 (2010-2016)

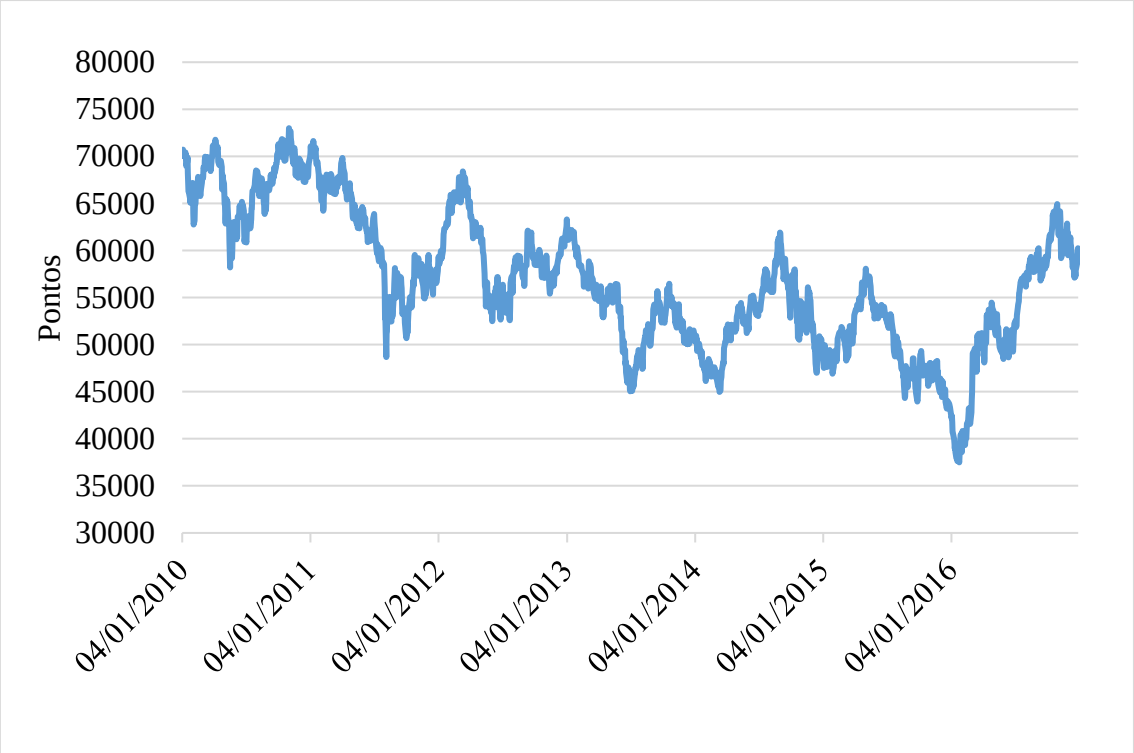

Figura 4 - Comportamento gráfico do índice IBOV (2010-2016)

3.2.2 Preço de Liquidação das Diferenças – PLD

Sendo publicado pela Câmara de Comercialização de Energia Elétrica - CCEE semanalmente [41], o PLD é um dos dados considerados neste estudo. O Preço de Liquidação das Diferenças é relevante pois é uma aproximação do preço de equilíbrio do mercado de energia elétrica, não sendo o próprio preço de equilíbrio por ter teto e piso regulatórios e por não considerar restrições de transmissão dentro de cada submercado [20].

Conforme já mencionado no Capítulo 2, o PLD é determinado para cada patamar de carga e cada submercado, sendo limitado por um preço máximo e mínimo vigente estabelecido pela Agência Nacional de Energia Elétrica - ANEEL [42].

A CCEE disponibiliza para consulta pública o histórico dos preços, que foi extraído de seu banco de dados [43], de janeiro de 2010 até dezembro de 2016. São disponibilizados os valores semanais do PLD para cada submercado e para cada patamar de carga dentro dos submercados.

Como foram analisadas empresas que possuem subsidiárias em todos subsistemas, ou seja, realizam transações variadas utilizando o PLD do subsistema ondes seus negócios estão alocados, é importante que o preço utilizado na modelagem responda genericamente.

Neste intuito, foi obtido o PLD médio de cada subsistema, ou seja, uma média dos patamares de carga (leve, médio e pesado). A partir deste preço médio de cada subsistema, uma nova média nacional foi calculada. O comportamento gráfico do PLD médio pode ser observado na Figura 5.

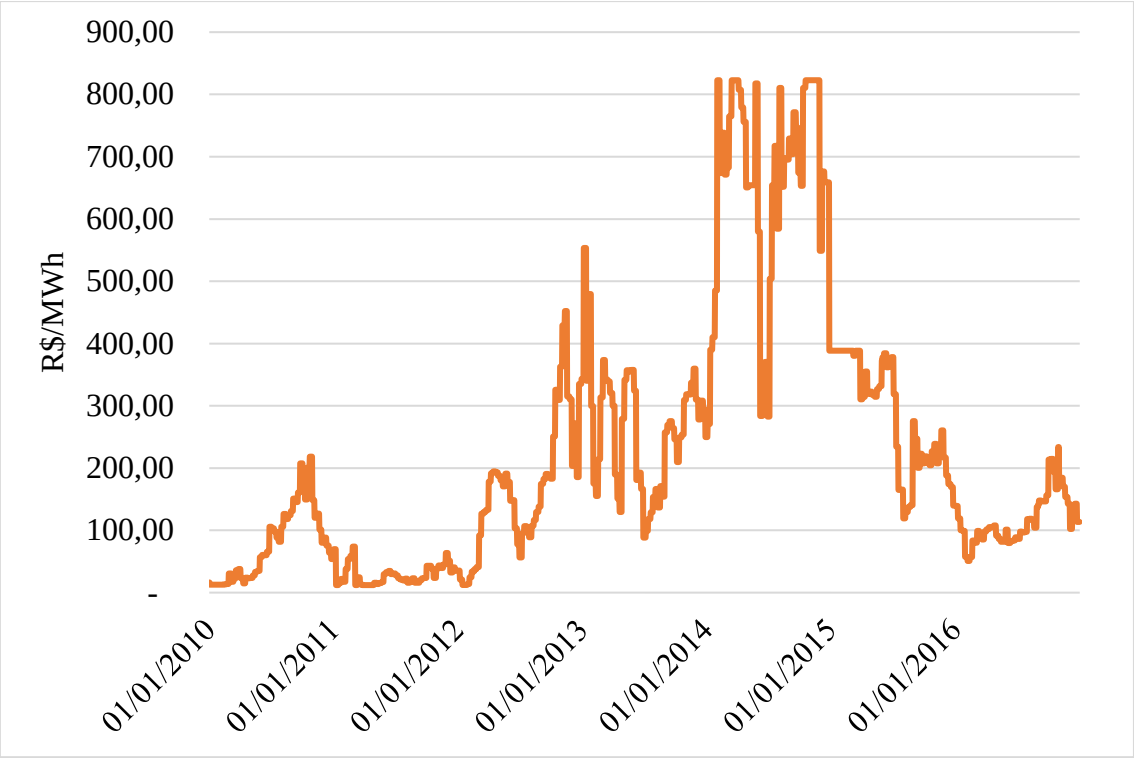

Figura 5 - Comportamento gráfico do PLD médio (2010-2016)

Esse preço médio nacional, responde bem ao comportamento do PLD, o que pode ser comprovado pela correlação entre o mesmo e o PLD médio correspondente de cada submercado[10], conforme pode ser observado na Tabela 2.

Tabela 2 - Correlação entre PLD médio nacional e de cada submercado

SE/CO	S	NE	N
0,991714	0,984912	0,981059	0,955558

3.2.3 Energia Armazenada – EAR

Sendo uma das variáveis mais importantes na formação do preço de energia elétrica no Brasil, a energia armazenada nos reservatórios é fator determinante nas tomadas de decisão do setor, logo foi levada em conta para análise.

A partir do banco de dados do Operador Nacional do Sistema - ONS [44], que disponibiliza o histórico da operação em seu website, os dados de EAR foram extraídos

[10] SE/CO – Sudeste e Centro-Oeste; S – Sul; NE – Nordeste e N – Norte.

em escala diária, na unidade de energia (MWmês) e porcentagem, para cada submercado de janeiro de 2010 até dezembro de 2016.

Cruzando os dados de EAR (MWmês) com EAR (%) é possível obter energia máxima armazenável para cada submercado (Equação 1). Levando em conta que, no decorrer dos 6 anos considerados no estudo houveram implementação de usinas com reservatórios com capacidade de armazenamento de energia considerável, a EAR máxima foi calculada para cada dia.

$$EAR_{máx}(MWmês) = \frac{EAR\ (MWmês)}{EAR\ (\%)} \qquad \text{Equação 1}$$

Somando então a energia armazenável máxima de todos os subsistemas, obtém-se o equivalente a capacidade máxima de energia armazenável do país para cada dia. Com base nesse dado, foi possível calcular a representatividade (R) de cada subsistema na EAR do Sistema Interligado Nacional - SIN como um todo (Equação 2).

$$R_{subsistema}\ (\%) = \frac{EAR_{subsistema}(MWmês)}{EAR_{total}(MWmês)} \qquad \text{Equação 2}$$

A partir dos dados de EAR (%) e da representatividade calculada foi obtida a EAR (%) do SIN para cada dia, dado este utilizado na modelagem (Equação 3). O comportamento gráfico da EAR pode ser observado na Figura 6.

$$EAR_{SIN}(\%) = EAR_{\frac{SE}{CO}} \times R_{\frac{SE}{CO}} + EAR_S \times R_S + EAR_{NE} \times R_{NE} + EAR_N \times R_N \qquad \text{Equação 3}$$

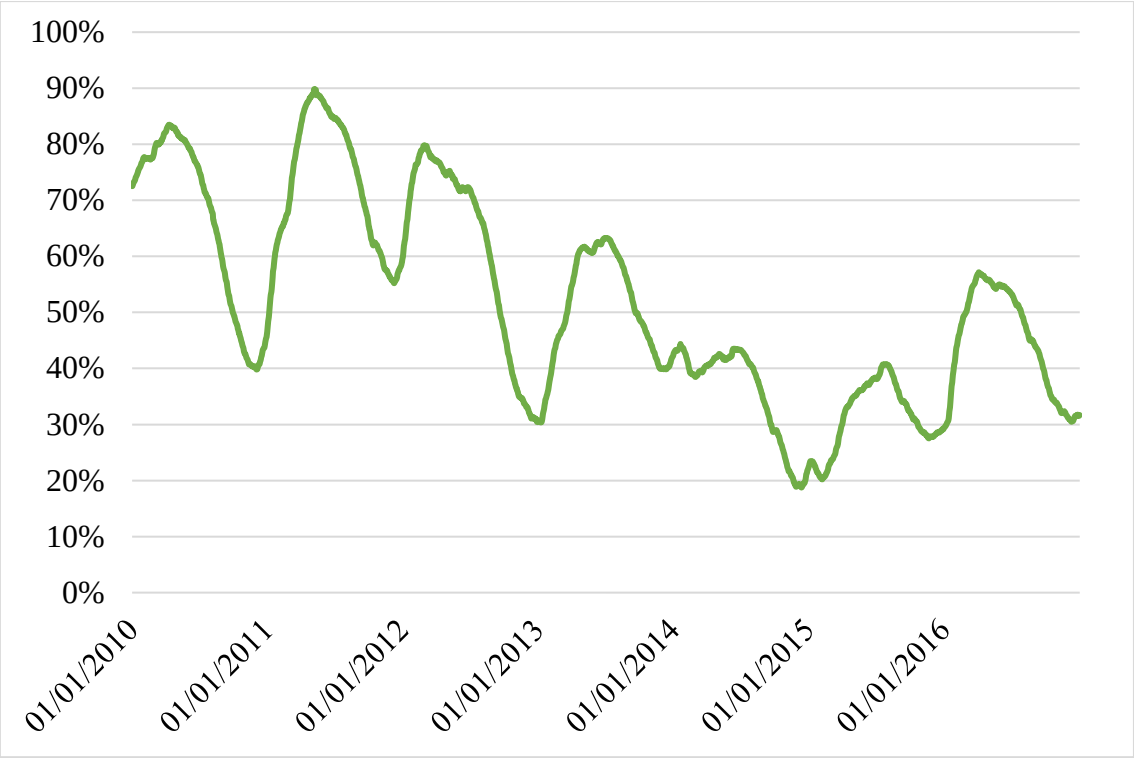

Figura 6 - Comportamento gráfico da EAR Nacional (2010-2016)

3.2.4 Consumo de Energia Elétrica - CEE

A EPE disponibiliza os dados de consumo mensal de energia elétrica na rede [45] e a ONS por sua vez, disponibiliza os dados diários de carga de energia elétrica[11][46]. Como o presente estudo utiliza a base diária, foram combinados os dados de carga e consumo de energia da seguinte maneira descrita a seguir.

Primeiramente foi considerado o valor da carga de energia em base mensal, para que, a partir dos dados de carga de energia diários, fosse encontrada a porcentagem de carga diária correspondente a carga mensal.

Sabida essa proporção diária da carga, foi possível cruzar os dados de carga com os dados de consumo de eletricidade mensal, encontrando um valor equivalente ao consumo diário de energia elétrica de 01/01/2010 a 31/12/2016 (Figura 7).

[11] Na grande maioria dos casos, os dados utilizados são originários da Base de Dados Técnica do ONS e refletem as grandezas supervisionadas e programadas pelo ONS.
Os dados de carga e geração de energia em escala mensal e anual, a partir de 2015, consideram os valores das usinas supervisionadas e programadas pelo ONS, acrescidos de informações recebidas da CCEE e de usinas conectadas às redes de distribuição, via as respectivas distribuidoras. O acréscimo dessas informações visa retratar mais fielmente a carga total do sistema [46].

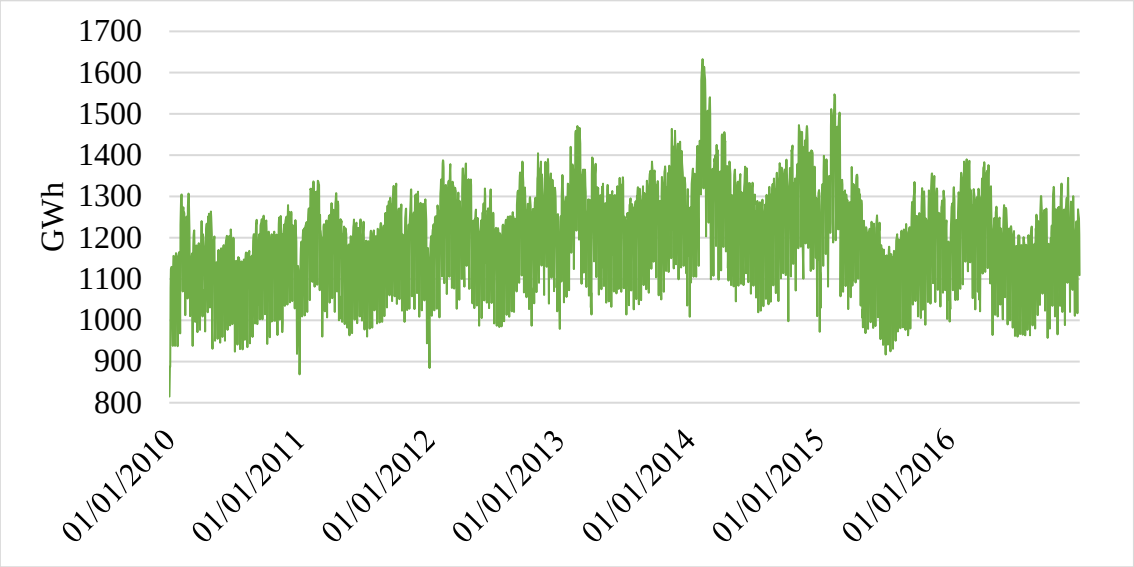

Figura 7 - Comportamento gráfico do Consumo de Energia Elétrica (2010-2016)

3.3 CORRELAÇÃO DOS DADOS UTILIZADOS

Quando observadas as Figuras 2 e 3, percebe-se que os ativos não apresentam um comportamento com forte correlação, isto é: ou seja nem sempre que o preço médio de uma empresa cresce, o outro cresce ou decresce. A respeito das variáveis de mercado e energia, também é observável a independência do comportamento gráfico das mesmas (Figuras 4, 5, 6 e 7).

Quando relacionados graficamente o preço das ações da Eletrobrás (ELET6), ativo base para modelagem, diretamente com as variáveis de energia e o índice de mercado fica mais evidente que a relação entre elas não é direta (Figuras 8 a 11). Na Figura 8 a construção gráfica considera a ordem dos dias de aquisição dos dados, nas Figuras 9, 10, 11 e 12 os valores foram ordenados.

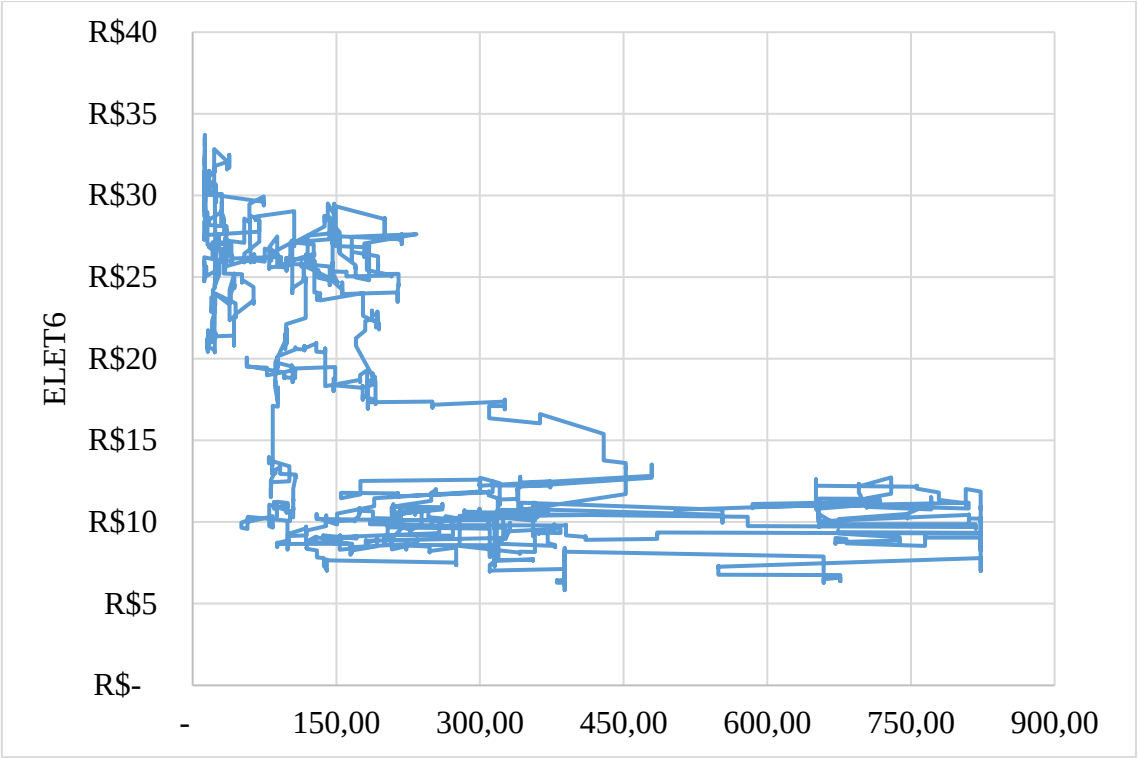

Figura 8 -Relação entre o PLD médio nacional (R$/MWh) e o preço médio dos ativos ELET6.

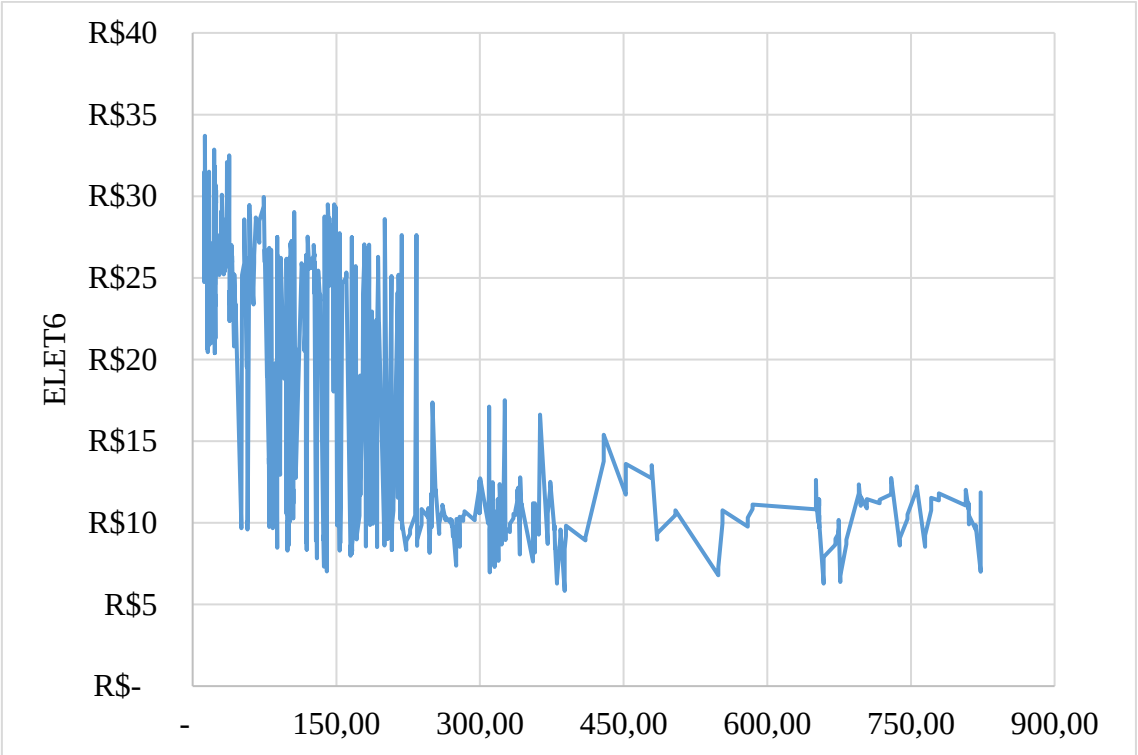

Figura 9 –Relação ordenada entre o PLD médio nacional (R$/MWh) e o preço médio dos ativos ELET6.

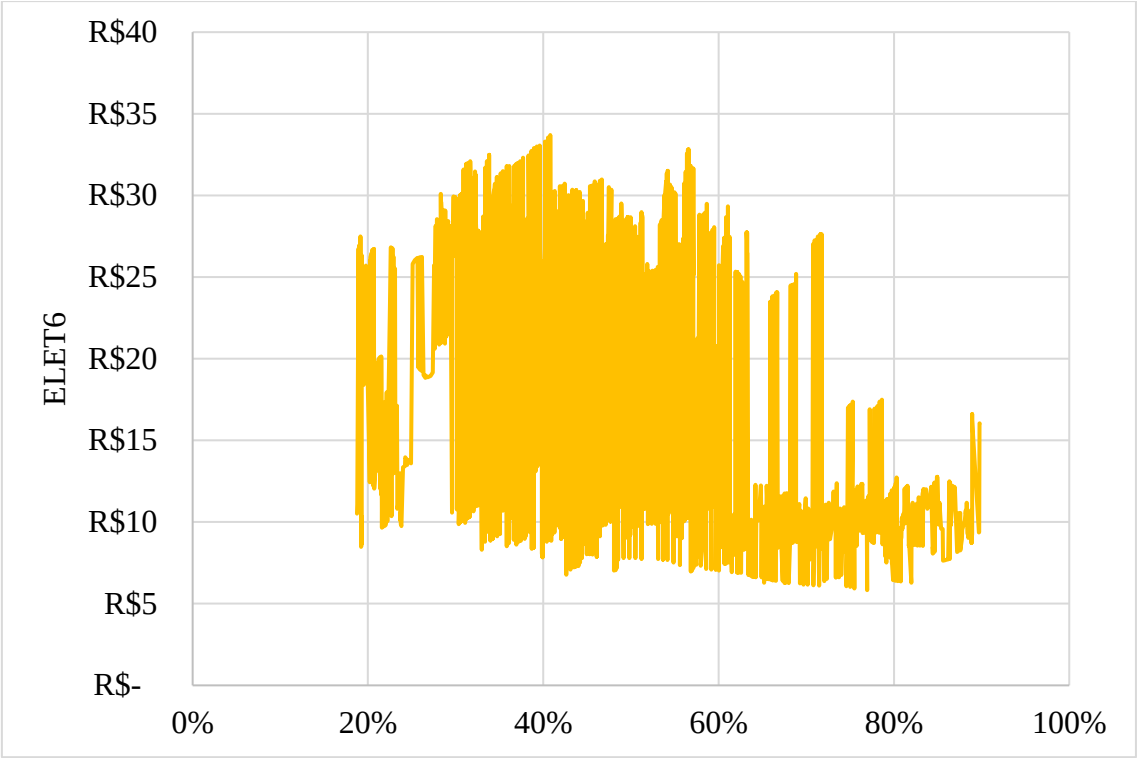

Figura 10 –Relação ordenada entre a EAR nacional e o preço médio dos ativos ELET6.

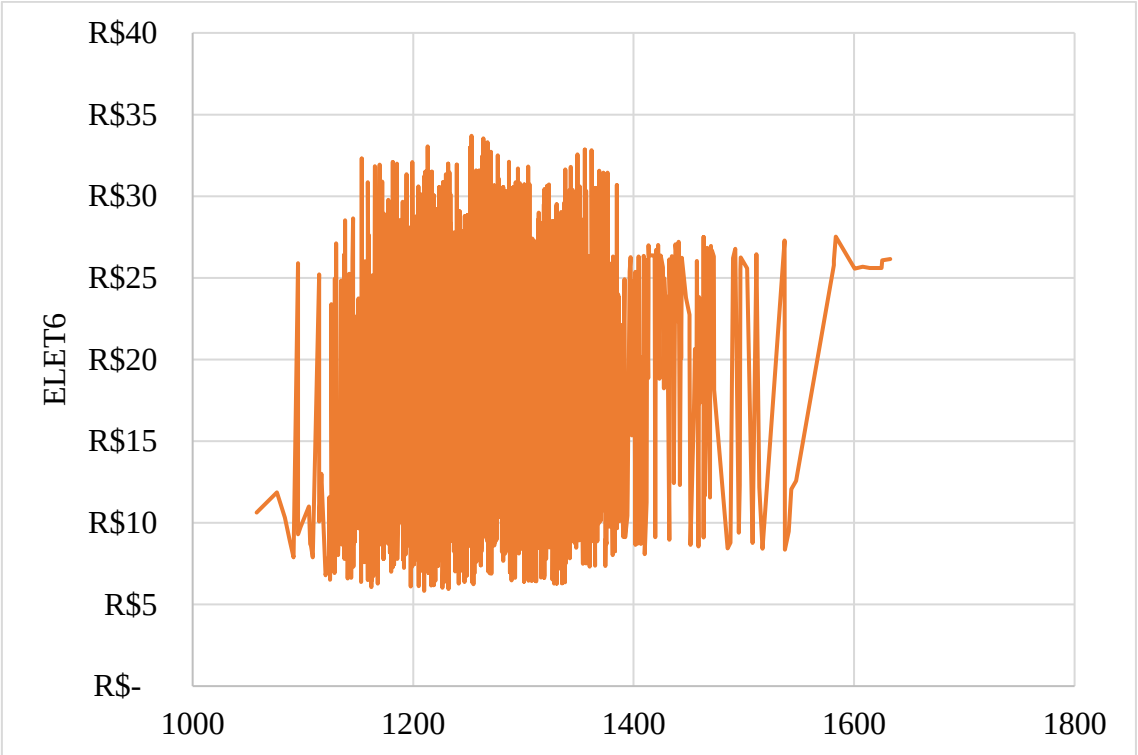

Figura 11 –Relação ordenada entre o consumo de energia elétrica (GWh) e o preço médio dos ativos ELET6.

Na Figura 12, é observável uma certa relação linear entre a subida do índice IBOVESPA com o preço da ação da Eletrobras, isto ocorre com a maioria das ações.

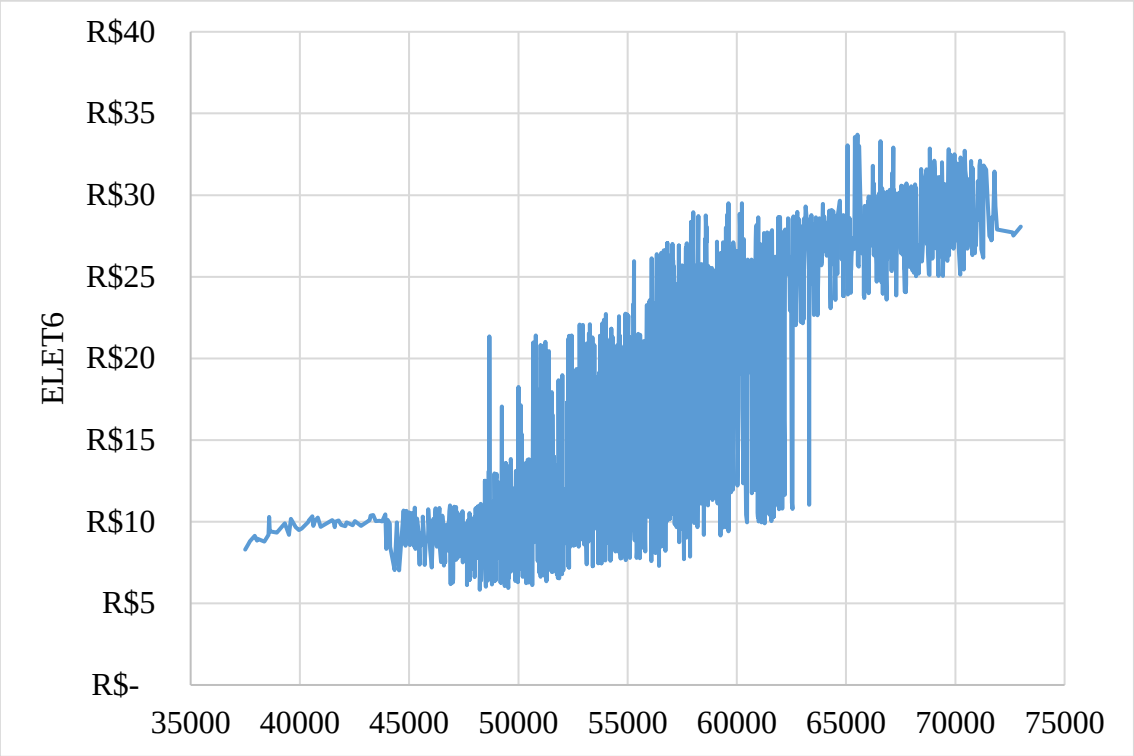

Figura 12 –Relação ordenada entre o IBOV (pontos) e o preço médio dos ativos ELET6.

3.4 ADEQUAÇÃO DOS DADOS PARA APLICAÇÃO DOS MÉTODOS

Após a obtenção e manipulação dos dados para que os mesmos estivessem em base diária e a nível nacional, foi necessário o tratamento dos dados para aplicação dos métodos computacionais.

Como o modelo visa encontrar a relação entre a resposta preço médio dos ativos e as variáveis de energia e de mercado no dia t, essa resposta possivelmente estará relacionada com os dados de dias anteriores (t-1, t-2, t-3, etc.). Essa abordagem é interessante pois em um mercado de capitais a resposta de um evento no preço dos ativos em bolsas de valores se dá em até 8 dias antes ou 8 dias depois do acontecimento [5].

Neste estudo, procurar a relação entre o preço médio e as variáveis no futuro (8 dias depois) não foi importante, já que o intuito da modelagem era perceber se a os dados

passados de Preço médio de ações, do índice de mercado IBOV, da EAR, do PLD e do CE são úteis para prever a faixa de preço das ações das empresas de energia no futuro.

Matematicamente o preço médio p das ações no dia t pode estar relacionado com IBOV, EAR, PLD e CE nos dias t, t-1, t-2, t-3, etc. Ele pode também estar relacionado com o preço da própria ação objeto de estudo nos dias anteriores.

Afim de testar o atraso que melhor responda ao preço médio no dia t, o procedimento exemplificado na Tabela 1 foi executado de t até t-8 para todas as variáveis em análise. Este atraso de 8 períodos fornece 9 dados de entrada, pois é possível se conhecer as cotações que estão acontecendo no dia (instante t). Dessa maneira, foram montadas as Tabelas para aplicação dos modelos considerando o atraso da resposta, o que pode ser exemplificado na Tabela 3:

Tabela 3 - Exemplo da Montagem das planilhas base para modelagem com respectivos atrasos.

Data	**t**	**t-1**	**t-2**	**t-3**
	PLD médio nacional			
01/01/2010	R$ 16,31			
02/01/2010	R$ 12,80	R$ 16,31		
03/01/2010	R$ 12,80	R$ 12,80	R$ 16,31	
04/01/2010	R$ 12,80	R$ 12,80	R$ 12,80	R$ 16,31
05/01/2010	R$ 12,80	R$ 12,80	R$ 12,80	R$ 12,80
06/01/2010	R$ 12,80	R$ 12,80	R$ 12,80	R$ 12,80

Os dados de EAR e CE estão em base diária, o PLD é dado em base semanal, enquanto os dados de mercado disponibilizados pela BM&FBovespa só possuem valores para os dias de pregão, ou seja, exclui sábado, domingos e feriados.

Para aplicação dos modelos, optou-se pela utilização somente dos dias úteis, ou seja, a exclusão dos dados das variáveis de energia em sábados, domingos e feriados. Outra possibilidade, a réplica do preço do último pregão para o fim de semana e feriados, não é interessante pois não é possível fazer transações no mercado financeiro nesses dias e, com a reabertura do pregão, a flutuação do preço se inicia.

Logo, depois de executados os atrasos, os dias sem pregão foram excluídos. Nessa ordem pois, se a exclusão fosse feita primeiramente, no atraso não seria considerado exatamente o dia anterior, mas sim o dia do pregão anterior. Em um raciocínio hipotético, onde se parte do pressuposto que o investidor em uma segunda-feira checará o histórico de energia armazenada para decidir sobre seu investimento em geração, o mesmo não estará interessado somente nos dados da sexta-feira (último pregão) mas também de sábado e domingo. O mesmo procedimento de atraso foi feito para os índices de mercado e preço médio de cada ativo estudado.

No presente estudo denomina-se conjunto, cada grupo de variáveis que foi considerado na modelagem, levando em conta sua natureza. Pode-se dividir os conjuntos em 3: no conjunto 1 são consideradas somente variáveis de energia, no conjunto 2 puramente variáveis de mercado e no conjunto 3, a mescla (Figura 13).

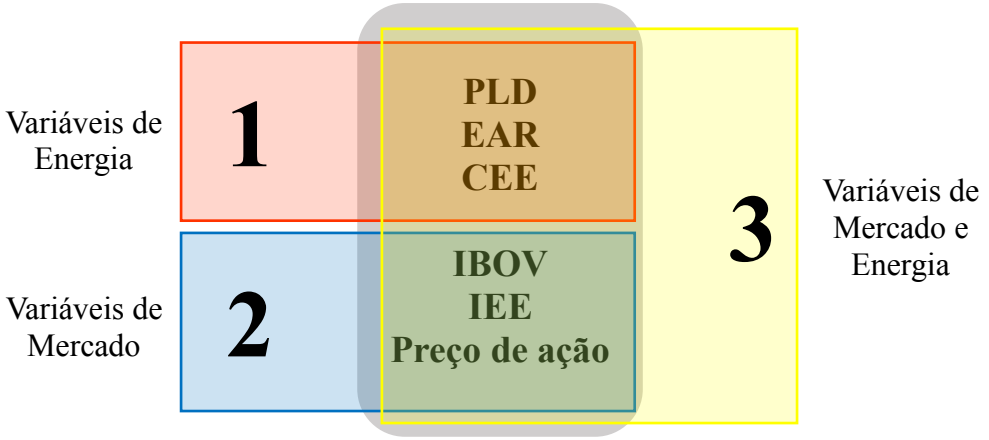

Figura 13 – Conjuntos considerados na modelagem.

Entendidos os conjuntos a serem analisados, cabe demonstrar a lógica dos atrasos que serão considerados na modelagem teste (Figura 14). Para cada conjunto as variáveis serão modeladas observando os atrasos, sendo o intuito perceber que grau de atraso mais influencia no preço das ações.

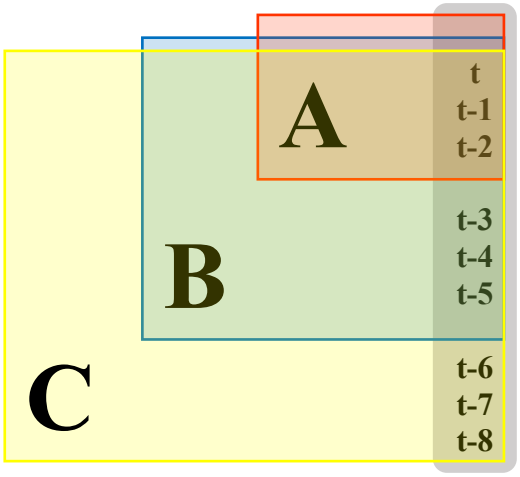

Figura 14 – Atrasos considerados na modelagem.

Como foi visto anteriormente, não existe uma função pela qual se possa estabelecer uma correspondência biunívoca entre o preço de uma ação e as variáveis de entrada consideradas; porém observou-se que pode existir uma relação entre as variáveis de entrada e a saída (preço da ação) se forem estabelecidas faixas de valores, tanto para as grandezas de entrada quanto para as grandezas de saída.

Foram determinadas 10 faixas das grandezas de entrada automaticamente pelo programa utilizado Weka 3.8, para cada metodologia testada, enquanto as faixas de saída foram objeto de estudo. A análise dos dados de entrada em faixas foi para perceber se há discriminação dos dados, de maneira a validar o estudo.

No caso das saídas, não é provável ou viável um método que determine exatamente o valor das ações, portanto neste estudo foram consideradas faixas de preço médio. Nos testes, analisou-se quantas faixas representariam melhor as saídas.

Denomina-se, portanto, como análise cada condição de saída imposta no estudo, sendo elas três. Para a análise 1, considerou-se 3 intervalos de saída, sendo os mesmos divididos em faixas entre o menor e o maior preço médio do período observado. Para a análise 2, 10 intervalos são levados em conta e, no caso da análise 3, os intervalos se dão de 1 em 1 real, sendo então o número de intervalos determinado pelo descolamento do preço para o tempo adotado no estudo.

O número de faixas da análise 2 foi determinado como 10 e para a análise 3, considerando que o ativo ELET6 é a base para a aplicação dos modelos, quando dividido o preço deste ativo em intervalos de 1 em 1 real, 29 é o número de faixas de saída para os testes executados. Essa análise (de 1 em 1 real) é justificável pois a flutuação da bolsa geralmente não se dá em grandes intervalos.

A etapa de testes do estudo serve para encontrar a melhor combinação entre conjunto de variáveis, atraso, número de faixas de saída e método, sendo feitos para o ativo ELET6 da Eletrobras. A escolha dessa empresa como teste foi baseada no fato de que essa é a empresa mais genérica considerada no estudo com investimentos em todos os segmentos, além de possui forte representatividade no setor. O diagrama da Figura 15 resume a etapa de testes, foram combinadas todas as possibilidades.

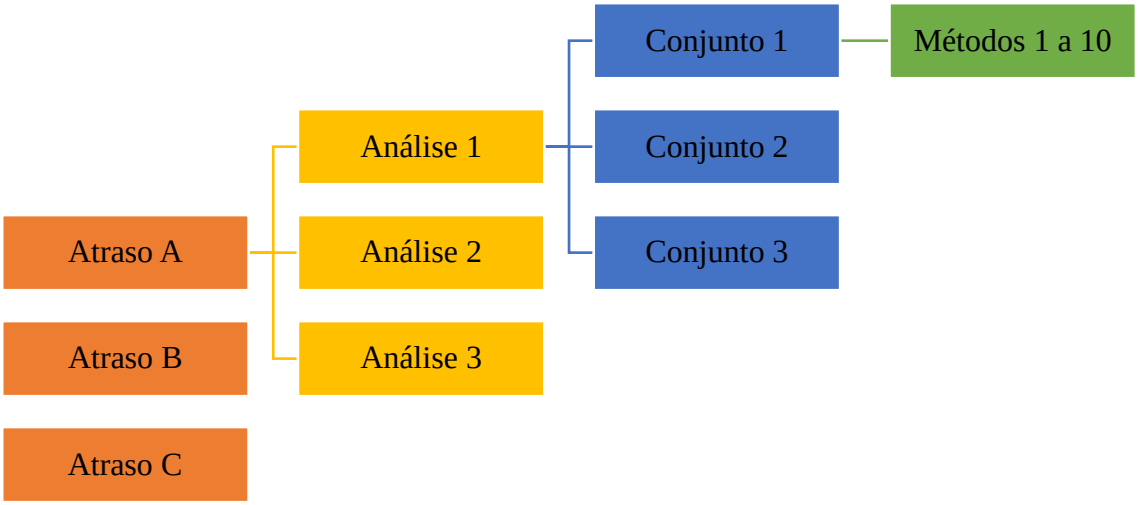

Figura 15 – Esquema representativo da fase de testes do estudo.

3.5 MÉTODOS E DADOS DE SAÍDA

O método Zero-R serve como balizador inferior da análise, e o modelo Persistente como o resultado a ser batido pelos demais. O intuito é que esses limites auxiliem na avaliação da efetividade da aplicação dos demais métodos. Conforme explanado no Apêndice, os modelos Persistente e Zero-R levam em conta somente as

faixas de saída representando então o melhor e o pior resultado passível de obtenção nas modelagens para cada ativo avaliado.

Para facilitar a síntese dos resultados, foram atribuídos números a cada método testado. Os métodos considerados para o estudo estão listados na Tabela 4 com sua respectiva numeração correspondente adotada.

Tabela 4 – Numeração correspondente dos métodos adotados para testes.

1	1R Classifier
2	PART Decision List
3	RIPPER
4	Decision Tables
5	REPTree
6	J48
7	Hoeffding Tree
8	Random Tree
9	Random Forest
10	Redes Neurais

Os métodos foram aplicados através do software Weka 3.8. O grau de representatividade de um modelo está relacionado com o erro que ele apresenta, enquanto a complexidade de representação está ligada com a dificuldade de se representar este modelo ou mesmo que compreendê-lo.

A utilização de vários métodos para teste, busca encontrar o(s) método(s) que ofereceria(m) um grande grau de acerto com um nível razoável de representatividade e complexidade. Não é interessante um modelo ótimo (com um alto grau de representatividade), mas com um alto grau de complexidade, já que isso dificultaria a aplicação do mesmo, portanto pode-se optar por um modelo com um nível aceitável de erro e uma complexidade reduzida.

Os dados de saída da aplicação dos métodos que servem de base para o estudo são o grau de acerto de cada metodologia[12], e sua matriz de confusão. A aplicação de cada modelagem gera uma matriz de confusão às saídas da mesma. No intuito de utilizar essas matrizes para auxiliar na avaliação foi construído um índice, medindo a dispersão dessa matriz. A metodologia de construção do índice será descrita no próximo subitem.

3.6 CONSTRUÇÃO DO ÍNDICE DE QUASE ACERTO

Das modelagens principais, os resultados levados em consideração afim de escolher o melhor método para previsão do preço são o grau de acerto de cada modelagem. No intuito de corroborar a escolha da modelagem mais adequada, se fez interessante um estudo relativo às matrizes de confusão.

Para uma análise onde se propõe 10 intervalos de saída será gerada uma matriz de confusão 10x10, onde na diagonal principal da matriz são representados os exemplares classificados corretamente. Os elementos classificados incorretamente estão fora da matriz principal.

Considera-se, hipoteticamente, um conjunto de dados de uma matriz aleatória 10x10, fosse essa a matriz confusão X de um conjunto de exemplares passíveis de classificação em 10 faixas entre 0 e 10 submetidos a aplicação da metodologia X. As faixas de saída seriam então dispostas como na Tabela 5.

Tabela 5 – Faixas e intervalos para aplicação hipotética da metodologia X.

Faixa	a	b	c	d	e	f	g	h	i	j
Intervalo	[0-1]	[1-2]	[2-3]	[3-4]	[4-5]	[5-6]	[6-7]	[7-8]	[8-9]	[9-10]

A matriz de confusão hipotética está disposta na Tabela 6, e a partir dos dados gerados aleatoriamente, encontrou-se um total de exemplares de 4642 exemplares hipoteticamente classificados pela metodologia X.

[12] O grau de acerto de cada metodologia para cada conjunto de variáveis, levando em conta os atrasos e o número de faixas de saída (análises).

Os valores destacados na diagonal principal da matriz representam os exemplares classificados corretamente pela metodologia aplicada e, executando a soma dos exemplares, sabe-se que 552 dos 4642 exemplares foram alocados na faixa correta, o que representa um grau de acerto de 13,50%.

Tabela 6 – Matriz de confusão hipotética gerada a partir da aplicação da metodologia X para 10 faixas de saída.

	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**
a	19	39	6	89	4	56	70	97	18	49
b	31	71	83	81	58	28	38	28	77	37
c	90	48	79	27	31	32	3	51	73	74
d	28	29	21	63	80	39	24	55	2	65
e	7	67	62	23	55	10	61	50	51	17
f	7	97	87	53	60	69	15	2	10	89
g	16	81	65	24	33	90	66	74	83	51
h	2	4	64	57	9	76	93	90	11	80
i	3	65	10	10	5	86	56	62	38	19
j	81	75	13	56	27	57	59	52	12	2

Agora, no intuito de analisar outra perspectiva, considerou-se a faixa *f* como objeto de estudo. Somando-se a linha tem-se que existiam 489 classificáveis como pertencentes a essa faixa, ou seja, 489 dos 4642 tem saídas com valores entre 5 e 6. Destes 489 exemplares classificáveis como pertencentes à faixa *f*, tem-se que 69 exemplares foram classificados corretamente.

Quando observados os erros em relação classificação, a presente análise procura levar em conta o que pode ser chamado de "quase acerto", isto é, o fato de que o método muitas vezes não classifica tão longe da faixa correta.

Parte-se de que a classificação errônea de um exemplar que pertenceria a faixa *f* na faixa *e* ou *g*, difere em intensidade do erro em classificar incorretamente esse exemplar como pertencente a faixa a. Em linhas gerais, se a modelagem prevê uma saída que seria 5,8 (faixa *f*) como 6,2 (faixa *g*), consiste em um erro menos intenso do que a prever como 1,3 (faixa *b*).

A partir dessa linha de raciocínio foi calculada uma ponderação do erro, de maneira a levar em consideração o "quase acerto". Para o cálculo da ponderação, leva-se em conta o número de saídas (Equação 4).

$$Valor\ a\ ser\ ponderado = \frac{Número\ de\ saídas - 1}{100} \qquad \text{Equação 4}$$

Para a análise da matriz de confusão aleatória utilizada como exemplo, que possui 10 saídas, o valor a ser ponderado será 9/100. O elemento da matriz principal representa 100,00 e o valor a ser ponderado é subtraído de cada elemento da linha correspondente sucessivamente.

Quanto mais distante da faixa correta de classificação, mais próxima de zero é a ponderação, chegando a zero somente nas extremidades opostas da faixa *a* e da faixa *j*. Para melhor compreensão, a matriz ponderação desta análise hipotética está ilustrada na Tabela 7.

Tabela 7 – Matriz ponderação para uma matriz de confusão 10x10.

	a	**b**	**c**	**D**	**e**	**f**	**g**	**h**	**i**	**j**
a	100,00	88,89	77,78	66,67	55,56	44,44	33,33	22,22	11,11	0,00
b	88,89	100,00	88,89	77,78	66,67	55,56	44,44	33,33	22,22	11,11
c	77,78	88,89	100,00	88,89	77,78	66,67	55,56	44,44	33,33	22,22
d	66,67	77,78	88,89	100,00	88,89	77,78	66,67	55,56	44,44	33,33
e	55,56	66,67	77,78	88,89	100,00	88,89	77,78	66,67	55,56	44,44
f	44,44	55,56	66,67	77,78	88,89	100,00	88,89	77,78	66,67	55,56
g	33,33	44,44	55,56	66,67	77,78	88,89	100,00	88,89	77,78	66,67
h	22,22	33,33	44,44	55,56	66,67	77,78	88,89	100,00	88,89	77,78
i	11,11	22,22	33,33	44,44	55,56	66,67	77,78	88,89	100,00	88,89
j	0,00	11,11	22,22	33,33	44,44	55,56	66,67	77,78	88,89	100,00

Para construção do índice de quase acerto, constrói-se a matriz índice (Equação 5), onde multiplica-se a matriz de confusão pela matriz ponderação, gerando assim o que pode ser chamado de matriz índice.

$$\begin{bmatrix} Matriz \\ Índice \end{bmatrix} = \begin{bmatrix} Matriz\ de \\ Confusão \end{bmatrix} \times \begin{bmatrix} Matriz \\ Ponderação \end{bmatrix} \quad \text{Equação 5}$$

Após a multiplicação da matriz de confusão de cada metodologia com a matriz ponderação, executou-se a soma de todos os elementos da matriz índice gerando o índice de quase acerto para cada metodologia. No exemplo hipotético utilizado, o índice de quase acerto seria 299.903,77.

Avaliando em base de proporção, caso todos os exemplares fossem alocados corretamente pela metodologia hipotética X existiriam 100% de acerto para os 4642 exemplares de saída, como se toda previsão sempre alocasse o exemplar no intervalo de saída correto, portanto o índice máximo gerado seria de 464.200,00. Sendo assim, a partir desse índice limite é possível calcular a razão do índice em relação ao seu máximo que, no caso da metodologia hipotética em análise, seria de 64,61%.

Esse procedimento foi executado para todas as matrizes de confusão geradas, encontrando um índice de quase acerto, em termos de percentual, para cada método aplicado a cada conjunto de entradas. Isso para que, analisando grau de acerto, e ainda o quase acerto, a escolha da metodologia seja a mais adequada ao estudo.

Capítulo 4

ANÁLISE DOS RESULTADOS PARA O ATIVO ELET6

Como mencionado anteriormente, a escolha dos parâmetros e metodologia adequados foi executada através de testes iniciais com base no ativo ELET6. Para fluidez do estudo, o mesmo será analisado partindo-se do disposto na Figura 15.

4.1 ATRASO A

Para o atraso A, onde as variáveis são atrasadas em até dois dias (t até t-2), os conjuntos de variáveis de entrada para modelagem são dispostos conforme listado na Figura 16.

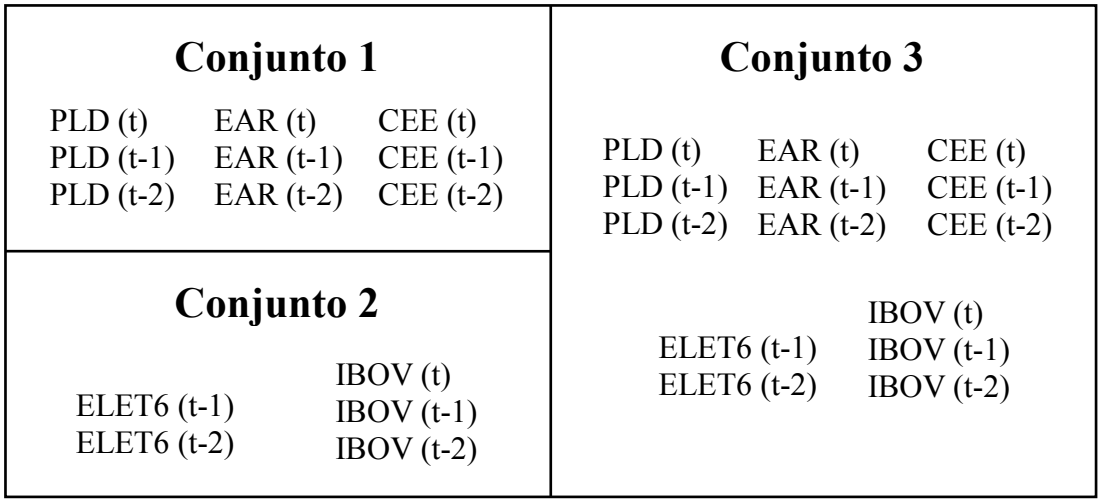

Figura 16 – Variáveis consideradas em cada conjunto para o atraso A.

Para as variáveis do preço do ativo consideradas nos conjuntos 2 e 3, o intuito do trabalho é justamente modelar o preço da ação ELET6 no momento t, não sendo pertinente incluir esse valor na modelagem.

4.1.1 Análise 1 – 3 faixas de saída

Primeiramente faz-se importante uma avaliação dos dados de entrada para justificar a consistência da análise. Considerou-se primeiramente 3 intervalos de saída do preço médio do ativo ELET6 e executou-se a contagem dos exemplares dos dados históricos analisados (2010-2016) presentes em cada intervalo (Tabela 8). Essa contagem é válida para relacionar os exemplares de saída com os conjuntos de entrada que serão avaliados a seguir.

Tabela 8 – Intervalos de saída, número de exemplares e legenda para a análise 1.

Intervalos de Saída	Número de exemplares	Legenda
[5,83;15,12]	892	
[15,12;24,41]	299	
[24,41;33,70]	542	

4.1.1.1 CONJUNTO 1 DE ENTRADAS

Analisando os dados entrada, as variáveis do conjunto 1 de entradas foram discretizadas em 10 faixas. Esta discretização, permite uma boa categorização das entradas, já que valores superiores ou inferiores a 10 podem apresentar intervalos sem dados de entrada ou muito cheios, respectivamente. Logo se efetuou a contagem do número de exemplares em cada faixa de saída da análise 1 e relacionou-se graficamente com os intervalos de saída.

De maneira geral, a partir da discretização, tem-se os intervalos, número de exemplares e gráfico para cada grandeza de entrada. Por conta dos atrasos, podem existir diferenças entre os intervalos das faixas para as entradas de uma mesma variável de energia (PLD, EAR e CEE) além da possibilidade de diferirem na quantidade de exemplares em cada faixa.

Analisando as entradas PLD (t), PLD (t-1), PLD (t-2), o número de exemplares e os intervalos gerados permanecem constante em cada faixa dessa variável e a distribuição dos mesmos pode ser observada na Figura 17.

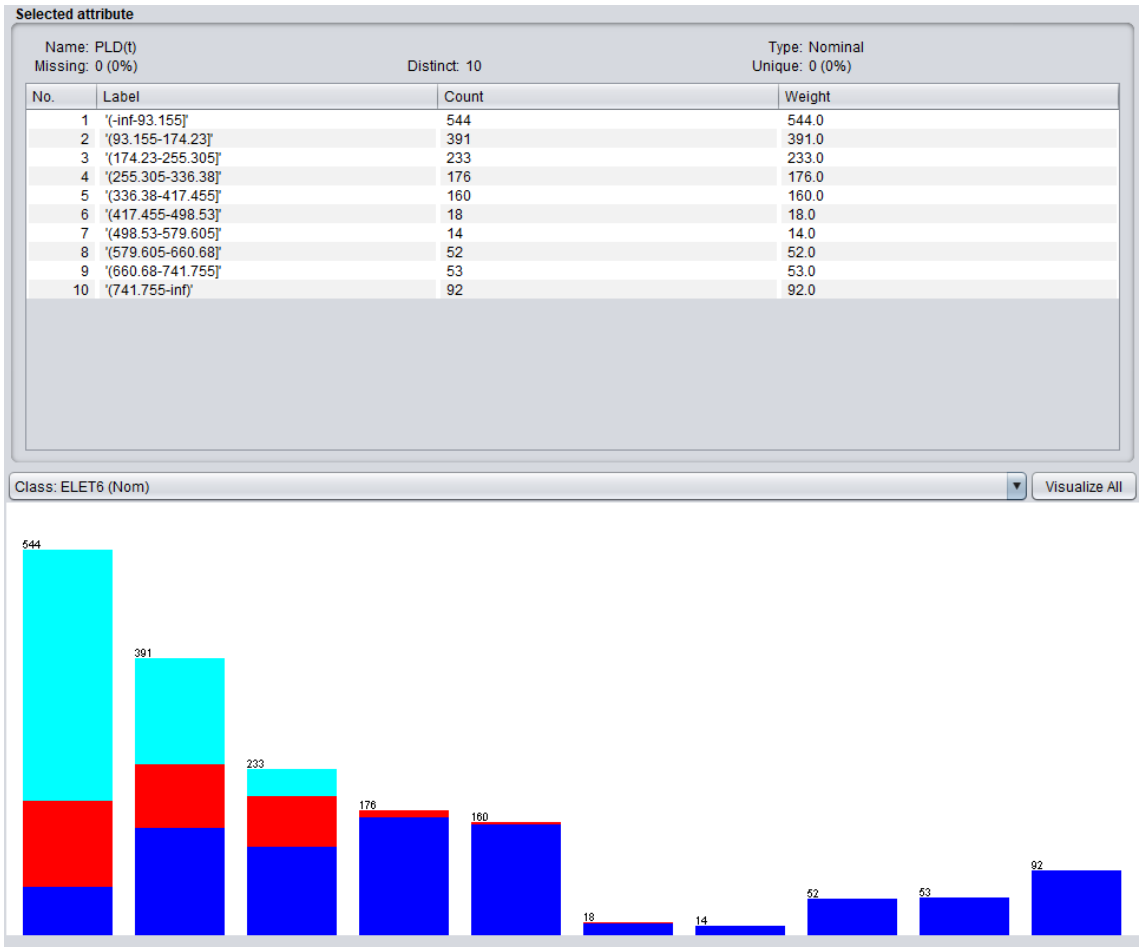

Figura 17 - Discretização dos intervalos de saída nas faixas de distribuição dos inputs PLD (t), PLD (t-1) e PLD (t-2).

Para as entradas EAR (t), EAR (t-1), EAR (t-2) os intervalos das 10 faixas não apresentam muita variação, mas existem diferenças entre o número de exemplares presentes em cada faixa para os atrasos da entrada EAR (Figuras 18, 19 e 20).

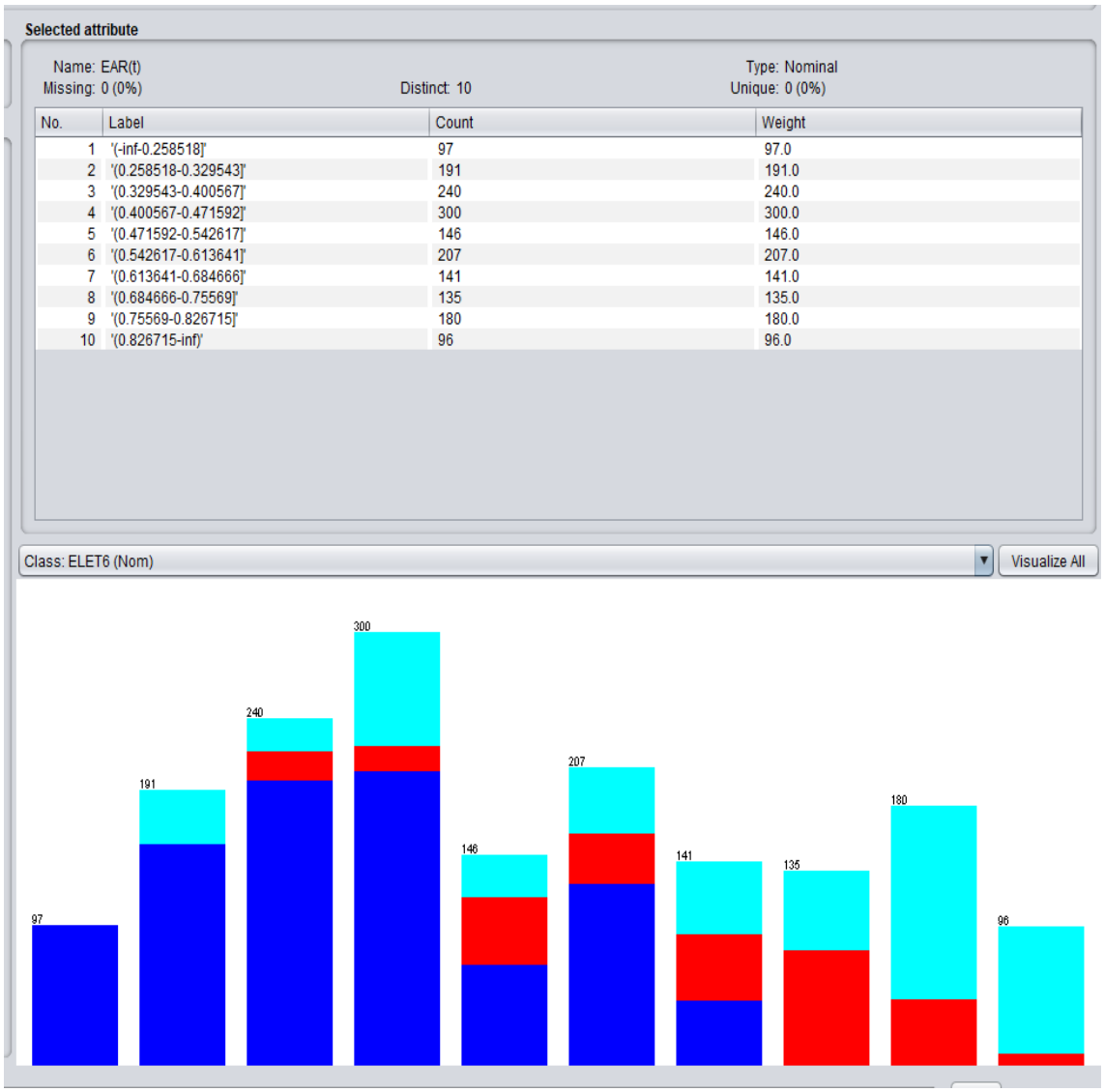

Figura 18: Discretização dos intervalos de saída nas faixas de distribuição de EAR (t).

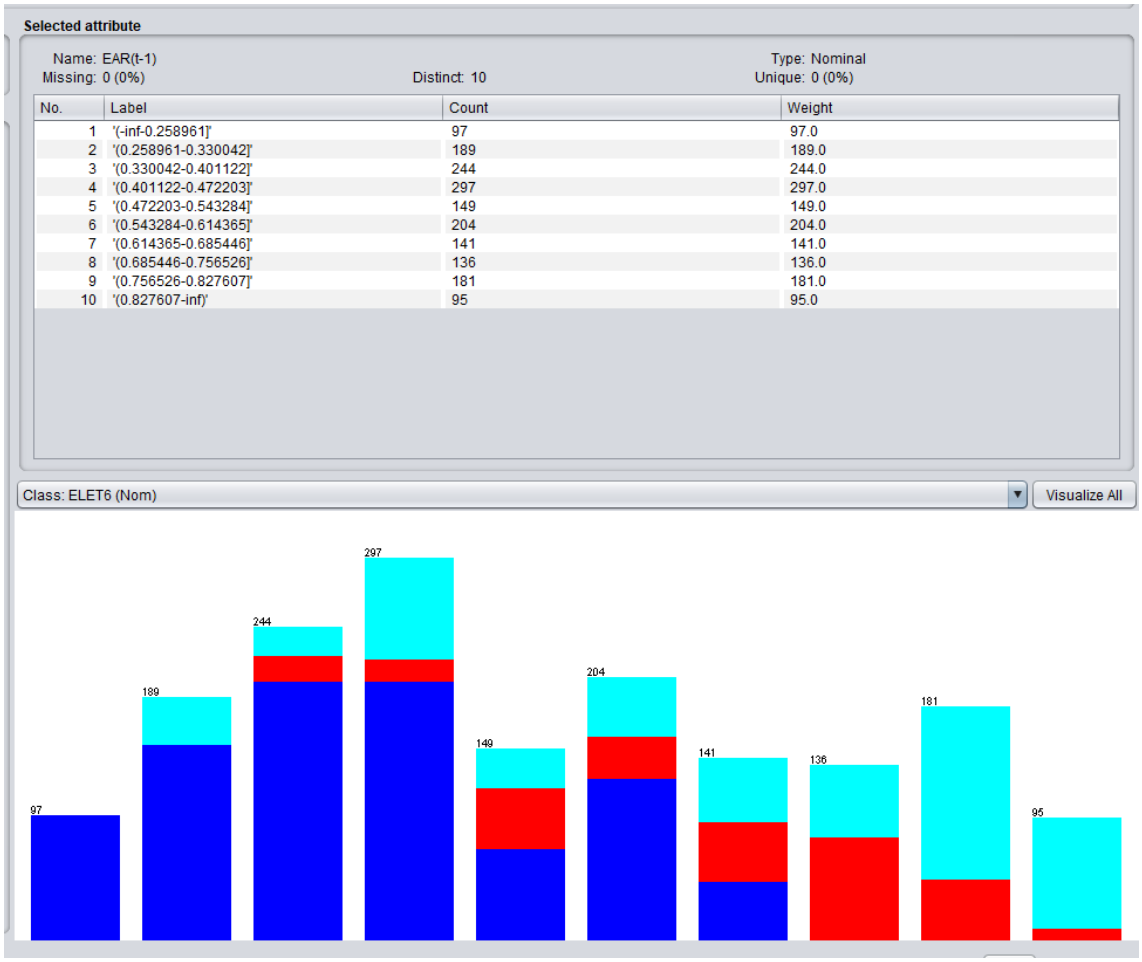

Figura 19: Discretização dos intervalos de saída nas faixas de distribuição de EAR (t-1).

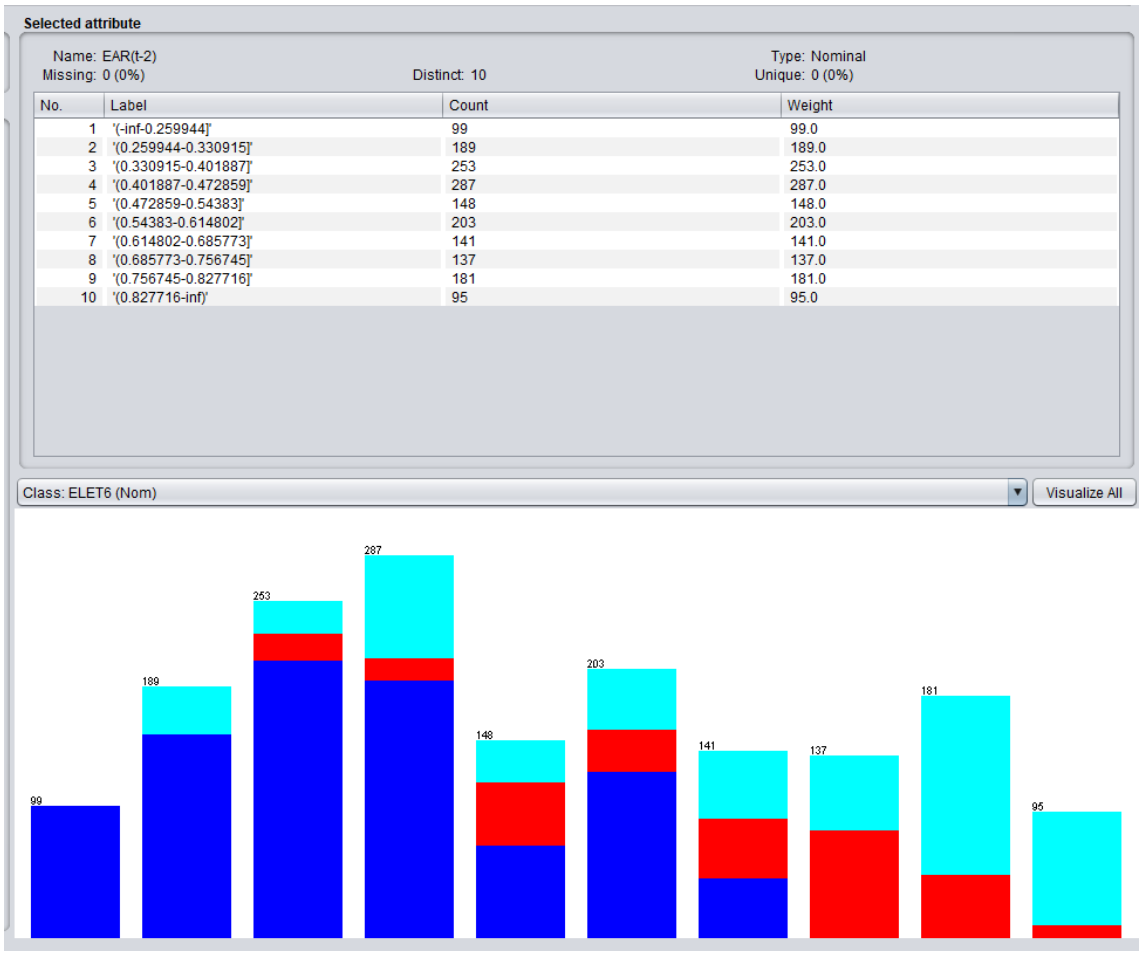

Figura 20: Discretização dos intervalos de saída nas faixas de distribuição de EAR (t-2).

No caso dos inputs CEE (t), CEE (t-1) e CEE (t-2), o intervalo das faixas apresentou variações para as grandezas e existem grandes diferenças entre o número de elementos em cada faixa para cada grandeza (Figuras 21, 22 e 23).

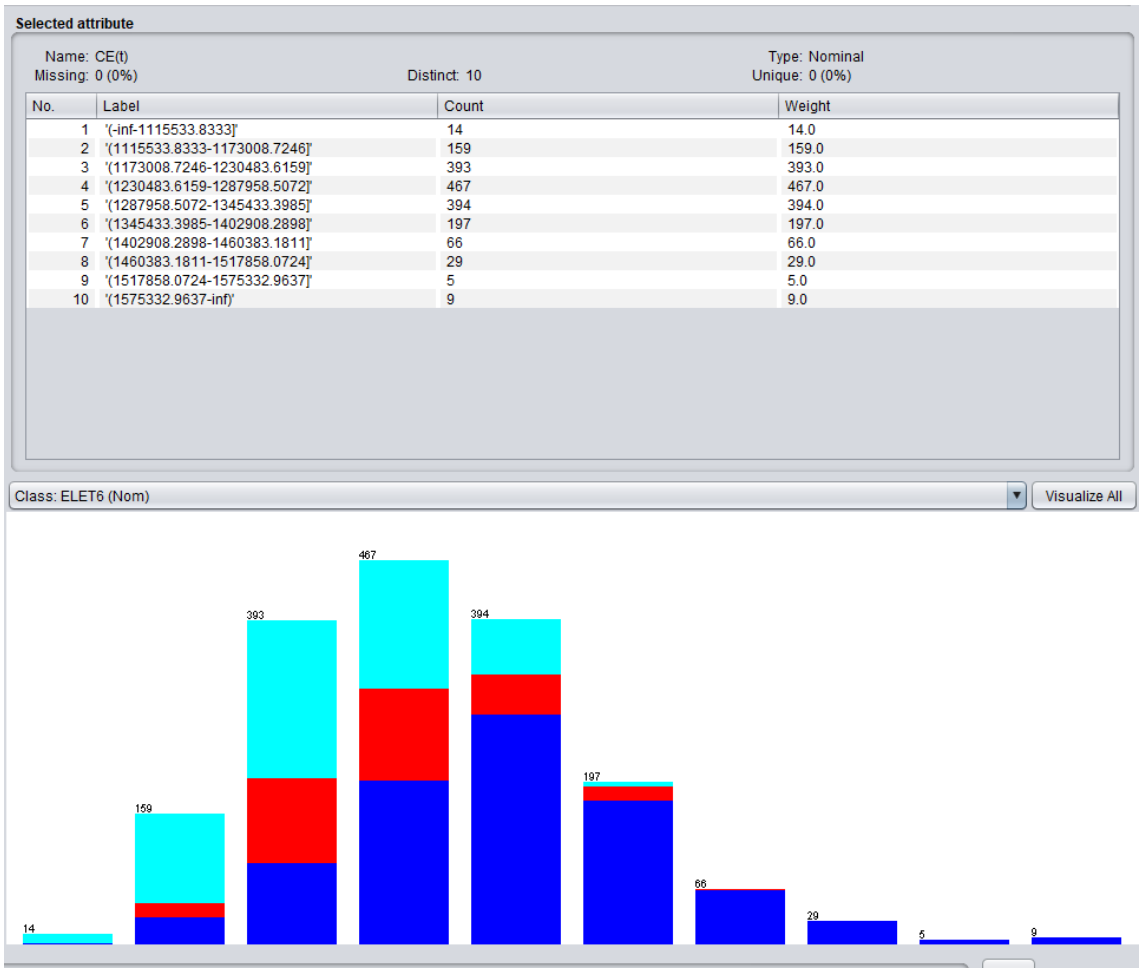

Figura 21: Discretização dos intervalos de saída nas faixas de distribuição de CEE (t).

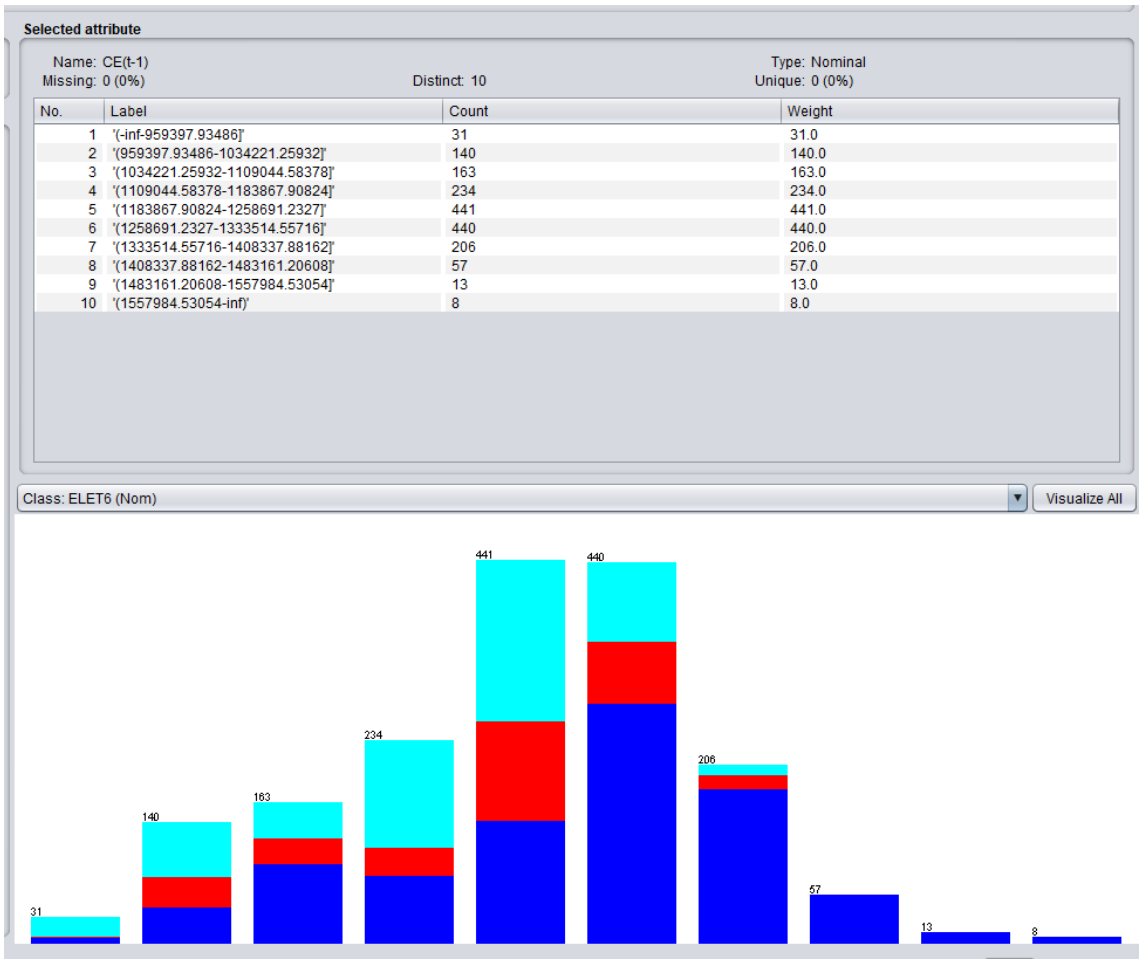

Figura 22: Discretização dos intervalos de saída nas faixas de distribuição de CEE (t-1).

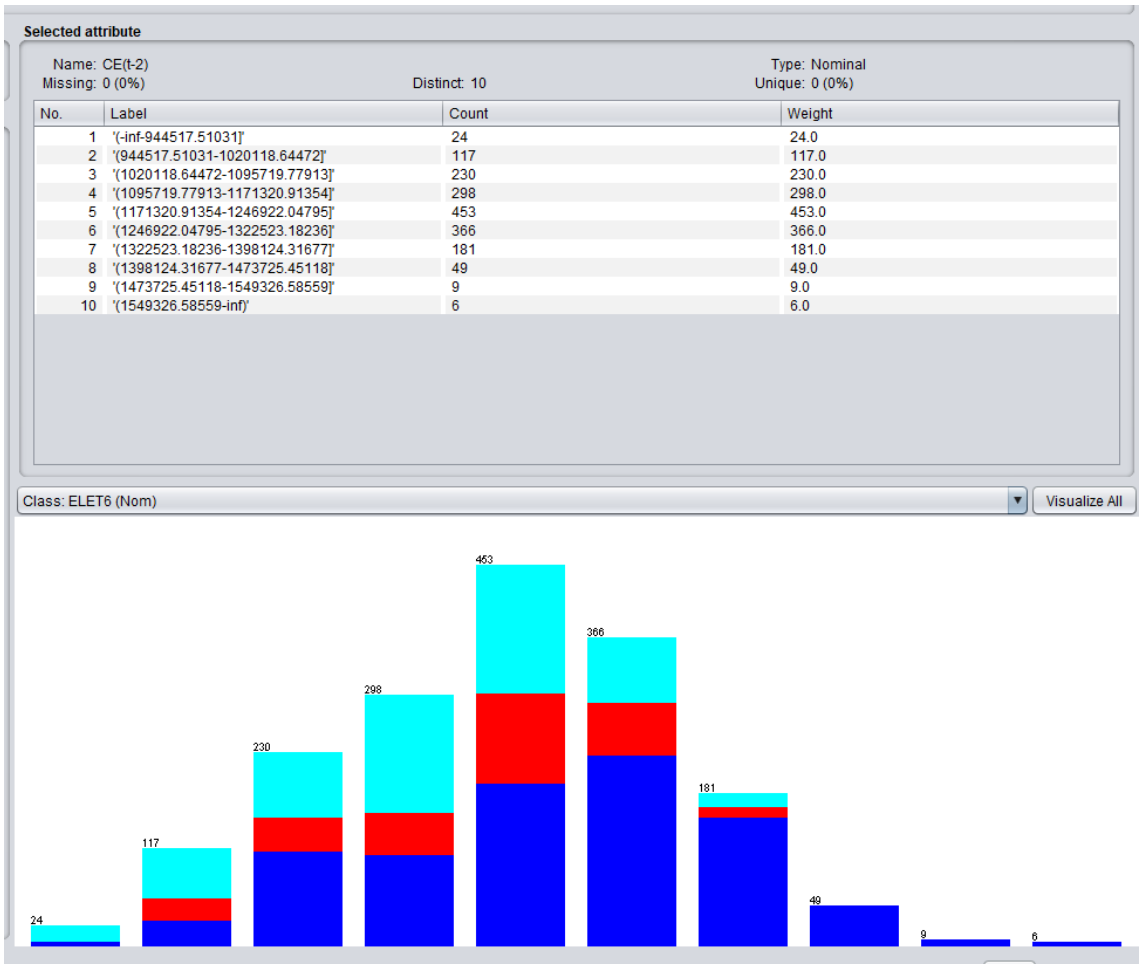

Figura 23: Discretização dos intervalos de saída nas faixas de distribuição de CEE (t-2).

Para fins de comparação, os gráficos da Figura 17 até a Figura 23 foram dispostos juntos na Figura 24. É perceptível que as saídas não são discriminantes, pois a distribuição dos exemplares de saídas se misturam nas faixas de entradas. Esse fato demonstra a importância e complexidade da análise.

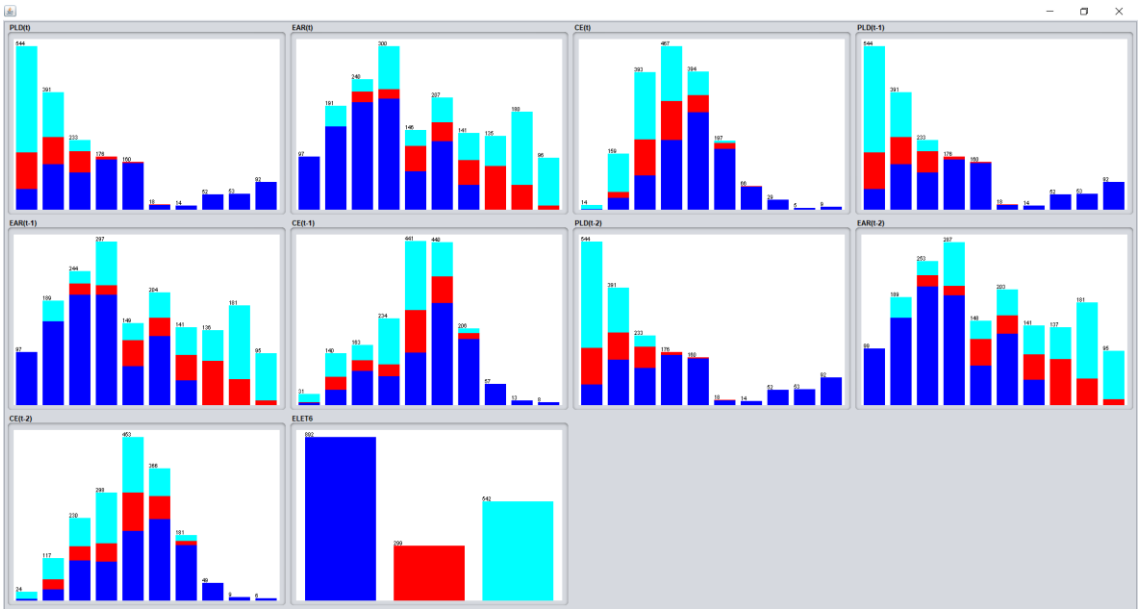

Figura 24 - Comparação da relação das entradas com os intervalos de saída para o conjunto 1.

Uma vez comprovada a não discriminação das entradas em relação às faixas de saída, os balizadores e os métodos escolhidos para análise foram aplicados e sua nomenclatura segue numeração da Tabela 4, exposta no capítulo 2.

Os modelos Persistente e Zero-R foram aplicados como balizadores uma vez que levam em conta somente as faixas de saída, resultando em grau de acerto superior de 98,96% (Persistente) e 51,47% (Zero-R).

Para os métodos em avaliação, cada metodologia aplicada fornece o número de exemplares classificados correta e erroneamente pela modelagem, ou seja, o grau de acerto que a modelagem oferece. No caso dos métodos PART Decision List, RIPPER e Decision Tables (2, 3 e 4), é fornecida a quantidade de regras que o modelo utilizou para atingir o grau de acerto alcançado.

Para os modelos REPTree, J48 e Hoeffding Tree (5, 6 e 7) é fornecido o tamanho da árvore, dado relacionado a complexidade do modelo. Para o método J48 (6) ainda é determinado o número de folhas. Para cada modelagem é gerada ainda uma matriz de confusão e os resultados gerados a partir da aplicação dos métodos em análise estão dispostos na Tabela 9.

Tabela 9 - Resultados da aplicação dos métodos para o conjunto 1 de entradas.

Método	Exemplares classificados corretamente		Exemplares classificados incorretamente		Nº de regras	Matriz de Confusão		
	Qtd	%	Qtd	%		a	b	c
1	1185	68,38%	548	31,62%	-	846	12	34
						119	85	95
						216	72	254
2	1385	79,92%	348	20,08%	63	803	25	64
						56	172	71
						64	68	410
3	1347	77,73%	386	22,27%	17	815	13	64
						109	125	65
						97	38	407
4	1381	79,69%	352	20,31%	253	803	28	61
						69	169	61
						82	51	409
5	1383	79,80%	350	20,20%	251*	825	17	50
						79	161	59
						88	57	397
6	1404	81,02%	271	18,98%	244** e 271*	810	29	53
						58	178	63
						68	58	416
7	1291	74,50%	442	25,50%	-	744	87	61
						43	162	94
						65	92	385
8	1386	79,98%	347	20,02%	2071*	806	35	51
						109	125	65
						59	87	396
9	1399	80,73%	344	19,27%	-	810	33	49
						47	170	82
						49	74	419
10	1403	80,96%	330	19,04%	-	811	19	62
						55	115	129
						24	41	477

*Tamanho da árvore
**Número de folhas

O grau de acerto da aplicação do método Zero-R serve como balizador dos resultados pois, qualquer método que ofereça um menor grau de acerto que o Zero-R estará muito aquém da expectativa da modelagem. Para o método 1, o programa varre

as variáveis de entrada, escolhendo a que gera maior grau de acerto e discretiza as saídas sobre as faixas dessa entrada.

Nas demais metodologias, o grau de acerto variou entre 74 e 81%. Na aplicação da metodologia 8, a árvore gerada é muito grande, sendo inclusive maior que a quantidade dados de cada variável de entrada, o que indica um grande grau de complexidade da modelagem.

4.1.1.2 CONJUNTO 2 DE ENTRADAS

Por meio do mesmo procedimento para o conjunto de variáveis de energia (Conjunto 1), as saídas de ELET6 (t) foram relacionadas com o Índice IBOV e com o preço médio dos ativos ELET6 de até dois dias anteriores. As faixas de saída foram novamente consideradas de acordo com a Tabela 8.

Logo, para o conjunto 2 de entradas foram determinadas 10 faixas e também se efetuou a contagem do número de exemplares em cada faixa dos inputs de entrada. As relações gráficas entre faixas de entrada e os exemplares dos intervalos de saída podem ser observadas na Figura 25.

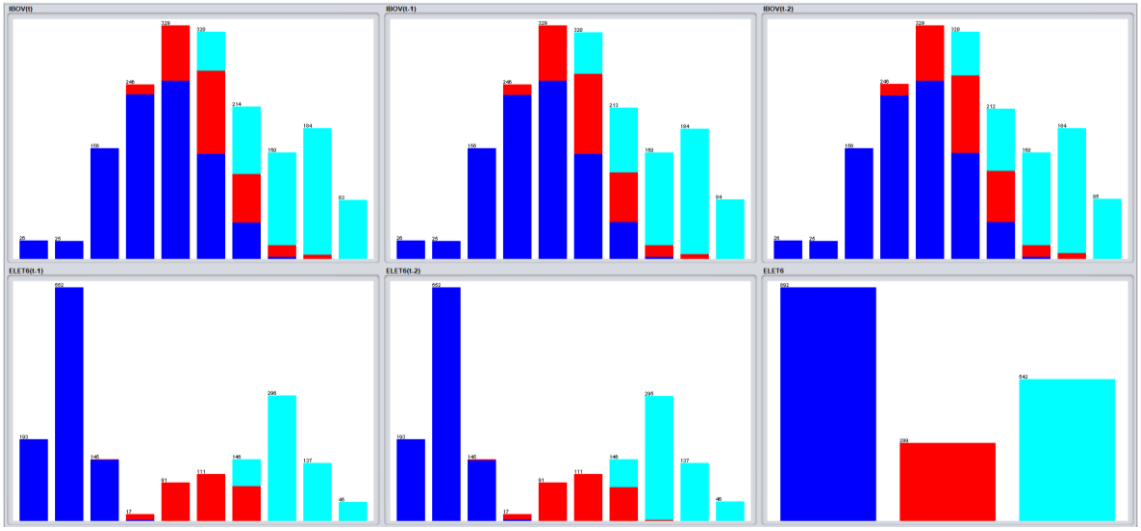

Figura 25 - Comparação da relação das entradas com os intervalos de saída para o conjunto 2.

Na análise do conjunto 2 é notável uma maior discriminação das faixas de saída do que no conjunto 1, principalmente quando analisadas as variáveis ELET6 (t-1) e ELET6 (t-2).

O comportamento da relação entre entrada e saída do conjunto 2 indica que o preço do ativo no passado e o comportamento do mercado (indicado pelo índice IBOV), tem uma relação mais simples com a previsão de preços do que as variáveis de energia estudadas no conjunto 1.

Os resultados da aplicação dos métodos para o conjunto 2 de entradas pode ser observado na Tabela 10. Percebe-se um grande grau de acerto para as entradas de natureza de mercado, com metodologias com um grau de acerto de mais que 95%, quase chegando ao resultado do modelo Persistente (98,96%).

Tabela 10 - Resultados da aplicação dos métodos para o conjunto 2 de entradas.

Método	Exemplares classificados corretamente		Exemplares classificados incorretamente		Nº de regras	Matriz de Confusão		
	Qtd	%	Qtd	%		a	b	c
1	1665	96,08%	68	3,92%	-	889	3	0
						1	298	0
						0	64	478
2	1672	96,48%	61	3,5199%	13	889	3	0
						1	283	15
						0	42	500
3	1665	96,08%	68	3,92%	8	889	3	0
						1	294	4
						0	60	482
4	1660	95,79%	73	4,21%	49	889	3	0
						5	283	11
						2	52	488
5	1662	95,90%	71	4,10%	41*	889	3	0
						1	288	0
						0	57	485
6	1672	96,48%	61	3,52%	46** e 51*	889	3	0
						1	282	16
						0	41	501
7	1673	96,54%	60	3,46%	-	877	4	1
						3	278	18
						0	34	508
8	1670	96,36%	63	3,64%	251*	889	3	0
						2	280	17
						0	41	501
9	1671	96,42%	62	3,58%	-	889	3	0
						1	275	23
						0	35	507
10	1671	96,42%	62	3,58%	-	889	3	0
						2	279	18
						0	39	503

*Tamanho da árvore
**Número de folhas

4.1.1.3 CONJUNTO 3 DE ENTRADAS

Utilizando mais uma vez as faixas de entrada da Tabela 8, discretizou-se novamente os exemplares de saída nas 10 faixas das entradas do conjunto 3 e relacionou-se graficamente com os intervalos de saída conforme ilustrado na Figura 26.

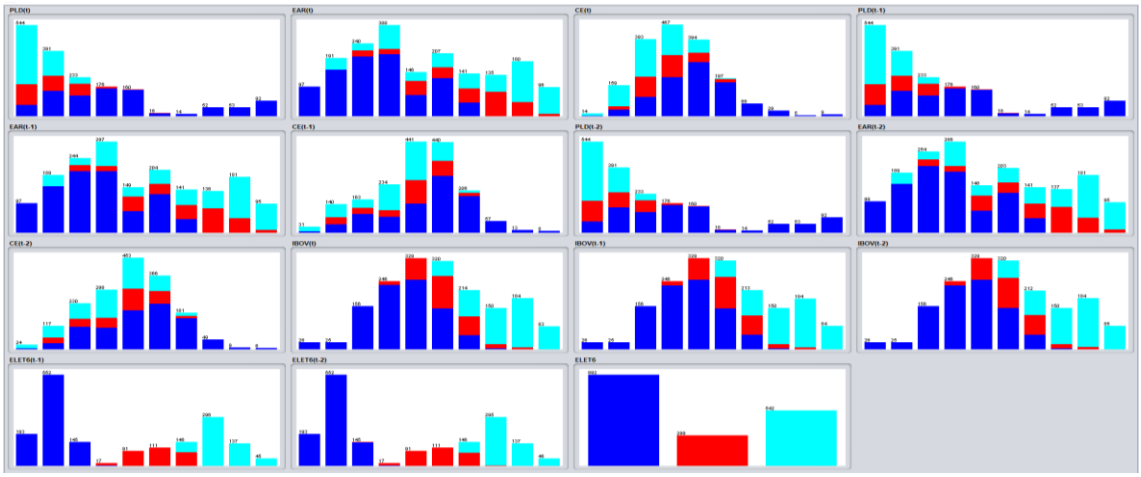

Figura 26 - Comparação da relação das entradas com os intervalos de saída para o conjunto 3.

Como o conjunto 3 se trata da mistura dos conjuntos 1 e 2 é possível visualizar na Figura 25 que a distribuição dos exemplares nas variáveis de energia não é discriminante e para as variáveis de mercado é notada discriminação. Após a aplicação dos modelos para esse novo conjunto, foram calculados os resultados que compõem a Tabela 11.

Tabela 11 - Resultados da aplicação dos métodos para o conjunto 3 de entradas.

Método	Exemplares classificados corretamente		Exemplares classificados incorretamente		Nº de regras	Matriz de Confusão		
	Qtd	%	Qtd	%		a	b	c
1	1665	96,08%	68	3,92%	-	889	3	0
						1	298	0
						0	64	478
2	1680	96,94%	53	3,06%	23	889	3	0
						4	274	21
						0	25	517
3	1678	96,83%	55	3,17%	13	888	4	0
						3	286	10
						0	38	50
4	1676	96,72%	57	3,29%	-	889	3	0
						10	280	9
						6	29	507
5	1689	97,46%	44	2,54%	41*	889	3	0
						3	283	13
						0	25	517
6	1690	97,52%	43	2,48%	55** e 61*	889	3	0
						2	281	16
						0	22	520
7	1664	96,02%	69	3,98%	-	892	0	0
						10	260	29
						0	30	512
8	1685	97,23%	48	2,77%	471*	887	5	0
						4	277	18
						0	21	521
9	1700	98,10%	33	1,90%	-	891	1	0
						2	281	16
						0	14	528
10	1697	97,92%	36	2,08%	-	891	1	0
						2	280	17
						0	16	526

*Tamanho da árvore
**Número de folhas

4.1.1.4 COMPARAÇÃO DO GRAU DE ACERTO E ÍNDICE DE QUASE ACERTO PARA A ANÁLISE 1

Para fins de comparação, os graus de acerto obtidos nas modelagens dos 3 conjuntos de entradas estão dispostos na Tabela 12.

Tabela 12 - Comparação do grau de acerto doas metodologias para os conjuntos 1, 2 e 3 da análise 1.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	68,38%	96,08%	96,08%
2	79,92%	96,48%	96,94%
3	77,73%	96,08%	96,83%
4	79,69%	95,79%	96,71%
5	79,80%	95,90%	97,46%
6	81,02%	96,48%	97,52%
7	74,50%	96,54%	96,02%
8	79,98%	96,36%	97,23%
9	80,73%	96,42%	98,10%
10	80,96%	96,42%	97,92%

Como balizador superior, a aplicação do modelo Persistente forneceu o resultado com 18 erros e 1715 acertos (98.96%), batendo todos os resultados da análise. Isto ocorre, pois, o número de intervalos considerado para a análise 1 é pequeno (3) e o número de troca de faixas também é pequeno (2). Quanto maior o número de intervalos, menor será o número de acerto do modelo persistente.

Nenhum resultado foi inferior ao que modelo do Zero-R (51,47%) apresentou, demonstrando que a escolha dos modelos se mostra coerente. O modelo 1 (1-R Classifier) escolheu o mesmo atributo de entrada para classificação do conjunto 2 e 3, daí o mesmo resultado.

Nos demais modelos, tiveram um pior resultado a aplicação dos mesmos para o conjunto 1, cujas entradas consideram as variáveis de energia. A utilização das grandezas de preços passados e do Índice de Mercado (Conjunto 2) gerou melhores

resultados do que na análise do conjunto 1. Quando todas as grandezas foram utilizadas juntas para modelagem (Conjunto 3), houve uma melhoria, a exceção da árvore de Hoeffding, dos resultados finais de classificação.

Conforme descrito no capítulo 3, uma métrica foi construída para levar em consideração o quase acerto dos exemplares na matriz de confusão, ou seja, quanto mais próximo da diagonal principal, mais representação esses exemplares têm no índice gerado. Os valores percentuais do índice para análise 1 estão dispostos na Tabela 13.

Tabela 13 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 1.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	89,44%	98,04%	98,04%
2	89,96%	98,24%	98,47%
3	89,82%	98,04%	98,41%
4	90,45%	97,95%	98,53%
5	91,00%	97,95%	98,73%
6	90,94%	98,24%	98,76%
7	87,36%	98,24%	98,01%
8	90,22%	98,18%	98,62%
9	90,36%	98,21%	99,05%
10	89,38%	98,21%	98,96%

Observa-se que o índice eleva a representatividade de todas as metodologias aplicadas. Nesta análise, isso se dá por conta do pequeno número de intervalos de saída considerado (3).

Quando a modelagem aloca erroneamente um dado de saída, ela só possui duas possibilidades de alocação. Partido das considerações da avaliação, onde quanto mais próximo da matriz principal mais intensa é a representatividade desse valor na construção do índice, para análise 1 a probabilidade de uma alocação errada estar próxima a matriz principal é muito grande.

4.1.2 Análise 2 – 10 faixas de saída

Na análise 2 estreitou-se as faixas, considerando-se agora 10 intervalos de saída do preço médio do ativo ELET6. Também se executou a contagem dos exemplares presentes em cada intervalo (Tabela 14).

Tabela 14 – Intervalos de Saída e número de exemplares correspondente para a análise 2.

Intervalos de Saída	**Número de exemplares**
[5.83;8.62)	195
[8.62;11.40)	550
[11.40;14.19)	145
[14.19;16.98)	17
[16.98;19.76)	91
[19.76;22.55)	111
[22.55;25.34)	146
[25.34;28.13)	298
[28.13;30.91)	136
[30.91;33.70]	44

4.1.2.1 CONJUNTO 1, 2 e 3 DE ENTRADAS

Os métodos listados na Tabela 8, foram aplicados mais uma vez aos conjuntos de entradas, neste caso com a condição da análise 2 (10 intervalos de saída).

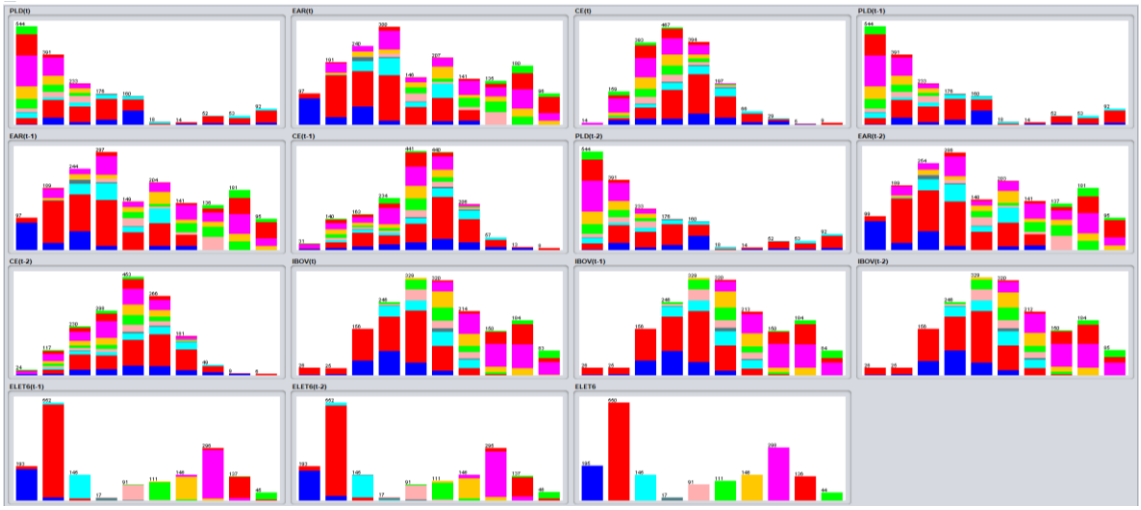

Figura 27 - Comparação da relação das entradas presentes nos três conjuntos com os intervalos de saída.

É notável que para 10 faixas de saída, as entradas são ainda menos discriminantes que na análise 1, sendo, nesta análise inclusive as entradas de mercado (IBOV e ELET6) distribuídas de maneira desordenada.

Sendo a classificação correta (grau de acerto) o dado mais pertinente para a escolha das metodologias a serem aplicadas aos demais ativos, de maneira a simplificar a apresentação dos resultados, somente o grau de acerto para cada método aplicado aos conjuntos 1, 2 e 3 estão dispostos na Tabela 15. Os dados de saída completos estão dispostos no anexo 1.

Tabela 15 – Grau de acerto da aplicação dos métodos para os conjuntos 1, 2 e 3 de entradas na Análise 2.

Método	**Conjunto 1**	**Conjunto 2**	**Conjunto 3**
1	45,07%	91,86%	91,86%
2	57,99%	91,57%	91,29%
3	47,78%	91,52%	91,52%
4	57,30%	91,86%	91,86%
5	57,30%	91,81%	91,81%
6	57,93%	91,86%	91,75%
7	44,00%	89,44%	86,79%
8	55,05%	89,49%	83,90%
9	56,90%	90,36%	88,92%
10	54,70%	89,84%	88,06%

Os balizadores para 10 faixas de saída apresentaram um grau de acerto de 31,74% (Zero-R) e 91,64% (Persistente). Novamente nenhum resultado da modelagem teve grau de acerto inferior ao do modelo Zero-R. No método 1, tem-se a mesma escolha de variável para os conjuntos 2 e 3 e por isso o mesmo resultado.

Para a análise 2, como na análise 1, o conjunto 2 apresenta maior grau de acerto frente aos demais conjuntos no geral. As metodologias 4 e 6 apresentam o melhor resultado (91,86%), sendo inclusive superior ao resultado do modelo Persistente. Para o conjunto 3, o resultado da aplicação do método 4 (*Decision Tables*) coincide com o do conjunto 2.

É notável que nesta análise, quando combinadas as variáveis dos conjuntos 1 e 2 (conjunto 3), o grau de acerto cai na maioria das vezes e quando não cai permanece o mesmo. Como os melhores resultados se dão para as variáveis de mercado (conjunto 2), entende-se que, para esta análise, a inserção das variáveis de energia diminui o grau de acerto das metodologias aplicadas.

Novamente o índice foi calculado para levar em consideração o quase acerto dos exemplares na matriz de confusão. Os valores percentuais do índice para análise 2 estão dispostos na Tabela 16.

Tabela 16 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 2.

Método	**Conjunto 1**	**Conjunto 2**	**Conjunto 3**
1	82,02%	99,10%	99,10%
2	89,16%	99,03%	98,99%
3	80,32%	99,06%	99,06%
4	88,37%	99,10%	99,10%
5	88,54%	99,09%	99,09%
6	89,04%	99,10%	99,08%
7	85,30%	98,78%	98,45%
8	88,74%	98,82%	98,04%
9	89,53%	98,93%	98,77%
10	89,07%	98,87%	98,63%

4.1.3 Análise 3 – Intervalos de 1 em 1 real

Para a análise 3 estreitou-se as faixas do limite inferior até o próximo valor inteiro e depois foram consideradas faixas de um em um real, logo para o caso do ativo ELET6 constitui-se 29 intervalos de saída. De maneira análoga a análise anterior, se executou a contagem dos exemplares presentes em cada intervalo (Tabela 17).

Tabela 17 – Intervalos de Saída e número de exemplares correspondente para a análise 3.

Intervalo de Saída	**Número de Exemplares**	**Intervalo de Saída**	**Número de Exemplares**
[5,86;6,00]	2	[20,00;21,00]	40
[6,00;7,00]	48	[21,00;22,00]	45
[7,00;8,00]	66	[22,00;23,00]	42
[8,00;9;00]	153	[23,00;24,00]	42
[9,00;10,00]	187	[24,00;25,00]	59
[10,00;11,00]	236	[25,00;26,00]	101
[11,00;12,00]	108	[26,00;27,00]	135
[12,00;13,00]	64	[27,00;28,00]	78
[13,00;14,00]	25	[28,00;29,00]	69
[14,00;15,00]	3	[29,00;30,00]	31
[15,00;16,00]	3	[30,00;31,00]	46
[16,00;17,00]	13	[31,00;32,00]	26
[17,00;18,00]	20	[32,00;33,00]	13
[18,00;19,00]	43	[33,00;33,70]	4
[19,00;20,00]	31		

4.1.3.1 CONJUNTO 1, 2 e 3 DE ENTRADAS

Para a análise 3, dividiu-se novamente os dados das variáveis de entrada em 10 faixas e, com os intervalos de saída ainda mais estreitos, é ainda mais perceptível que as saídas não são discriminantes, pois a distribuição dos exemplares de saídas se misturam nas faixas de entradas. Na Figura 28 é possível observar essa distribuição para o conjunto 1 de entradas.

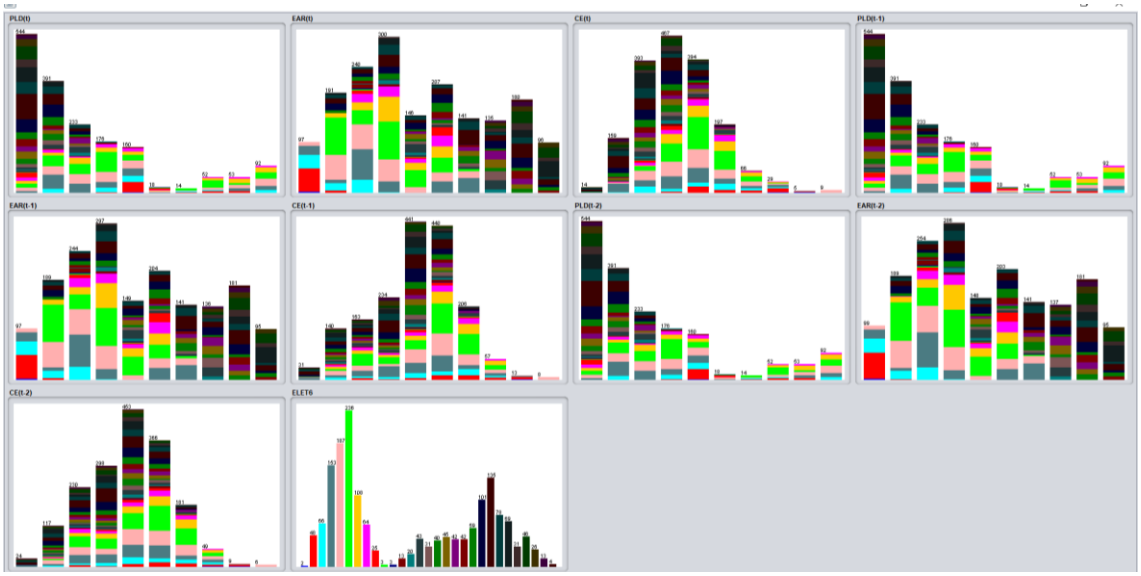

Figura 28 - Comparação da relação do conjunto 1 de entradas com os intervalos de saída.

Para 29 intervalos de saída, os balizadores Persistente e Zero-R apresentam 74,06% e 13,62% de grau de acerto, respectivamente. Na Tabela 18 está a comparação do grau de acerto na aplicação dos métodos para os conjuntos 1, 2 e 3 na análise 3. Os resultados completos da análise estão dispostos no anexo 1.

Tabela 18 – Grau de acerto da aplicação dos métodos para os conjuntos 1, 2 e 3 de entradas na Análise 3.

Método	**Conjunto 1**	**Conjunto 2**	**Conjunto 3**
	%	**%**	**%**
1	23,89%	42,18%	42,18%
2	35,78%	48,41%	56,26%
3	23,31%	37,74%	54,13%
4	33,58%	46,22%	55,11%
5	34,68%	45,70%	56,72%
6	37,97%	48,18%	59,43%
7	27,81%	47,09%	53,78%
8	32,60%	46,86%	57,59%
9	35,08%	48,30%	62,84%
10	32,08%	44,78%	58,39%

Para o conjunto 1, o grau de acerto é baixo quando estreitados os intervalos de saída, já para o conjunto 2 é um pouco maior. Os melhores resultados da análise 3 são obtidos quando aplicados os métodos ao conjunto 3 de entradas.

Nas análises 1 e 2, os melhores resultados foram obtidos quando levadas em consideração somente as variáveis de mercado na análise, ou seja, o conjunto 2 de entradas. Na análise 2 (10 intervalos de saída), quando combinados os conjuntos 1 e 2 (conjunto 3), o grau de acerto era sempre é inferior ou igual aos resultados do conjunto 2 para os métodos aplicados.

Para a análise 3, a combinação das variáveis de energia e mercado, ampliam significativamente o grau de acerto, porém apesar dessa melhora nenhuma metodologia alcançou um grau de acerto maior que 63% (Método 9). Essas conclusões são ilustradas na Figura 29.

No índice de quase acerto é seguido o padrão da análise (Tabela 19), onde o conjunto 3 é o que possui os melhores resultados. O método 9 (Random Forest) fornece o maior índice, sendo também o que fornece o maior grau de acerto na análise 3.

Com a comparação do grau de acerto de 62,84% com o índice de quase acerto de 98,50% (Metodologia 9) na análise 3, é perceptível que apesar não alocar corretamente os dados nos intervalos de saída, o método não aloca os exemplares muito distantes da faixa correta.

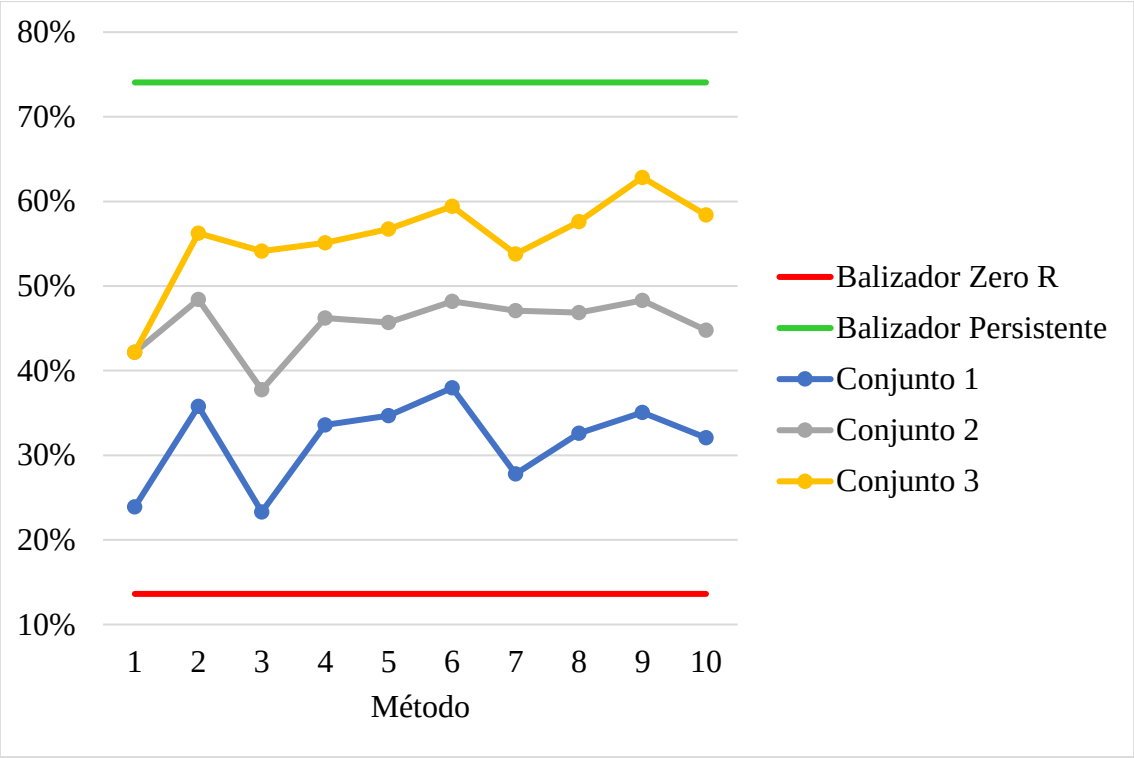

Figura 29 - Comparação dos resultados para a análise 3 no atraso A.

Tabela 19 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 3.

Método	**Conjunto 1**	**Conjunto 2**	**Conjunto 3**
1	82,78%	97,42%	97,42%
2	88,48%	97,72%	98,09%
3	75,60%	89,25%	96,62%
4	87,92%	96,16%	95,12%
5	88,84%	97,61%	98,14%
6	89,52%	97,72%	98,28%
7	87,10%	97,64%	97,92%
8	89,39%	97,64%	97,89%
9	90,24%	97,72%	98,50%
10	88,85%	97,54%	97,92%

4.2 ATRASO B

Para o atraso B, as variáveis de entrada são atrasadas em até cinco dias (t até t-5), os conjuntos de variáveis de entrada para modelagem são dispostos conforme listado na Figura 30.

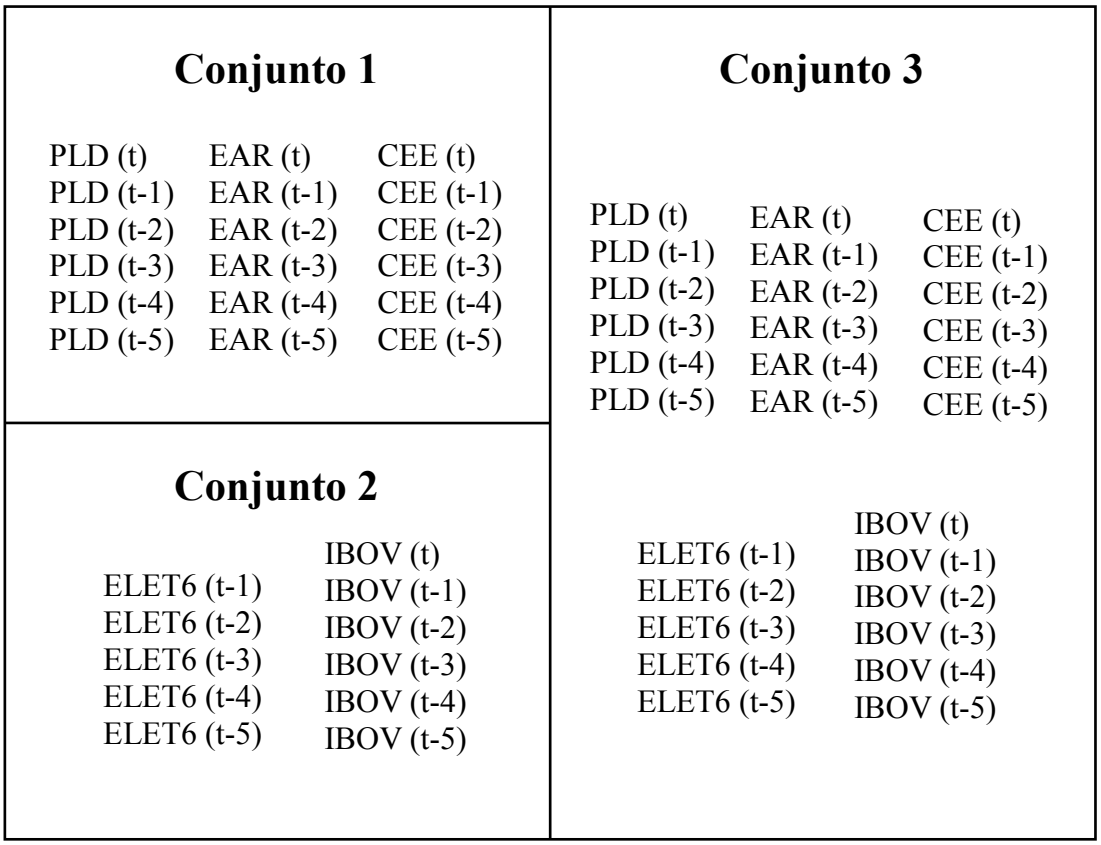

Figura 30 – Variáveis consideradas em cada conjunto para o atraso B.

4.2.1 Análise 1 – 3 faixas de saída

Utilizando novamente a contagem dos exemplares de ELET6 em cada faixa de saída da análise 1 (Tabela 8), os exemplares de saída foram relacionados com as faixas das variáveis de entrada do Atraso B, a discriminação dos dados para as 3 faixas de saída pode ser observada na Figura 31.

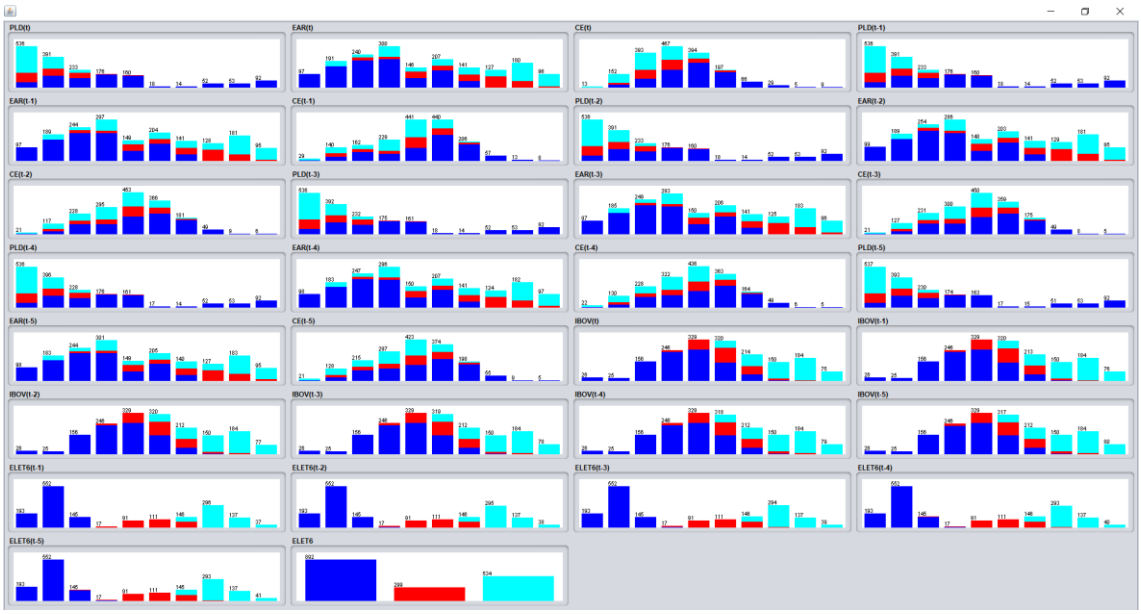

Figura 31 - Comparação da relação das variáveis de entradas com os intervalos de saída para a análise 1.

4.2.1.1 CONJUNTO 1, 2 e 3 DE ENTRADAS

Mais uma vez, de maneira análoga ao atraso A os métodos foram aplicados para a análise 1 no atraso B. O grau de acerto das metodologias para cada conjunto de entradas pode ser observado na Tabela 20 e os resultados completos estão dispostos no anexo 1. Os resultados do índice de quase acerto, calculado a partir das matrizes de confusão geradas pelas modelagens podem ser observados na Tabela 21.

Tabela 20 - Comparação do grau de acerto da aplicação das metodologias para os conjuntos 1, 2 e 3 da análise 1.

Método	**Conjunto 1**	**Conjunto 2**	**Conjunto 3**
1	68,17%	96,06%	96,06%
2	80,64%	96,75%	97,45%
3	77,04%	95,54%	96,87%
4	79,65%	96,23%	96,17%
5	79,65%	96,23%	97,16%
6	82,84%	96,29%	97,91%
7	73,62%	96,23%	95,65%
8	76,29%	96,46%	97,57%
9	80,87%	96,93%	98,49%
10	81,33%	96,64%	98,67%

Tabela 21 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 3.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	89,15%	97,58%	97,58%
2	89,04%	97,92%	98,27%
3	89,01%	97,32%	97,98%
4	90,22%	97,69%	97,84%
5	89,50%	97,66%	98,12%
6	90,22%	97,69%	98,50%
7	86,73%	97,66%	97,37%
8	88,03%	97,78%	98,33%
9	89,87%	98,01%	98,79%
10	89,84%	97,86%	98,87%

4.2.2 Análise 2 – 10 faixas de saída

Novamente, para a análise 2 estreitou-se as faixas, considerando-se agora 10 intervalos de saída do preço médio do ativo ELET6. Também se executou a contagem dos exemplares presentes em cada intervalo conforme Tabela 14.

4.2.2.1 CONJUNTO 1, 2 e 3 DE ENTRADAS

Utilizando mais uma vez a contagem dos exemplares de ELET6 em cada faixa de saída da análise 2 (Tabela 14), os exemplares de saída foram relacionados com as faixas das variáveis de entrada do Atraso B, a discriminação dos dados pode ser observada na Figura 32.

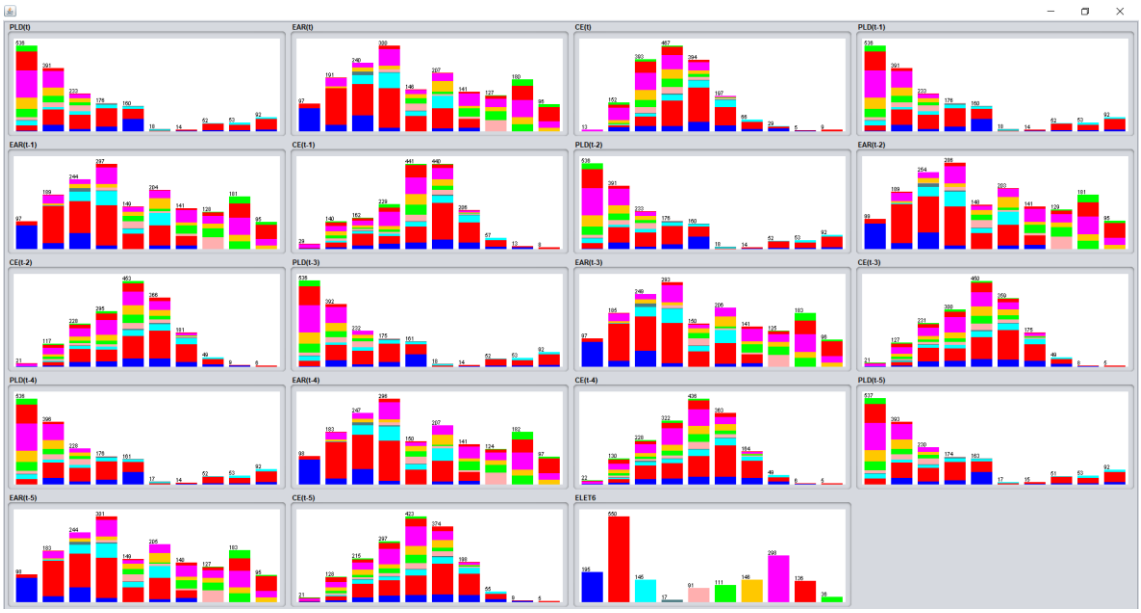

Figura 32 - Comparação da relação das variáveis de entradas com os intervalos de saída para a análise 2.

Analogamente ao atraso A os métodos foram aplicados para a análise 2 no atraso B. O grau de acerto das metodologias para cada conjunto de entradas pode ser observado na Tabela 22 e os resultados completos estão dispostos no anexo 1. Os resultados do índice de quase acerto, calculado a partir das matrizes de confusão geradas pelas modelagens podem ser observados na Tabela 23.

Tabela 22 - Comparação do grau de acerto da aplicação das metodologias para os conjuntos 1, 2 e 3 da análise 2.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	45,33%	45,33%	45,33%
2	58,37%	90,49%	90,89%
3	51,32%	91,13%	91,26%
4	55,48%	91,83%	91,83%
5	56,35%	91,65%	91,77%
6	62,15%	91,83%	91,71%
7	42,20%	85,86%	84,41%
8	52,87%	85,86%	83,01%
9	58,20%	89,62%	89,68%
10	57,97%	89,33%	88,58%

Tabela 23 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 2.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	81,74%	81,74%	81,74%
2	73,60%	98,40%	98,50%
3	69,40%	98,56%	98,56%
4	73,42%	98,63%	98,63%
5	73,66%	98,61%	98,62%
6	74,39%	98,63%	98,62%
7	70,51%	97,92%	97,73%
8	73,03%	97,94%	97,63%
9	74,16%	98,39%	98,40%
10	73,92%	98,33%	98,26%

4.2.3 Análise 3 – Intervalos de 1 em 1 real (29 faixas de saída)

Mais uma vez estreitadas as faixas de saída em intervalos de 1 em 1 real e se executou a contagem dos exemplares presentes em cada intervalo conforme Tabela 17. A discriminação pode ser observada na Figura 33.

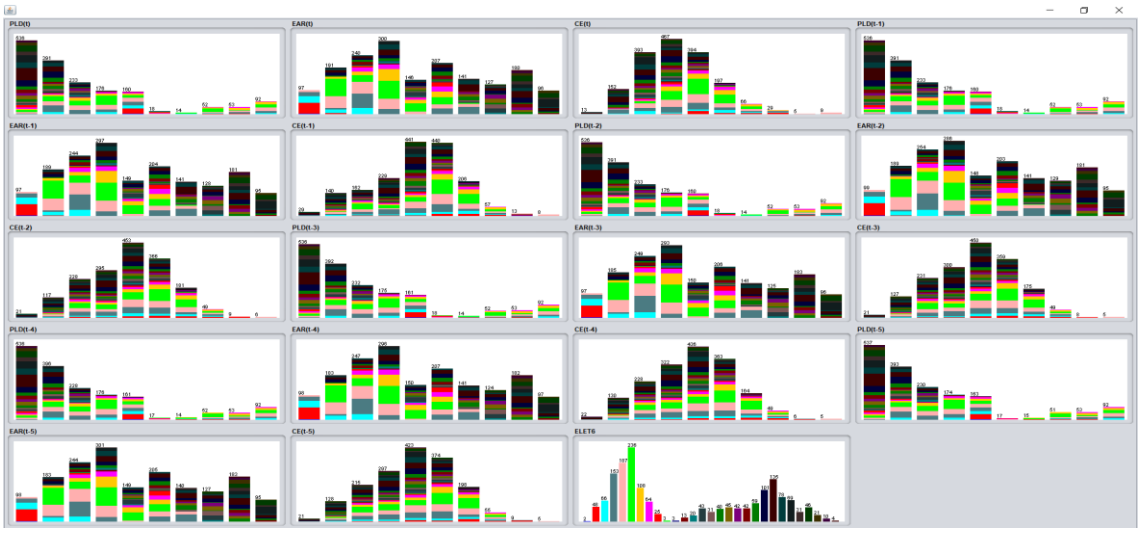

Figura 33 - Comparação da relação das variáveis de entradas com os intervalos de saída para a análise 3.

4.2.3.1 CONJUNTO 1, 2 e 3 DE ENTRADAS

Analogamente ao atraso A os métodos foram aplicados para a análise 3 no atraso B. O grau de acerto das metodologias para cada conjunto de entradas pode ser observado na Tabela 24 e os resultados completos estão dispostos no anexo 1. Os resultados do índice de quase acerto, calculado a partir das matrizes de confusão geradas pelas modelagens podem ser observados na Tabela 25.

Tabela 24 - Comparação do grau de acerto da aplicação das metodologias para os conjuntos 1, 2 e 3 da análise 3.

Método	**Conjunto 1**	**Conjunto 2**	**Conjunto 3**
1	13,68%	13,68%	13,68%
2	35,71%	47,36%	57,10%
3	24,93%	43,71%	52,23%
4	35,13%	50,84%	53,10%
5	32,12%	48,23%	54,49%
6	37,86%	49,45%	60,58%
7	27,59%	47,59%	53,10%
8	31,07%	45,80%	52,81%
9	35,88%	49,10%	64,92%
10	36,52%	47,07%	55,13%

Tabela 25 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 3.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	82,52%	82,52%	82,52%
2	88,54%	97,18%	97,58%
3	76,85%	92,52%	96,67%
4	87,47%	96,50%	94,35%
5	87,19%	97,32%	97,60%
6	89,15%	97,39%	97,92%
7	86,12%	97,22%	97,43%
8	88,73%	97,17%	97,35%
9	89,79%	97,37%	98,12%
10	89,38%	97,06%	96,84%

No atraso B a análise 3 apresenta o mesmo comportamento da análise 3 com as variáveis do atraso A, onde a combinação das variáveis de energia e mercado, ampliam significativamente o grau de acerto (Figura 34).

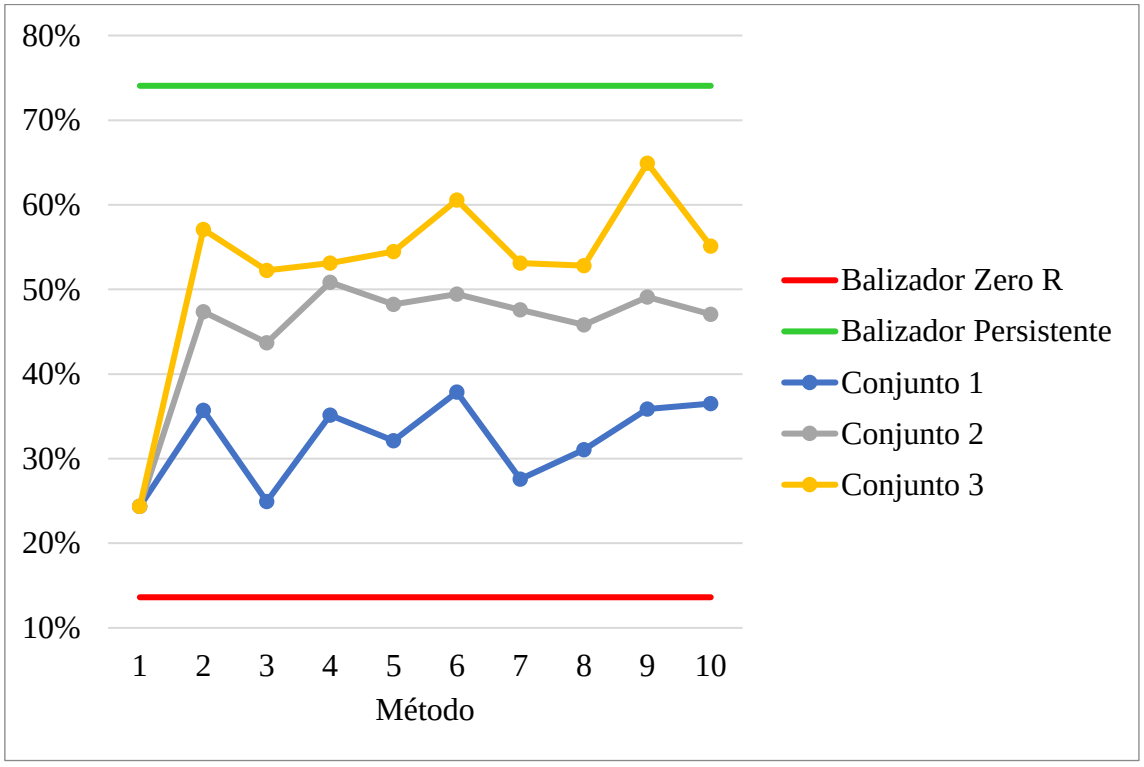

Figura 34 - Comparação do grau de acerto para a análise 3 para o atraso B.

4.3 ATRASO C

Para o atraso C, as variáveis de entrada foram atrasadas em até oito dias (t até t-8), os conjuntos de variáveis de entrada para modelagem são dispostos conforme listado na Figura 35.

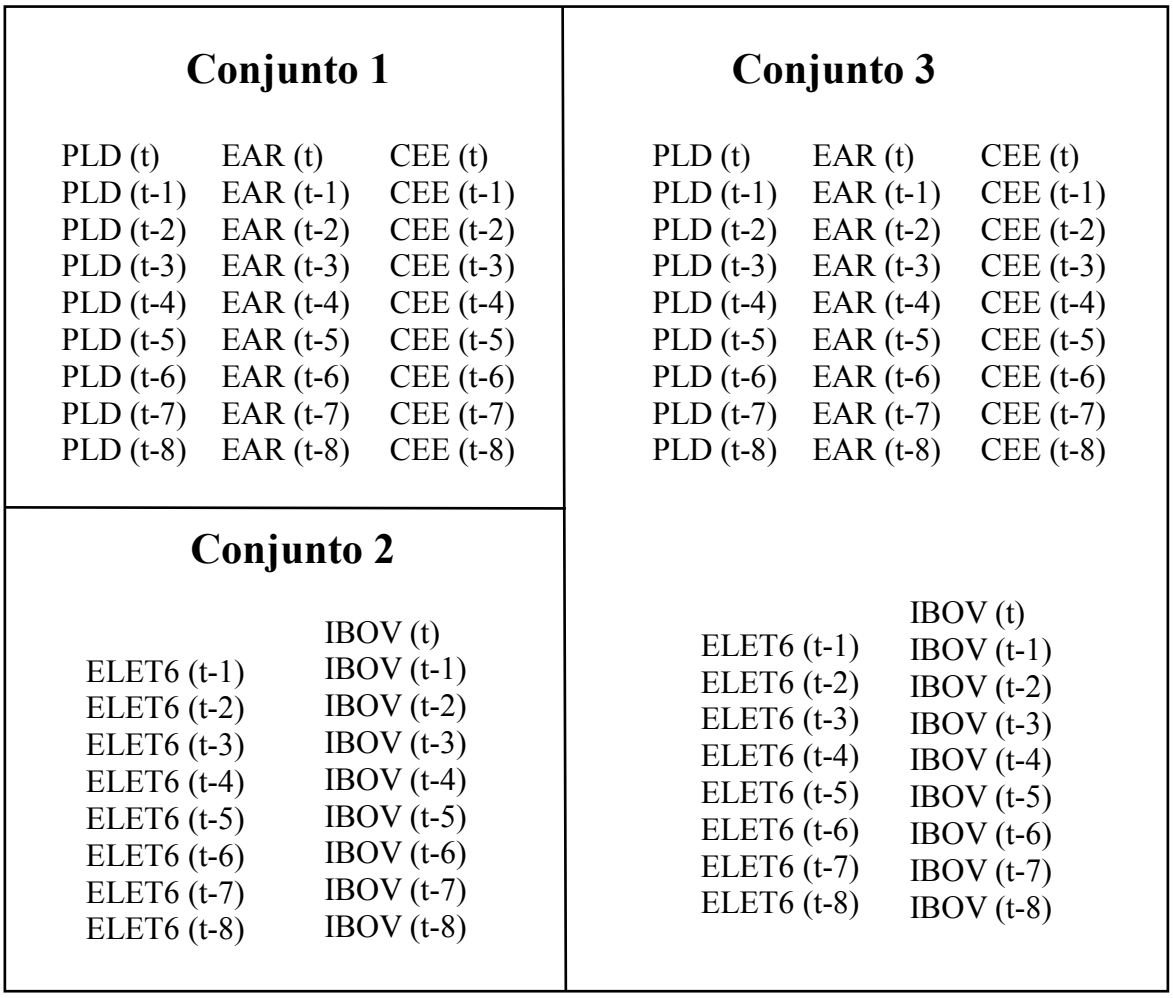

Figura 35 – Variáveis consideradas em cada conjunto para o atraso C.

4.3.1 Análise 1 – 3 faixas de saída

Para a análise 1 considerou-se 3 intervalos de saída do preço médio do ativo ELET6. Também se executou a contagem dos exemplares presentes em cada intervalo conforme Tabela 8.

4.3.1.1 CONJUNTO 1, 2 e 3 DE ENTRADAS

Utilizando a contagem dos exemplares de ELET6 em cada faixa de saída da análise 1 (Tabela 8), os exemplares de saída foram relacionados com as faixas das variáveis de entrada do Atraso C.

Os métodos foram aplicados para a análise 1 no atraso C. O grau de acerto das metodologias para cada conjunto de entradas pode ser observado na Tabela 26. Os resultados do índice de quase acerto, calculado a partir das matrizes de confusão geradas pelas modelagens podem ser observados na Tabela 27.

Tabela 26 - Comparação do grau de acerto da aplicação das metodologias para os conjuntos 1, 2 e 3 da análise 1.

Método	**Conjunto 1**	**Conjunto 2**	**Conjunto 3**
1	68,17%	96,06%	96,06%
2	81,68%	96,52%	97,39%
3	77,04%	95,77%	97,16%
4	82,61%	96,12%	96,06%
5	81,22%	96,41%	97,16%
6	86,78%	96,46%	98,55%
7	74,14%	95,83%	95,48%
8	80,87%	96,81%	97,68%
9	85,79%	97,39%	98,55%
10	85,27%	96,87%	98,43%

Tabela 27 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 1.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	89,15%	97,58%	97,58%
2	89,70%	97,81%	98,24%
3	88,89%	97,43%	98,15%
4	92,21%	97,63%	97,81%
5	90,08%	97,75%	98,12%
6	92,50%	97,78%	98,82%
7	86,99%	97,46%	97,29%
8	89,70%	97,95%	98,38%
9	92,35%	98,24%	98,82%
10	92,24%	97,98%	98,76%

4.3.2 Análise 2 – 10 faixas de saída

No atraso C, para a análise 2 estreitou-se as faixas, considerando-se agora 10 intervalos de saída do preço médio do ativo ELET6. Também se executou a contagem dos exemplares presentes em cada intervalo conforme Tabela 14.

4.3.2.1 CONJUNTO 1, 2 e 3 DE ENTRADAS

Utilizando mais uma vez a contagem dos exemplares de ELET6 em cada faixa de saída da análise 2 (Tabela 14), os exemplares de saída foram relacionados com as faixas das variáveis de entrada do atraso C.

Os métodos foram aplicados para a análise 2 no atraso C. O grau de acerto das metodologias para cada conjunto de entradas pode ser observado na Tabela 28. Os resultados do índice de quase acerto, calculado a partir das matrizes de confusão geradas pelas modelagens podem ser observados na Tabela 29.

Tabela 28 - Comparação do grau de acerto da aplicação das metodologias para os conjuntos 1, 2 e 3 da análise 2.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	45,04%	91,83%	91,83%
2	61,16%	90,61%	89,97%
3	53,86%	91,25%	90,96%
4	56,06%	91,83%	91,83%
5	59,25%	91,59%	91,83%
6	66,14%	91,83%	91,71%
7	42,49%	82,78%	82,43%
8	56,35%	84,58%	83,19%
9	65,04%	89,62%	89,56%
10	43,42%	87,25%	88,41%

Tabela 29 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 2.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	81,50%	98,63%	98,63%
2	89,23%	98,42%	98,35%
3	82,86%	98,57%	98,53%
4	86,87%	98,63%	98,63%
5	89,01%	98,61%	98,63%
6	91,57%	98,63%	98,62%
7	84,23%	97,54%	97,45%
8	88,79%	97,80%	97,58%
9	91,31%	98,38%	98,38%
10	91,61%	98,11%	98,24%

4.3.3 Análise 3 – Intervalos de 1 em 1 real (29 faixas de saída)

Utilizando mais uma vez a contagem dos exemplares de ELET6 em cada faixa de saída da análise 3 (Tabela 17), os exemplares de saída foram relacionados com as faixas das variáveis de entrada do Atraso C.

4.3.3.1 CONJUNTO 1, 2 e 3 DE ENTRADAS

Os métodos foram aplicados para a análise 3 no atraso C. O grau de acerto das metodologias para cada conjunto de entradas pode ser observado na Tabela 30. Os resultados do índice de quase acerto, calculado a partir das matrizes de confusão geradas pelas modelagens podem ser observados na Tabela 31.

Tabela 30 - Comparação do grau de acerto da aplicação das metodologias para os conjuntos 1, 2 e 3 da análise 3.

Método	**Conjunto 1**	**Conjunto 2**	**Conjunto 3**
1	23,94%	42,09%	42,09%
2	39,59%	48,23%	58,55%
3	30,20%	46,55%	56,00%
4	37,45%	49,56%	53,68%
5	34,72%	49,28%	55,94%
6	44,52%	50,61%	61,33%
7	29,04%	46,55%	53,27%
8	34,90%	46,61%	54,44%
9	45,22%	53,27%	67,07%
10	43,42%	49,33%	36,06%

Tabela 31 - Comparação do índice de quase acerto das metodologias para os conjuntos 1, 2 e 3 da análise 3.

Método	Conjunto 1	Conjunto 2	Conjunto 3
1	89,15%	97,58%	97,58%
2	89,70%	97,81%	98,24%
3	88,89%	97,43%	98,15%
4	92,21%	97,63%	97,81%
5	90,08%	97,75%	98,12%
6	92,50%	97,78%	98,82%
7	86,99%	97,46%	97,29%
8	89,70%	97,95%	98,38%
9	92,35%	98,24%	98,82%
10	92,24%	97,98%	98,76%

Mais uma vez, a análise 3 se mostra como a que percebe melhor a melhora dos resultados quando analisadas as variáveis de mercado e de energia. A comparação dos conjuntos nessa análise para o atraso C pode ser observada na Figura 36.

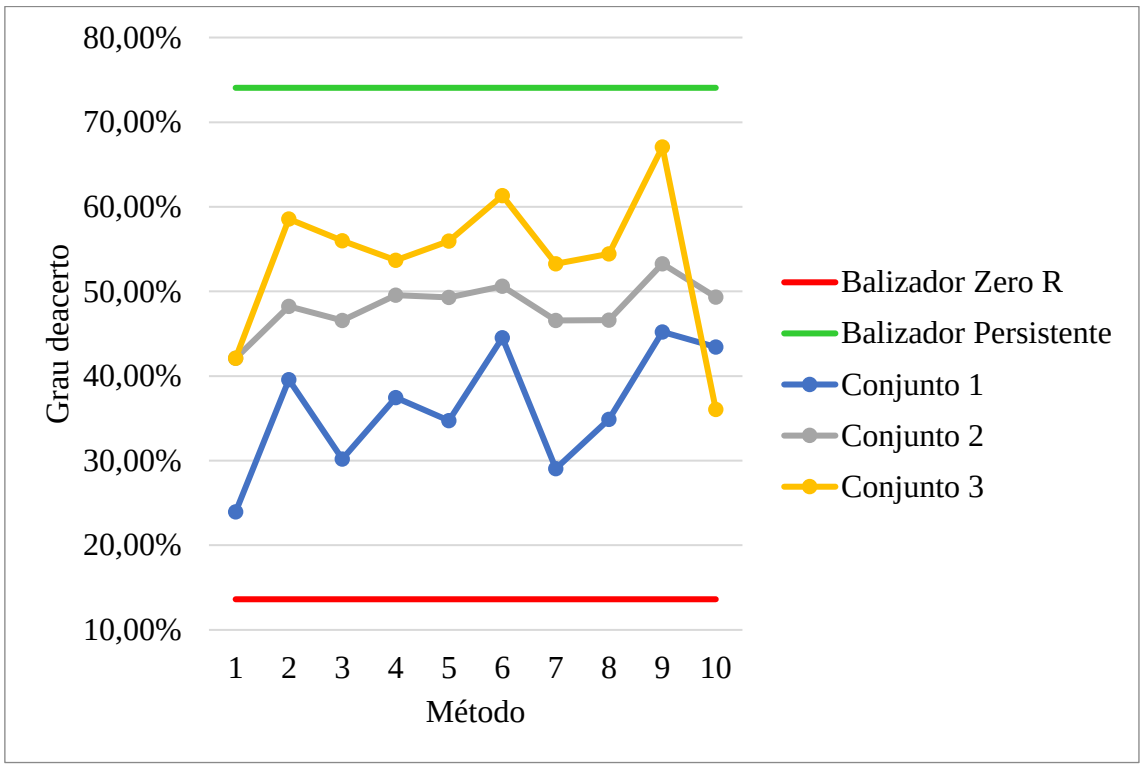

Figura 36 - Comparação dos resultados para a análise 3 para o atraso C.

4.4 FILTRO DOS RESULTADOS ELET6

Conforme descrito na metodologia, todos os arranjos possíveis levantados neste estudo foram aplicados para o ativo ELET6. Como o ativo representa a empresa mais genérica e representativa do setor elétrico tratada neste estudo, ela fornecerá a melhor resposta para a escolha do arranjo (atraso, análise, conjunto de saída e metodologia) mais adequado para de empresas tratado no presente estudo.

Portanto, a partir dos resultados antepostos neste capítulo, de maneira sintética foram filtradas as melhores premissas a serem adotadas para os ativos CESP6, TRPL4, COCE5 e CMIG4.

4.4.1 Escolha da Análise

Empiricamente, percebe-se que a escolha da melhor análise, que se refere ao melhor número de faixas de saída, precisa ser relacionada ao comportamento do mercado para validação da metodologia. Essa conclusão se dá pelo fato de que a sensibilidade diária do mercado não acontece em grande escala.

Quando se observa os intervalos da análise com três intervalos de saída por exemplo, o salto entre o preço médio máximo e o mínimo do ativo ELET6 é da ordem de 9 reais enquanto observa-se que, a despeito de grandes eventos isolados do mercado, no geral as variações são em escalas bem menores (entre 1 e 2 reais ou até mesmo centavos).

A partir dessa observação, determina-se que para resultados mais aproximados do comportamento real do mercado de ações, a análise escolhida será a análise 3, que divide as faixas de saída em intervalos de 1 em 1 real sendo, para o ativo ELET6, 29 faixas de saída.

4.4.2 Escolha do atraso

Uma vez determinada que a análise 3 (intervalos de 1 em 1 real) será a adotada para modelagem dos demais ativos deste estudo, o segundo critério a ser determinado foi atraso mais adequado. Para tal, foram comparados os graus de acerto das metodologias aplicadas para cada conjunto em cada atraso estudado. A partir dos dados das Tabelas 18, 24 e 30, que comparam o grau de acerto dos conjuntos 1, 2 e 3 para a análise 3, foram plotados os gráficos da Figura 37.

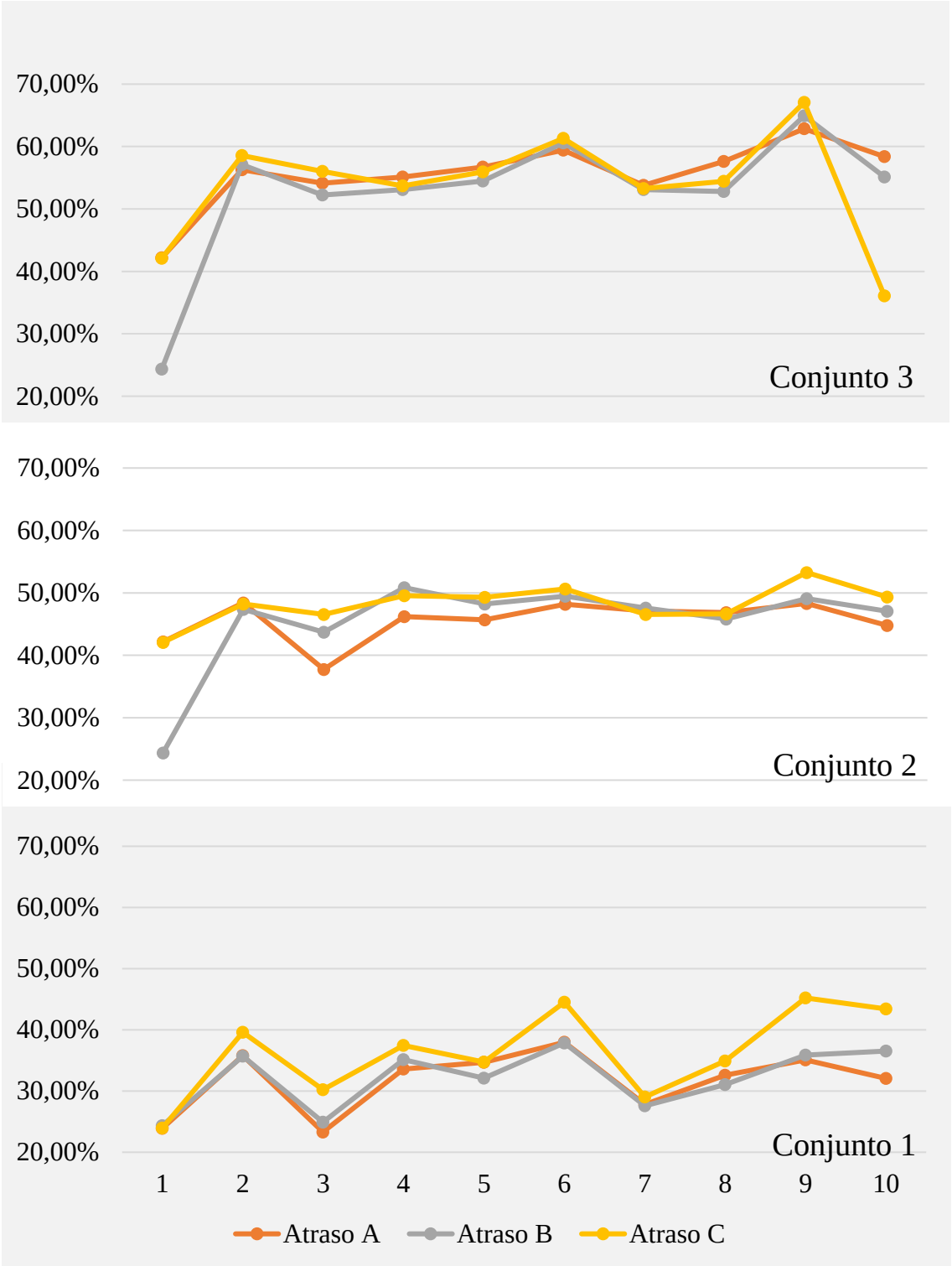

Figura 37 – Comparação gráfica dos conjuntos 1, 2 e 3 na análise 3 considerando os atrasos A, B e C.

Analisando a Figura 37, percebe-se que para os três conjuntos o atraso C é o que fornece, no geral, os melhores resultados. Entende-se, portanto, que as metodologias

aplicadas aos dados com atraso de até 8 dias fornecem resultados de maior confiabilidade na projeção.

Isso pode ser corroborado com os resultados da Tabela 32, onde percebe-se que em média, as metodologias aplicadas ao atraso C fornecem os maiores graus de acerto. Define-se então o atraso C a ser adotado para as simulações dos demais ativos.

Tabela 32 - Comparação da média do grau de acerto dos 10 métodos aplicados para os conjuntos 1, 2 e 3 nos atrasos A, B e C da análise 3.

	Conjunto 1	Conjunto 2	Conjunto 3	**Média**
Atraso A	31,68%	45,55%	55,64%	**44,29%**
Atraso B	32,12%	45,35%	52,78%	**43,42%**
Atraso C	36,30%	48,21%	53,84%	**46,12%**

4.4.3 Escolha do conjunto

Uma vez definidos a análise e o atraso que fornecem os melhores resultados, cabe escolher qual o melhor conjunto de dados para modelagem dos demais ativos. Na Figura 38, são comparados graficamente os conjuntos 1, 2 e 3 para o atraso C na análise 3, onde é perceptível que o conjunto 3, fornece os melhores resultados.

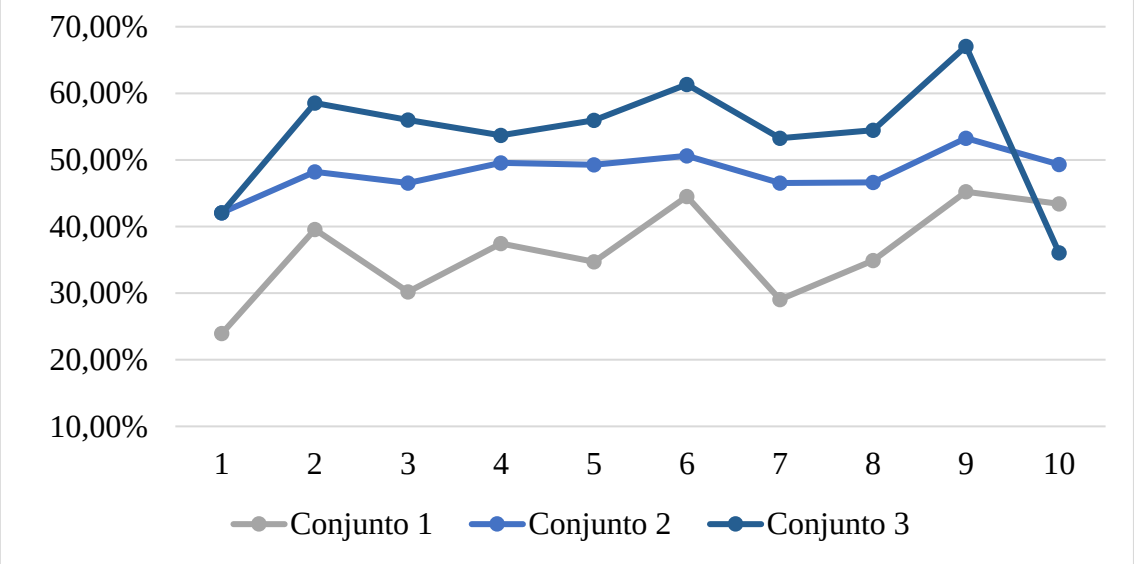

Figura 38 – Comparação gráfica dos conjuntos 1, 2 e 3 na análise 3 para atraso C.

Em média os métodos aplicados ao conjunto 3 apresentam cerca de 50% de grau de acerto, enquanto para os conjuntos 1 e 2 a média da aplicação das metodologias fica em torno de 32% e 43% respectivamente (Tabela 33). Define-se, portanto, o conjunto 3 como o conjunto mais adequado para a aplicação das metodologias aos demais ativos do estudo.

Tabela 33 - Comparação da média do grau de acerto dos 10 métodos aplicados para os conjuntos 1, 2 e 3 nos atrasos A, B e C da análise 3.

	Conjunto 1	Conjunto 2	Conjunto 3
Atraso A	31,68%	45,55%	55,64%
Atraso B	32,12%	45,35%	52,58%
Atraso C	36,30%	48,21%	53,84%
Média	**33,36%**	**46,37%**	**54,09%**

4.4.4 Escolha dos métodos

De maneira a corroborar a escolha dos métodos a serem aplicados para os demais ativos, serão comparados para o conjunto 3, na análise 3 com atraso C tanto o grau de acerto quanto o índice de quase acerto das metodologias modeladas (Tabela 34).

Tabela 34 - Comparação do grau de acerto e do índice de quase acerto para os 10 métodos aplicados ao conjunto 3 de entradas no atraso C da análise 3.

Método	Grau de acerto	Índice de quase acerto
1	42,09%	96,97%
2	58,55%	97,77%
3	56,00%	96,94%
4	53,68%	94,86%
5	55,94%	97,68%
6	**61,33%**	**97,94%**
7	53,27%	97,36%
8	54,44%	97,47%
9	**67,07%**	**98,20%**
10	36,06%	86,50%

Nota-se que tanto para a grau de acerto quanto para o índice de quase acerto, os métodos 6 e 9 (J48 e Random Forest) apresentam os melhores resultados, sendo definidos os métodos 6 e 9 para estudo dos demais ativos.

4.4.5 Resumo das premissas adotadas

Conforme já mencionado, o modelo persistente serve como balizador superior para o melhor resultado passível de alcance através da modelagem, desta maneira será utilizado como modelo ótimo para validação dos resultados.

Também conforme já mencionado, o modelo Zero-R (Modelo 0) possui a característica mais simples dos modelos adotados na análise, visto que leva em consideração somente as saídas determinando como verdadeiro o intervalo que possui o maior número de exemplares. Desse modo o método 0 serve como balizador inferior dos resultados.

Apresentadas, portanto essas duas ressalvas e a partir das premissas definidas com base nas modelagens do capítulo 3, os demais ativos serão avaliados segundo a Figura 39.

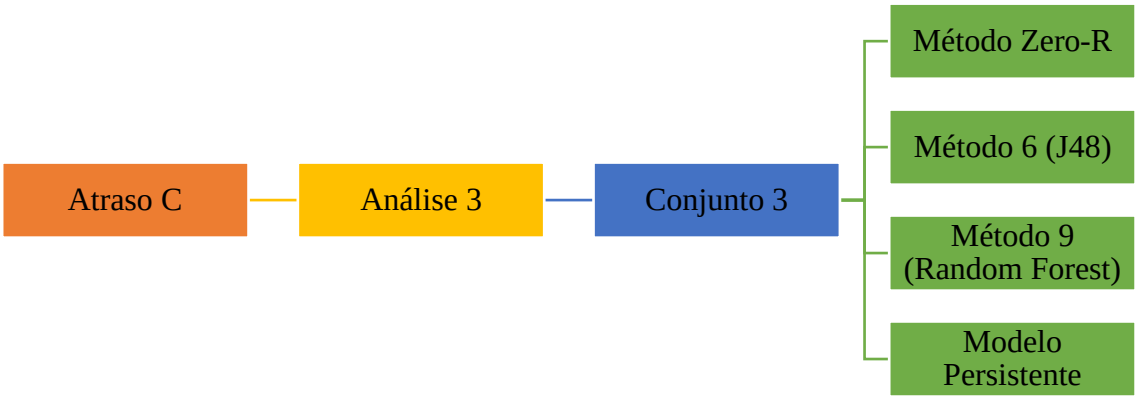

Figura 39 – Consolidação das premissas adotadas para modelagem dos ativos CESP6, TRPL4, COCE5 e CMIG4.

Capítulo 5

ANÁLISE DOS RESULTADOS PARA OS ATIVOS CESP6, TRPL4, COCE5 E CMIG4

5.1 GERAÇÃO - ATIVO CESP6

Conforme explanado no capítulo 2, o ativo CESP6 é o que representa melhor o segmento de geração. Desta maneira, o arranjo definido no capítulo 3 foi aplicado para o ativo CESP6.

Para o ativo CESP6, quando divididas em intervalos de 1 em 1 real, soma-se 28 faixas de saída. Na Tabela 35 são observados os intervalos de saída e contagem dos exemplares dos dados históricos analisados (2010-2016) presentes em cada intervalo.

As variáveis de entrada utilizadas na modelagem do ativo CESP6 (conjunto 3 e atraso C) foram discretizadas em 10 faixas. Também se efetuou a contagem do número de exemplares em cada faixa de saída da análise 1 e relacionou-se graficamente com os intervalos de saída (Figura 40). É perceptível que as saídas não são discriminantes, corroborando os resultados da análise para o ativo ELET6.

Tabela 35 – Intervalos de saída, número de exemplares para os dados de entrada do ativo CESP6.

Intervalo de Saída	Número de Exemplares	Intervalo de Saída	Número de Exemplares
[11,08;12,00]	25	[25,00;26,00]	87
[12,00;13,00]	61	[26,00;27,00]	68
[13,00;14,00]	74	[27,00;28,00]	111
[14,00;15,00]	67	[28,00;29,00]	86
[15,00;16,00]	72	[29,00;30,00]	75
[16,00;17,00]	42	[30,00;31,00]	76
[17,00;18,00]	26	[31,00;32,00]	48
[18,00;19,00]	44	[32,00;33,00]	36
[19,00;20,00]	80	[33,00;34,00]	17
[20,00;21,00]	93	[34,00;35,00]	15
[21,00;22,00]	98	[35,00;36,00]	23
[22,00;23,00]	99	[36,00;37,00]	50
[23,00;24,00]	103	[37,00;38,00]	41
[24,00;25,00]	95	[38,00;38,40]	3

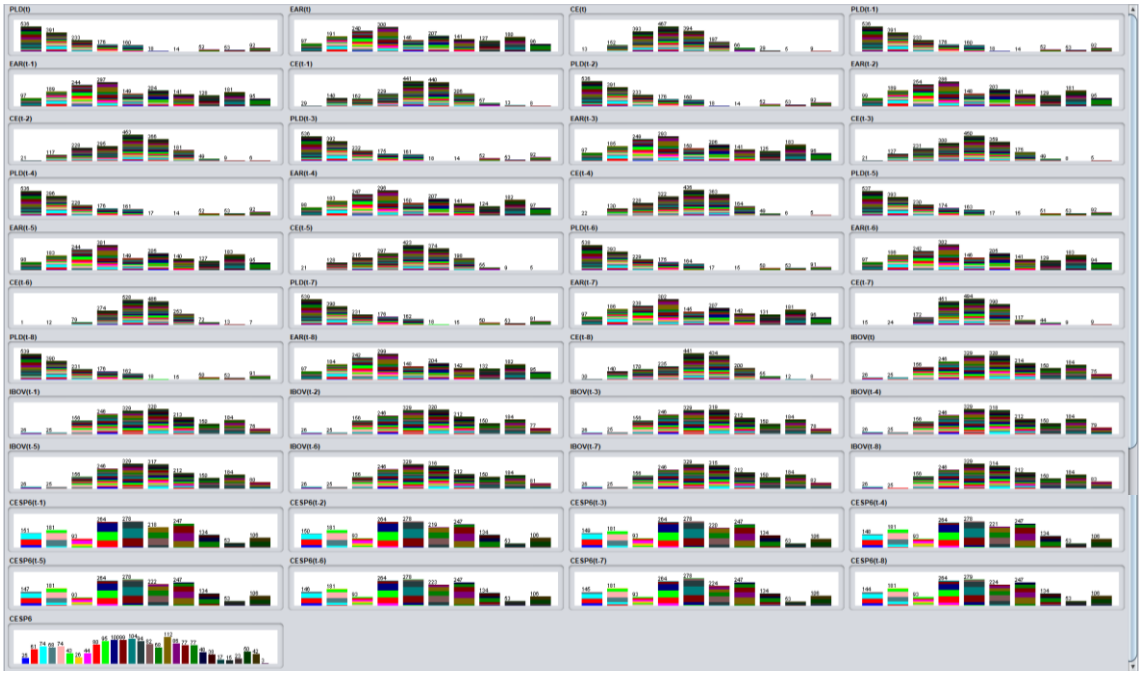

Figura 40 - Comparação da relação das entradas com os intervalos de saída para o ativo CESP6.

Logo, os métodos balizadores e a metodologia 6 e 9 foi aplicada para o conjunto 3 de entradas com atraso C fornecendo os resultados da Tabela 36 para grau de acerto e índice de quase acerto.

Tabela 36 – Grau de Acerto e Índice de quase acerto para o ativo CESP6.

Método	**Grau de Acerto (%)**	**Índice de quase acerto (%)**
Balizador Zero-R	6,49%	-
Balizador Persistente	66,90%	-
Método 6 (J48)	54,67%	98,00%
Método 9	60,00%	98,36%

Fundamentando-se nos balizadores, as metodologias escolhidas fornecem resultados de grau de acerto bem próximos do modelo ótimo. Quando analisados os índices de quase acerto, percebe-se que a alocação dos dados, mesmo quando errada, é concentrada em faixas bem próximas a faixa correta.

5.2 TRANSMISSÃO - ATIVO TRPL4

Conforme explanado no capítulo 2, o ativo TRPL4 foi escolhido como o que representa melhor o segmento de transmissão. Desta maneira, o arranjo definido no capítulo 3 foi aplicado para o ativo TRPL4.

Para o ativo TRPL4, quando divididas em intervalos de 1 em 1 real, somam-se 49 faixas de saída. Na Tabela 37 são observados os intervalos de saída e contagem dos exemplares dos dados históricos analisados (2010-2016) presentes em cada intervalo.

Tabela 37 – Intervalos de saída, número de exemplares para os dados de entrada do ativo TRPL4.

Intervalo de Saída	**Número de Exemplares**	**Intervalo de Saída**	**Número de Exemplares**	**Intervalo de Saída**	**Número de Exemplares**
[23,13;24,00]	21	[39,00;40,00]	53	[55,00;56,00]	39
[24,00;25,00]	36	[40,00;41,00]	65	[56,00;57,00]	28
[25,00;26,00]	23	[41,00;42,00]	66	[58,00;59,00]	17
[26,00;27,00]	33	[42,00;43,00]	14	[59,00;60,00]	16
[27,00;28,00]	22	[43,00;44,00]	24	[60,00;61,00]	22
[28,00;29,00]	34	[44,00;45,00]	33	[61,00;62,00]	30
[29,00;30,00]	17	[45,00;46,00]	60	[62,00;63,00]	40
[30,00;31,00]	27	[46,00;47,00]	90	[63,00;64,00]	26
[31,00;32,00]	25	[47,00;48,00]	41	[64,00;65,00]	36
[32,00;33,00]	47	[48,00;49,00]	70	[65,00;66,00]	21
[33,00;34,00]	69	[49,00;50,00]	76	[66,00;67,00]	24
[34,00;35,00]	74	[50,00;51,00]	70	[67,00;68,00]	21
[35,00;36,00]	51	[51,00;52,00]	41	[68,00;69,00]	18
[36,00;37,00]	39	[52,00;53,00]	30	[69,00;70,00]	8
[37,00;38,00]	26	[53,00;54,00]	27	[70,00;71,00]	2
[38,00;39,00]	33	[54,00;55,00]	27	[71,00;71,37]	1

As variáveis de entrada utilizadas na modelagem do ativo TRPL4 (conjunto 3 e atraso C) foram discretizadas em 10 faixas. Também se efetuou a contagem do número de exemplares em cada faixa de saída da análise 1 e relacionou-se graficamente com os intervalos de saída (Figura 41). É perceptível que as saídas não são discriminantes, corroborando os resultados da análise para os ativos CESP6 e ELET6.

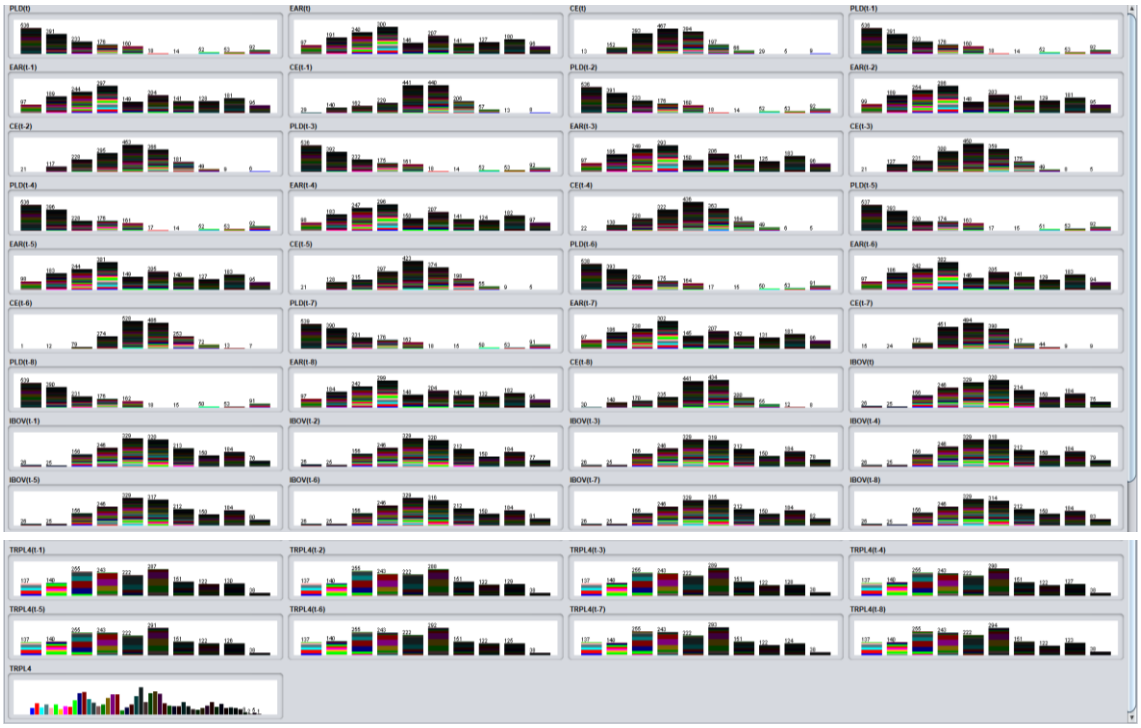

Figura 41 - Comparação da relação das entradas com os intervalos de saída para o ativo TRPL4.

Os métodos balizadores e a metodologia 6 e 9 foi aplicada para o conjunto 3 de entradas com atraso C fornecendo os resultados da Tabela 38 para grau de acerto e índice de quase acerto.

Tabela 38 – Grau de Acerto e Índice de quase acerto para o ativo TRPL4.

Método	**Grau de Acerto (%)**	**Índice de quase acerto (%)**
Balizador Zero-R	6,49%	-
Balizador Persistente	59,42%	-
Método 6 (J48)	45,22%	98,31%
Método 9	52,55%	98,71%

Fundamentando-se nos balizadores, as metodologias escolhidas fornecem resultados de grau de acerto próximos do modelo ótimo. Quando analisados os índices de quase acerto, percebe-se que a alocação dos dados, mesmo quando errada, é concentrada em faixas bem próximas a faixa correta. Sendo os índices de quase acerto superiores ao do ativo CESP6.

5.3 DISTRIBUIÇÃO - ATIVO COCE5

Conforme explanado no capítulo 2, o ativo COCE5 foi escolhido como o que representa melhor o segmento de distribuição. Desta maneira, o arranjo definido no capítulo 3 foi aplicado para o ativo COCE5.

Para o ativo COCE5, quando divididas em intervalos de 1 em 1 real, somam-se 28 faixas de saída. Na Tabela 39 são observados os intervalos de saída e contagem dos exemplares dos dados históricos analisados (2010-2016) presentes em cada intervalo.

Tabela 39 – Intervalos de Saída e número de exemplares correspondente para os dados de entrada do ativo COCE5.

Intervalo de Saída	**Número de Exemplares**	**Intervalo de Saída**	**Número de Exemplares**
[24,13;25,00]	12	[39,00;40,00]	100
[25,00;26,00]	24	[40,00;41,00]	67
[26,00;27,00]	26	[41,00;42,00]	103
[27,00;28,00]	47	[42,00;43,00]	71
[28,00;29,00]	61	[43,00;44,00]	27
[29,00;30,00]	71	[44,00;45,00]	30
[30,00;31,00]	85	[45,00;46,00]	15
[31,00;32,00]	52	[46,00;47,00]	16
[32,00;33,00]	57	[47,00;48,00]	42
[33,00;34,00]	72	[48,00;49,00]	37
[34,00;35,00]	130	[49,00;50,00]	24
[35,00;36,00]	122	[50,00;51,00]	20
[36,00;37,00]	142	[51,00;52,00]	10
[37,00;38,00]	126	[52,00;52,42]	1
[38,00;39,00]	125		

Os métodos balizadores e a metodologia 6 e 9 foi aplicada para o conjunto 3 de entradas com atraso C fornecendo os resultados da Tabela 40 para grau de acerto e índice de quase acerto.

Tabela 40 – Grau de Acerto e Índice de quase acerto para o ativo COCE5.

Método	Grau de Acerto (%)	Índice de quase acerto (%)
Balizador Zero-R	8,23%	-
Balizador Persistente	69,16%	-
Método 6 (J48)	55,71%	98,02%
Método 9	64,52%	98,49%

5.4 ATUAÇÃO MISTA - ATIVO CMIG4

Conforme explanado no capítulo 2, o ativo CMIG4 foi escolhido para também representar uma empresa de atuação mista, logo, o arranjo definido no capítulo 3 foi aplicado para o ativo CMIG4.

Para o ativo CMIG4, quando divididas em intervalos de 1 em 1 real, somam-se 46 faixas de saída. Na Tabela 41 são observados os intervalos de saída e contagem dos exemplares dos dados históricos analisados (2010-2016) presentes em cada intervalo.

Tabela 41 – Intervalos de saída, número de exemplares para os dados de entrada do ativo CMIG4.

Intervalo de Saída	Número de Exemplares	Intervalo de Saída	Número de Exemplares	Intervalo de Saída	Número de Exemplares
[4,24;5,00]	14	[20,00;21,00]	92	[35,00;36,00]	23
[5,00;6,00]	41	[21,00;22,00]	32	[36,00;37,00]	16
[6,00;7,00]	61	[22,00;23,00]	29	[37,00;38,00]	19
[8,00;9,00]	112	[23,00;24,00]	39	[38,00;39,00]	22
[9,00;10,00]	69	[24,00;25,00]	40	[39,00;40,00]	13
[10,00;11,00]	56	[25,00;26,00]	49	[40,00;41,00]	24
[11,00;12,00]	4	[26,00;27,00]	81	[41,00;42,00]	5
[12,00;13,00]	43	[27,00;28,00]	52	[42,00;43,00]	4
[13,00;14,00]	54	[28,00;29,00]	79	[43,00;44,00]	8
[14,00;15,00]	84	[29,00;30,00]	66	[44,00;45,00]	3
[15,00;16,00]	53	[30,00;31,00]	105	[45,00;46,00]	73
[16,00;17,00]	39	[31,00;32,00]	71	[46,00;47,00]	3
[17,00;18,00]	50	[32,00;33,00]	43	[47,00;48,00]	2
[18,00;19,00]	20	[33,00;34,00]	21	[48,00;49,00]	4
[19,00;20,00]	47	[34,00;35,00]	8	[49,00;49,17]	1

Os métodos balizadores e a metodologia 6 e 9 foi aplicada para o conjunto 3 de entradas com atraso C fornecendo os resultados da Tabela 42 para grau de acerto e índice de quase acerto.

Tabela 42 – Grau de Acerto e Índice de quase acerto para o ativo CMIG4.

Método	Grau de Acerto (%)	Índice de quase acerto (%)
Balizador Zero-R	6,55%	-
Balizador Persistente	73,33%	-
Método 6 (J48)	60,69%	98,72%
Método 9	65,33%	99,05%

Capítulo 6

DISCUSSÃO DOS RESULTADOS PARA OS ATIVOS ELET6, CESP6, TRPL4, COCE5 E CMIG4

A partir dos resultados expostos anteriormente, por conta da convergência das análises, o presente capítulo consolida a discussão dos resultados observados para todos os ativos considerados neste trabalho.

6.1 SIMULAÇÕES DE 10 EM 10 CENTAVOS: PERSISTENTE *VERSUS* J48 E RANDOM FOREST.

Para avaliar melhor a comparação entre os métodos utilizados para análise de todos os ativos do presente estudo, os dados de entrada com atraso de 8 dias (Atraso C) foram modelados para os quatro métodos aplicados (Zero – R, Persistente, J48 e Random Forest) considerando intervalos de saída de 10 em 10 centavos.

Sendo o método Zero – R o balizador inferior e o modelo persistente o método a ser batido pelos demais, o intuito da análise adicional com intervalos de saída ainda mais estreitos é perceber se o modelo Persistente pode ser batido, principalmente quando os intervalos se tornam cada vez menores.

Em suma, alheia ao grau de acerto alcançado como um todo, a seguinte análise visa avaliar a capacidade dos modelos J48 e Random Forest de se distanciar do balizador Zero-R e superar o modelo Persistente.

Na Figura 42, pode ser observado que ao analisar intervalos de saída de 10 em 10 centavos, os modelos escolhidos superam o modelo persistente para todos os ativos avaliados no presente estudo. Constata-se, portanto, que o que garante o grau de acerto superior do modelo persistente é o grande intervalo considerado (intervalos de saída de 1 em 1 real).

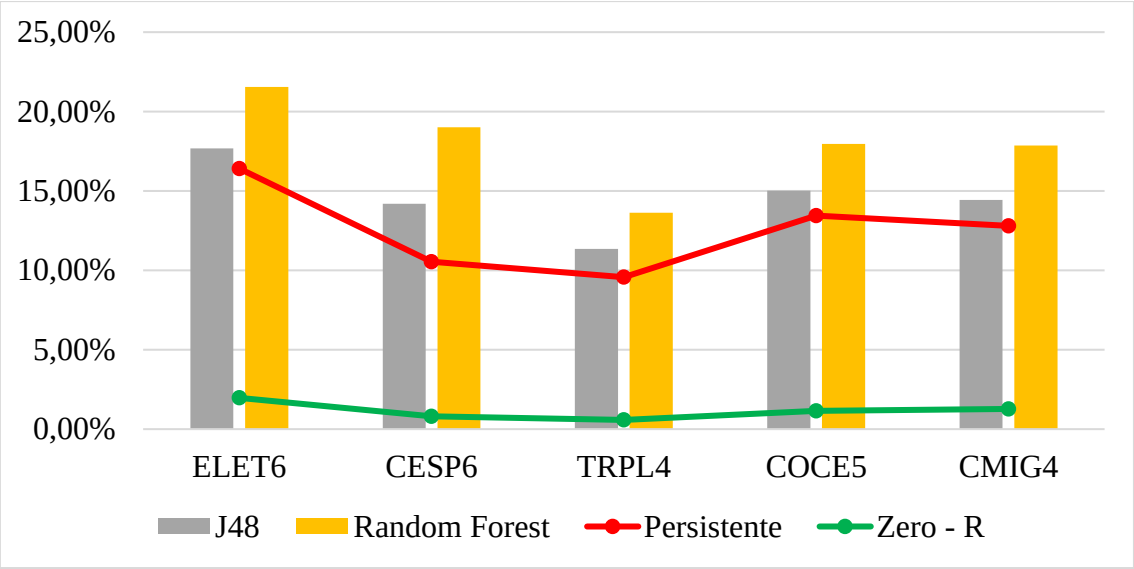

Figura 42 – Comparação gráfica do grau de acerto dos modelos Zero – R, Persistente, J48 e Random Forest para os dados de entrada dos ativos ELET6, CESP6, TRPL4, COCE5 e CMIG4 considerando o atraso C e intervalos de saída de 10 em 10 centavos.

6.2 RESULTADOS CONSOLIDADOS

Pela convergência dos resultados apresentados no capítulo 5, nesta seção são apresentados os resultados obtidos de maneira consolidada, conforme pode ser observado na Figura 43.

Para os ativos dos segmentos de geração, transmissão e distribuição e para os ativos de atuação mista os resultados dos métodos em análise são convergentes. O método 9 (Random Forest) apresenta resultados superiores ao método 6 (J48), porém sempre inferior ao modelo Persistente.

Todavia, conforme explanado na Seção 6.1, o fato do modelo persistente apresentar maior grau de acerto frente aos demais se dá em razão de os intervalos de saída se dividirem de 1 em 1 real, uma faixa ainda longa para a sensibilidade das entradas analisadas.

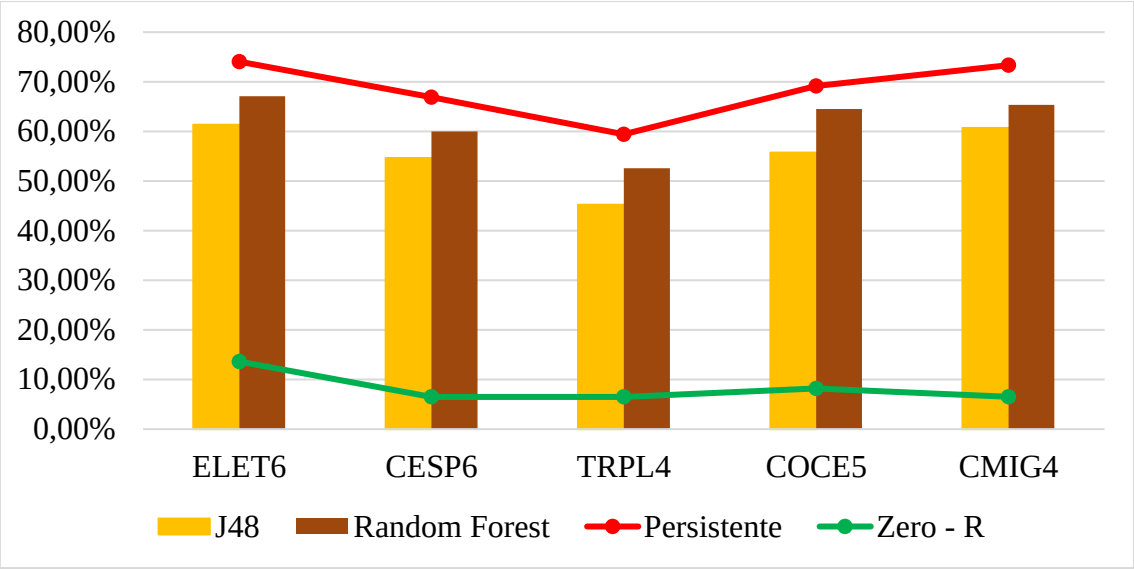

Figura 43 – Comparação gráfica do grau de acerto dos modelos Zero – R, Persistente, J48 e Random Forest para os dados de entrada dos ativos ELET6, CESP6, TRPL4, COCE5 e CMIG4 considerando o atraso C e intervalos de saída de 1 em 1 real.

Quando observados os produtos provenientes da aplicação dos modelos utilizados na análise, percebe-se que, apesar da influência de todas as variáveis de entrada na ampliação do grau de acerto dos resultados, a entrada preponderante na construção dos resultados é o preço da ação no dia anterior.

Desta maneira, constata-se que, apesar da inserção de variáveis de energia na modelagem ampliar o grau de acerto, elas não foram as que mais influenciaram na previsão do preço das ações das empresas do setor elétrico.

Esse fato pode ser justificado pelo fato de que o mercado financeiro não está somente atento aos fatores sistêmicos que podem impactar nas finanças em tais empresas, e que já podem estar precificados nos valores das ações dos dias anteriores, sendo os fatores financeiros e de governança empresarial mais relevantes no comportamento de mercado.

CONCLUSÃO

A análise procurou avaliar o preço das ações de empresas do setor elétrico vis a vis as variáveis de energia e de mercado através da aplicação do princípio do *Data Mining* considerando como dados de entrada varáveis de mercado e de energia.

Ao observar os resultados, percebeu-se que para intervalos pequenos, a inserção das variáveis de energia (Conjunto 3 de entradas) melhora o grau de acerto dos modelos J48 e Random Forest (Métodos 6 e 9) para intervalos de saída de 1 em 1 real (Análise 3) com atraso de 8 dias (Atraso C).

Porém, na análise mais ampla de cada método aplicado é percebido que, apesar da melhoria no resultado global, o que mais influencia o resultado final é o dado de entrada do preço da ação no dia anterior, logo não é possível afirmar que as variáveis de energia possuem influência no preço das ações de empresas do setor elétrico.

Desta maneira, para trabalhos futuros, sugere-se: uma análise qualitativa sobre a influência das questões setoriais, tanto técnicas quanto de cunho regulatório e institucional nas empresas do setor elétrico, filtrando os resultados associados a governança e ao mercado financeiro.

Também se sugere a análise separada de empresas de estatais, economia mista e caráter privado, pois a interferência governamental influencia fortemente nas expectativas do mercado financeiro em relação a empresas estatais e de economia mista.

Por fim, sugere-se uma análise da influência da diminuição da capacidade de geração hidrelétrica devido à má hidrologia recorrente em empresas cujo principal ativo são empreendimento hidrelétricos.

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APÊNDICE

ZERO – R

O método Zero-R é o método de classificação mais simples deste estudo, que se baseia somente nas saídas e ignora todos os dados de entrada. O classificador Zero - R simplesmente prevê a categoria majoritária (classe) [47].

Embora não haja poder de previsibilidade no ZeroR, é útil determinar um desempenho de referência. Ele serve como referência para avaliação de outros métodos de classificação [47].

1-R CLASSIFIER

O método 1-R é a abreviação para “uma regra”, consistindo em um algoritmo de classificação simples, mas preciso, que gera uma regra para cada entrada nos dados e, em seguida, seleciona a regra com o menor erro total como "regra única"[48].

Para criar uma regra para uma entrada, constrói-se uma Tabela de frequência para cada dado de entrada em relação ao alvo. O 1-R produz regras apenas ligeiramente menos precisas do que algoritmos de classificação de última geração e de fácil interpretação [48].

DECISION TABLES

A maneira mais simples de representar a saída de um modelo de aprendizado automático é torná-lo igual a entrada em uma Tabela de decisão. A criação de uma Tabela de decisão pode envolver a avaliação da relevância de alguns dos dados de entrada [49].

Isso quer dizer que, se em um determinado conjunto de entradas uma variável for irrelevante para a decisão, o mais adequado é condensar tal Tabela, retirando a

variável irrelevante para que a Tabela seja mais simples. Porém, há que avaliar quais entradas deixar de fora sem afetar a decisão final [49].

Entende-se, portanto, que a Tabela de decisão é um tipo de classificador para o qual a seleção de dados específicos do esquema é uma parte essencial do processo de aprendizagem automático [49].

Como mencionado, selecionar os dados certos para atribuir à Tabela é o maior problema para tal modelagem. Geralmente isso é feito medindo a Tabela desempenho de validação cruzada para diferentes subconjuntos de entrada e escolhendo o subconjunto de melhor desempenho [49].

DECISION TREES

Neste trabalho, foram utilizados sete tipos de árvores de decisão para as avaliações. As modelagens baseadas em árvores de decisão partem de uma abordagem de "dividir para conquistar", onde uma modelagem de aprendizado automático se constrói naturalmente em estilo de representação chamado árvore de decisão [49].

Nós em uma árvore de decisão envolvem o teste de uma determinada variável. Normalmente, o teste em um nó compara um atributo valor com uma constante. Algumas árvores comparam dois atributos com outro atributo, ou ainda utiliza alguma função de um ou mais atributos [49].

Na construção de árvores de decisão também existem nós de folha, que fornecem uma classificação que se aplica a todas as instâncias que atingem a folha, ou um conjunto de classificações, ou uma distribuição de probabilidade sobre todas as classificações possíveis [49]. Neste estudo são árvores de decisão os modelos Part Decision List, RIPPER, REPTree, J48, Hoffding Tree, Random Tree e Random Forest;

REDES NEURAIS

Uma rede neural é um sistema inspirado na rede neural biológica, como o cérebro. O cérebro tem aproximadamente 100 bilhões de neurônios, que se comunicam através de sinais eletroquímicos. Os neurônios são conectados através de junções chamadas sinapses [50].

Cada neurônio recebe milhares de conexões com outros neurônios, recebendo constantemente sinais de entrada para alcançar o corpo celular. Se a soma resultante dos sinais ultrapassar um certo limite, uma resposta é enviada através do axônio[50].

A rede neural tenta recriar o espelho computacional da rede neural biológica, embora não seja comparável, uma vez que o número e a complexidade dos neurônios e o utilizado em uma rede neural biológica são muitas vezes superiores aos de uma rede artificial neutra [50].

Uma rede neural é composta por uma rede de neurônios artificiais (também conhecidos como nós). Esses nós são conectados um ao outro, e a força de suas conexões é atribuída um valor baseado em sua força. Se o valor da conexão for alto, isso indica que há uma conexão forte [50].

Anexo

DADOS DE SAÍDA COMPLETOS

ELET6 – ATRASO A - ANÁLISE 2

10 Intervalos de Saída: [5.83;8.62), [8.62;11.40), [11.40;14.19), [14.19;16.98), [16.98;19.76), [19.76;22.55), [22.55;25.34), [25.34;28.13), [28.13;30.91), [30.91;33.70]

Conjunto 1: PLD(t), PLD(t-1), PLD(t-2), EAR(t), EAR(t-1), EAR(t-2), CE(t), CE(t-1),CE(t-2)

Conjunto 2: IBOV(t), IBOV(t-1), IBOV(t-2), ELET6(t-1), ELET(t-2)

Conjunto 3: PLD(t), PLD(t-1), PLD(t-2), EAR(t), EAR(t-1), EAR(t-2), CE(t), CE(t-1),CE(t-2), IBOV(t), IBOV(t-1), IBOV(t-2), ELET6(t-1), ELET(t-2)

CONJUNTO 1

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.7369 %

Incorrectly Classified Instances 1183 68.2631 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
0	195	0	0	0	0	0	0	0	0	| a = [5.83;8.62)
0	550	0	0	0	0	0	0	0	0	| b = [8.62;11.40)
0	145	0	0	0	0	0	0	0	0	| c = [11.40;14.19)
0	17	0	0	0	0	0	0	0	0	| d = [14.19;16.98)
0	91	0	0	0	0	0	0	0	0	| e = [16.98;19.76)
0	111	0	0	0	0	0	0	0	0	| f = [19.76;22.55)
0	146	0	0	0	0	0	0	0	0	| g = [22.55;25.34)
0	298	0	0	0	0	0	0	0	0	| h = [25.34;28.13)
0	136	0	0	0	0	0	0	0	0	| i = [28.13;30.91)
0	44	0	0	0	0	0	0	0	0	| j = [30.91;33.70]

Método 2: 1R classifier

Correctly Classified Instances 781 45.0664 %

Incorrectly Classified Instances 952 54.9336 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
 84  98   0   0   0   0   0  13   0   0 |   a = [5.83;8.62)
 15 503   0   0   0   0   0  32   0   0 |   b = [8.62;11.40)
  0 145   0   0   0   0   0   0   0   0 |   c = [11.40;14.19)
  0  17   0   0   0   0   0   0   0   0 |   d = [14.19;16.98)
  0  43   0   0  41   0   0   7   0   0 |   e = [16.98;19.76)
  0  25   0   0  31   0   0  55   0   0 |   f = [19.76;22.55)
  0  84   0   0  16   0   0  32  14   0 |   g = [22.55;25.34)
  0 145   0   0  27   0   0 103  23   0 |   h = [25.34;28.13)
  0  20   0   0  11   0   0  55  50   0 |   i = [28.13;30.91)
  0   0   0   0  11   0   0  25   8   0 |   j = [30.91;33.70]
```

Método 3: PART decision list

Number of Rules : 144

Correctly Classified Instances 1005 57.9919 %

Incorrectly Classified Instances 728 42.0081 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
103  72   4   0   0   3   6   6   1   0 |   a = [5.83;8.62)
 21 459  18   2   6   8  14  21   1   0 |   b = [8.62;11.40)
  2  52  62   1   5   0  14   8   1   0 |   c = [11.40;14.19)
  0  10   5   0   1   0   0   1   0   0 |   d = [14.19;16.98)
  0  14   2   0  44  19   4   7   1   0 |   e = [16.98;19.76)
  1   3   0   0   9  54  12  18  14   0 |   f = [19.76;22.55)
```

11 10 7 0 8 26 38 29 16 1 | g = [22.55;25.34)

7 19 11 0 9 17 31 163 30 11 | h = [25.34;28.13)

0 3 2 0 5 8 3 31 79 5 | i = [28.13;30.91)

0 0 0 0 0 1 0 25 15 3 | j = [30.91;33.70]

Método 4: RIPPER

Number of Rules : 32

Correctly Classified Instances 828 47.7784 %

Incorrectly Classified Instances 905 52.2216 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

102 92 0 0 0 1 0 0 0 0 | a = [5.83;8.62)

24 499 11 0 2 3 1 10 0 0 | b = [8.62;11.40)

0 128 15 1 0 0 0 1 0 0 | c = [11.40;14.19)

0 15 2 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 53 0 0 30 6 0 2 0 0 | e = [16.98;19.76)

0 62 1 0 9 26 0 8 5 0 | f = [19.76;22.55)

4 102 1 0 2 15 7 2 13 0 | g = [22.55;25.34)

2 166 4 0 6 2 2 92 23 1 | h = [25.34;28.13)

0 50 0 0 3 0 2 23 57 1 | i = [28.13;30.91)

0 16 0 0 0 0 0 16 12 0 | j = [30.91;33.70]

Método 5: Decision Tables

Number of Rules : 260

Correctly Classified Instances 980 56.5493 %

Incorrectly Classified Instances 753 43.4507 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

110 69 2 0 0 1 7 6 0 0 | a = [5.83;8.62)

62 432 16 0 4 6 13 17 0 0 | b = [8.62;11.40)

12 51 57 2 5 0 13 5 0 0 | c = [11.40;14.19)

4 7 2 2 2 0 0 0 0 0 | d = [14.19;16.98)

1 18 4 0 52 11 0 2 3 0 | e = [16.98;19.76)

1 14 0 0 12 43 7 15 19 0 | f = [19.76;22.55)

12 18 7 0 2 26 36 27 18 0 | g = [22.55;25.34)

12 29 11 0 6 17 23 161 31 8 | h = [25.34;28.13)

1 6 1 0 4 6 2 31 82 3 | i = [28.13;30.91)

1 0 0 0 0 2 0 16 20 5 | j = [30.91;33.70]

Método 6: REPTree

Size of the tree : 361

Correctly Classified Instances 993 57.2995 %

Incorrectly Classified Instances 740 42.7005 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

113 64 0 0 0 1 6 11 0 0 | a = [5.83;8.62)

36 462 12 0 6 4 12 18 0 0 | b = [8.62;11.40)

2 62 52 0 9 1 12 7 0 0 | c = [11.40;14.19)

1 8 5 2 1 0 0 0 0 0 | d = [14.19;16.98)

0 17 8 0 43 17 1 4 1 0 | e = [16.98;19.76)

0 10 0 0 17 50 2 15 17 0 | f = [19.76;22.55)

14 16 11 0 8 24 30 21 22 0 | g = [22.55;25.34)

8 27 9 0 10 18 24 164 34 4 | h = [25.34;28.13)

0 6 2 0 6 7 0 39 76 0 | i = [28.13;30.91)

0 0 0 0 0 1 0 27 15 1 | j = [30.91;33.70]

Método 7: J48

Number of Leaves : 433

Size of the tree : 481

Correctly Classified Instances 1004 57.9342 %

Incorrectly Classified Instances 729 42.0658 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
108	70	0	0	0	2	6	9	0	0	a = [5.83;8.62)
29	468	14	0	3	5	15	16	0	0	b = [8.62;11.40)
2	64	49	0	6	0	16	8	0	0	c = [11.40;14.19)
1	9	4	0	3	0	0	0	0	0	d = [14.19;16.98)
0	12	3	0	49	16	1	7	3	0	e = [16.98;19.76)
1	4	0	0	15	49	8	16	18	0	f = [19.76;22.55)
12	18	3	0	2	25	42	27	17	0	g = [22.55;25.34)
6	29	9	0	10	13	27	159	32	13	h = [25.34;28.13)
0	2	2	0	8	6	4	39	73	2	i = [28.13;30.91)
0	0	0	0	0	1	0	22	14	7	j = [30.91;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 766 44.2008 %

Incorrectly Classified Instances 967 55.7992 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
105	38	4	6	1	6	23	12	0	0	a = [5.83;8.62)
51	320	56	15	20	28	47	13	0	0	b = [8.62;11.40)
2	68	22	10	1	5	37	0	0	0	c = [11.40;14.19)
4	7	0	4	0	2	0	0	0	0	d = [14.19;16.98)
0	13	2	0	43	28	3	0	0	2	e = [16.98;19.76)
0	0	0	0	30	35	15	12	15	4	f = [19.76;22.55)

2 14 1 0 18 28 38 24 19 2 | g = [22.55;25.34)

1 37 0 0 19 35 28 89 44 45 | h = [25.34;28.13)

0 4 1 0 0 9 3 18 84 17 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 18 26 | j = [30.91;33.70]

Método 9: Random Tree

Size of the tree : 3511

Correctly Classified Instances 954 55.049 %

Incorrectly Classified Instances 779 44.951 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

120 57 4 1 0 2 6 4 1 0 | a = [5.83;8.62)

51 424 32 2 9 6 16 10 0 0 | b = [8.62;11.40)

3 45 60 6 7 1 9 14 0 0 | c = [11.40;14.19)

1 7 5 1 3 0 0 0 0 0 | d = [14.19;16.98)

1 11 6 3 43 15 4 5 2 1 | e = [16.98;19.76)

0 5 2 0 16 43 19 17 9 0 | f = [19.76;22.55)

10 16 11 0 11 26 35 24 13 0 | g = [22.55;25.34)

7 20 12 0 14 17 31 165 22 10 | h = [25.34;28.13)

2 3 2 0 5 12 7 41 57 7 | i = [28.13;30.91)

0 0 0 0 0 3 1 22 12 6 | j = [30.91;33.70]

Método 10: Random Forest

Correctly Classified Instances 986 56.8956 %

Incorrectly Classified Instances 747 43.1044 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

109 68 2 1 0 2 7 5 1 0 | a = [5.83;8.62)

37 440 32 2 8 5 17 9 0 0 | b = [8.62;11.40)

3 41 67 2 7 2 10 13 0 0 | c = [11.40;14.19)

2 6 4 2 3 0 0 0 0 0 | d = [14.19;16.98)

0 9 3 0 52 16 5 4 2 0 | e = [16.98;19.76)

0 5 2 0 15 44 19 15 9 2 | f = [19.76;22.55)

11 11 9 0 7 28 36 32 11 1 | g = [22.55;25.34)

5 15 11 0 8 14 29 172 34 10 | h = [25.34;28.13)

2 3 1 0 5 12 7 38 59 9 | i = [28.13;30.91)

0 0 0 0 0 4 1 20 14 5 | j = [30.91;33.70]

Método 11: Rede Neural

Time taken to build model: 68.69 seconds

Correctly Classified Instances 948 54.7028 %

Incorrectly Classified Instances 785 45.2972 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

115 63 2 2 0 1 6 5 1 0 | a = [5.83;8.62)

41 407 45 5 13 10 15 13 1 0 | b = [8.62;11.40)

3 45 69 3 5 2 7 9 2 0 | c = [11.40;14.19)

2 5 6 1 3 0 0 0 0 0 | d = [14.19;16.98)

2 9 2 1 47 14 6 8 2 0 | e = [16.98;19.76)

0 5 2 0 12 41 23 13 13 2 | f = [19.76;22.55)

7 12 8 0 9 27 44 28 11 0 | g = [22.55;25.34)

2 18 15 0 10 15 28 164 31 15 | h = [25.34;28.13)

1 6 0 0 3 8 14 40 53 11 | i = [28.13;30.91)

0 0 0 0 0 1 1 18 17 7 | j = [30.91;33.70]

CONJUNTO 2

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.7369 %

Incorrectly Classified Instances 1183 68.2631 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
0	195	0	0	0	0	0	0	0	0	a = [5.83;8.62)
0	550	0	0	0	0	0	0	0	0	b = [8.62;11.40)
0	145	0	0	0	0	0	0	0	0	c = [11.40;14.19)
0	17	0	0	0	0	0	0	0	0	d = [14.19;16.98)
0	91	0	0	0	0	0	0	0	0	e = [16.98;19.76)
0	111	0	0	0	0	0	0	0	0	f = [19.76;22.55)
0	146	0	0	0	0	0	0	0	0	g = [22.55;25.34)
0	298	0	0	0	0	0	0	0	0	h = [25.34;28.13)
0	136	0	0	0	0	0	0	0	0	i = [28.13;30.91)
0	44	0	0	0	0	0	0	0	0	j = [30.91;33.70]

Método 2: 1R classifier

Correctly Classified Instances 1592 91.8638 %

Incorrectly Classified Instances 141 8.1362 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	524	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	13	3	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 40 | j = [30.91;33.70]

Método 3: PART decision list

Number of Rules : 15

Correctly Classified Instances 1587 91.5753 %

Incorrectly Classified Instances 146 8.4247 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 99 7 0 1 0 | f = [19.76;22.55)

0 0 0 2 0 9 123 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 40 | j = [30.91;33.70]

Método 4: RIPPER

Number of Rules : 12

Correctly Classified Instances 1586 91.5176 %

Incorrectly Classified Instances 147 8.4824 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
177  18   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
 16 523  11   0   0   0   0   0   0   0 |   b = [8.62;11.40)
  0  10 134   1   0   0   0   0   0   0 |   c = [11.40;14.19)
  0   0   1  13   3   0   0   0   0   0 |   d = [14.19;16.98)
  0   0   0   3  84   4   0   0   0   0 |   e = [16.98;19.76)
  0   0   0   0   4  99   8   0   0   0 |   f = [19.76;22.55)
  0   0   0   0   0   9 125  12   0   0 |   g = [22.55;25.34)
  0   0   0   0   0   0  12 273  13   0 |   h = [25.34;28.13)
  0   0   0   0   0   0   0  11 118   7 |   i = [28.13;30.91)
  0   0   0   0   0   0   0   0   4  40 |   j = [30.91;33.70]
```

Método 5: Decision Tables

Number of Rules : 10

Correctly Classified Instances 1592 91.8638 %

Incorrectly Classified Instances 141 8.1362 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
177  18   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
 16 524  10   0   0   0   0   0   0   0 |   b = [8.62;11.40)
  0  10 134   1   0   0   0   0   0   0 |   c = [11.40;14.19)
  0   0   1  13   3   0   0   0   0   0 |   d = [14.19;16.98)
  0   0   0   3  84   4   0   0   0   0 |   e = [16.98;19.76)
  0   0   0   0   4 100   7   0   0   0 |   f = [19.76;22.55)
  0   0   0   0   0   7 127  12   0   0 |   g = [22.55;25.34)
  0   0   0   0   0   0  12 273  13   0 |   h = [25.34;28.13)
  0   0   0   0   0   0   0  11 120   5 |   i = [28.13;30.91)
  0   0   0   0   0   0   0   0   4  40 |   j = [30.91;33.70]
```

Método 6: REPTree

Size of the tree : 11

Correctly Classified Instances 1591 91.8061 %

Incorrectly Classified Instances 142 8.1939 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	524	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	13	3	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	4	100	7	0	0	0	f = [19.76;22.55)
0	0	0	0	0	7	127	12	0	0	g = [22.55;25.34)
0	0	0	0	0	0	12	273	13	0	h = [25.34;28.13)
0	0	0	0	0	0	0	12	119	5	i = [28.13;30.91)
0	0	0	0	0	0	0	0	4	40	j = [30.91;33.70]

Método 7: J48

Number of Leaves : 10

Size of the tree : 11

Correctly Classified Instances 1592 91.8638 %

Incorrectly Classified Instances 141 8.1362 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	524	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	13	3	0	0	0	0	0	d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 40 | j = [30.91;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 1550 89.4403 %

Incorrectly Classified Instances 183 10.5597 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

173 21 1 0 0 0 0 0 0 0 | a = [5.83;8.62)

24 511 14 0 0 0 0 0 1 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 2 11 4 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 4 81 6 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 98 9 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 10 120 16 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 13 271 14 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 16 114 6 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 7 37 | j = [30.91;33.70]

Método 9: Random Tree

Size of the tree : 1411

Correctly Classified Instances 1551 89.498 %

Incorrectly Classified Instances 182 10.502 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
173  22   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
 21 519  10   0   0   0   0   0   0   0 |   b = [8.62;11.40)
  1  14 129   1   0   0   0   0   0   0 |   c = [11.40;14.19)
  0   0   1  12   4   0   0   0   0   0 |   d = [14.19;16.98)
  0   0   0   4  83   4   0   0   0   0 |   e = [16.98;19.76)
  0   0   0   0   6  97   8   0   0   0 |   f = [19.76;22.55)
  0   0   0   0   0   9 122  15   0   0 |   g = [22.55;25.34)
  0   0   0   0   0   0  13 274  11   0 |   h = [25.34;28.13)
  0   0   0   0   0   0   0  23 106   7 |   i = [28.13;30.91)
  0   0   0   0   0   0   0   1   7  36 |   j = [30.91;33.70]
```

Método 10: Random Forest

Correctly Classified Instances 1566 90.3635 %

Incorrectly Classified Instances 167 9.6365 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
173  22   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
 17 522  11   0   0   0   0   0   0   0 |   b = [8.62;11.40)
  0  12 132   1   0   0   0   0   0   0 |   c = [11.40;14.19)
  0   0   1  12   4   0   0   0   0   0 |   d = [14.19;16.98)
  0   0   0   3  84   4   0   0   0   0 |   e = [16.98;19.76)
  0   0   0   0   6  97   8   0   0   0 |   f = [19.76;22.55)
  0   0   0   0   0  10 121  15   0   0 |   g = [22.55;25.34)
  0   0   0   0   0   0  13 272  13   0 |   h = [25.34;28.13)
  0   0   0   0   0   0   0  16 113   7 |   i = [28.13;30.91)
  0   0   0   0   0   0   0   0   4  40 |   j = [30.91;33.70]
```

Método 11: Rede Neural

Time taken to build model: 26.19 seconds

Correctly Classified Instances 1557 89.8442 %

Incorrectly Classified Instances 176 10.1558 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
172	23	0	0	0	0	0	0	0	0	a = [5.83;8.62)
19	519	12	0	0	0	0	0	0	0	b = [8.62;11.40)
0	12	132	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	10	6	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	4	98	9	0	0	0	f = [19.76;22.55)
0	0	0	0	0	8	123	15	0	0	g = [22.55;25.34)
0	0	0	0	0	0	13	271	14	0	h = [25.34;28.13)
0	0	0	0	0	0	0	19	110	7	i = [28.13;30.91)
0	0	0	0	0	0	0	0	6	38	j = [30.91;33.70]

CONJUNTO 3

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.7369 %

Incorrectly Classified Instances 1183 68.2631 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
0	195	0	0	0	0	0	0	0	0	a = [5.83;8.62)
0	550	0	0	0	0	0	0	0	0	b = [8.62;11.40)
0	145	0	0	0	0	0	0	0	0	c = [11.40;14.19)
0	17	0	0	0	0	0	0	0	0	d = [14.19;16.98)
0	91	0	0	0	0	0	0	0	0	e = [16.98;19.76)

0 111 0 0 0 0 0 0 0 0 | f = [19.76;22.55)

0 146 0 0 0 0 0 0 0 0 | g = [22.55;25.34)

0 298 0 0 0 0 0 0 0 0 | h = [25.34;28.13)

0 136 0 0 0 0 0 0 0 0 | i = [28.13;30.91)

0 44 0 0 0 0 0 0 0 0 | j = [30.91;33.70]

Método 2: 1R classifier

Correctly Classified Instances 1592 91.8638 %

Incorrectly Classified Instances 141 8.1362 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 40 | j = [30.91;33.70]

Método 3: PART decision list

Number of Rules : 36

Correctly Classified Instances 1582 91.2868 %

Incorrectly Classified Instances 151 8.7132 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 11 3 0 1 1 0 0 | d = [14.19;16.98)

0 0 0 3 82 4 2 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 99 8 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 8 122 16 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 274 12 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 12 119 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 40 | j = [30.91;33.70]

Método 4: RIPPER

Number of Rules : 13

Correctly Classified Instances 1586 91.5176 %

Incorrectly Classified Instances 147 8.4824 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 522 12 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 4 83 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 9 125 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 119 6 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 40 | j = [30.91;33.70]

Método 5: Decision Tables

Number of Rules : 10

Correctly Classified Instances 1592 91.8638 %

Incorrectly Classified Instances 141 8.1362 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 177  18   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  16 524  10   0   0   0   0   0   0   0 |   b = [8.62;11.40)
   0  10 134   1   0   0   0   0   0   0 |   c = [11.40;14.19)
   0   0   1  13   3   0   0   0   0   0 |   d = [14.19;16.98)
   0   0   0   3  84   4   0   0   0   0 |   e = [16.98;19.76)
   0   0   0   0   4 100   7   0   0   0 |   f = [19.76;22.55)
   0   0   0   0   0   7 127  12   0   0 |   g = [22.55;25.34)
   0   0   0   0   0   0  12 273  13   0 |   h = [25.34;28.13)
   0   0   0   0   0   0   0  11 120   5 |   i = [28.13;30.91)
   0   0   0   0   0   0   0   0   4  40 |   j = [30.91;33.70]
```

Método 6: REPTree

Size of the tree : 51

Correctly Classified Instances 1591 91.8061 %

Incorrectly Classified Instances 142 8.1939 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 177  18   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  16 524  10   0   0   0   0   0   0   0 |   b = [8.62;11.40)
   0  10 134   1   0   0   0   0   0   0 |   c = [11.40;14.19)
   0   0   1  13   3   0   0   0   0   0 |   d = [14.19;16.98)
   0   0   0   3  84   4   0   0   0   0 |   e = [16.98;19.76)
   0   0   0   0   4 100   7   0   0   0 |   f = [19.76;22.55)
   0   0   0   0   0   7 127  12   0   0 |   g = [22.55;25.34)
   0   0   0   0   0   0  13 272  13   0 |   h = [25.34;28.13)
```

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 40 | j = [30.91;33.70]

Método 7: J48

Number of Leaves : 10

Size of the tree : 11

Correctly Classified Instances 1590 91.7484 %

Incorrectly Classified Instances 143 8.2516 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 11 5 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 40 | j = [30.91;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 1504 86.7859 %

Incorrectly Classified Instances 229 13.2141 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

166 24 0 5 0 0 0 0 0 0 | a = [5.83;8.62)

28 508 13 1 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 131 4 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 2 13 2 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 2 83 6 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 97 10 0 0 0 | f = [19.76;22.55)

0 0 0 0 2 14 111 19 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 25 256 17 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 25 102 9 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 7 37 | j = [30.91;33.70]

Método 9: Random Tree

Size of the tree : 2991

Correctly Classified Instances 1454 83.9008 %

Incorrectly Classified Instances 279 16.0992 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

168 27 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

36 495 19 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 27 113 3 2 0 0 0 0 0 | c = [11.40;14.19)

0 0 5 8 4 0 0 0 0 0 | d = [14.19;16.98)

0 1 2 7 73 7 1 0 0 0 | e = [16.98;19.76)

0 0 0 0 8 87 15 1 0 0 | f = [19.76;22.55)

0 0 0 0 0 11 116 18 1 0 | g = [22.55;25.34)

0 2 0 0 0 1 20 260 14 1 | h = [25.34;28.13)

0 0 0 0 0 0 4 22 100 10 | i = [28.13;30.91)

0 0 0 0 0 0 0 1 9 34 | j = [30.91;33.70]

Método 10: Random Forest

Correctly Classified Instances 1541 88.9209 %

Incorrectly Classified Instances 192 11.0791 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
170  25   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
 22 517  11   0   0   0   0   0   0   0 |   b = [8.62;11.40)
  0  14 130   1   0   0   0   0   0   0 |   c = [11.40;14.19)
  0   0   6   8   3   0   0   0   0   0 |   d = [14.19;16.98)
  0   0   0   5  80   6   0   0   0   0 |   e = [16.98;19.76)
  0   0   0   0   6  95  10   0   0   0 |   f = [19.76;22.55)
  0   0   0   0   0   9 121  16   0   0 |   g = [22.55;25.34)
  0   0   0   0   0   0  17 270  11   0 |   h = [25.34;28.13)
  0   0   0   0   0   0   0  17 111   8 |   i = [28.13;30.91)
  0   0   0   0   0   0   0   0   5  39 |   j = [30.91;33.70]
```

Método 11: Rede Neural

Time taken to build model: 176.95 seconds

Correctly Classified Instances 1526 88.0554 %

Incorrectly Classified Instances 207 11.9446 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
173  22   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
 30 507  13   0   0   0   0   0   0   0 |   b = [8.62;11.40)
  0  15 129   1   0   0   0   0   0   0 |   c = [11.40;14.19)
  0   0   3  10   4   0   0   0   0   0 |   d = [14.19;16.98)
  0   0   1   2  80   8   0   0   0   0 |   e = [16.98;19.76)
  0   0   0   0   4  97   9   0   1   0 |   f = [19.76;22.55)
  0   0   0   0   1  11 113  21   0   0 |   g = [22.55;25.34)
  0   0   0   1   0   0  15 269  13   0 |   h = [25.34;28.13)
  0   0   0   0   0   0   0  18 110   8 |   i = [28.13;30.91)
  0   0   0   0   0   0   0   0   6  38 |   j = [30.91;33.70]
```

ELET6 – ATRASO A - ANÁLISE 3

29 Intervalos de Saída:
[5.83;6),[6;7),[7;8),[8;9),[9;10),[10;11),[11;12),[12;13),[13;14),[14;15),[15;16),[16;17),[17;18),[18;19),[19;20),[20;21),[21;22),[22;23),[23;24),[24;25),[25;26),[26;27),[27;28),[28;29),[29;30),[30;31),[31;32),[32;33),[33;33.70]

Conjunto 1: PLD(t), PLD(t-1), PLD(t-2), EAR(t), EAR(t-1), EAR(t-2), CE(t), CE(t-1),CE(t-2)

Conjunto 2: IBOV(t), IBOV(t-1), IBOV(t-2), ELET6(t-1), ELET(t-2)

Conjunto 3: PLD(t), PLD(t-1), PLD(t-2), EAR(t), EAR(t-1), EAR(t-2), CE(t), CE(t-1),CE(t-2), IBOV(t), IBOV(t-1), IBOV(t-2), ELET6(t-1), ELET(t-2)

CONJUNTO 1

Classificação:

Método 1: Zero-R

Correctly Classified Instances 236 13.618 %

Incorrectly Classified Instances 1497 86.382 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 0 0 153 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 0 0 187 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 236 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 64 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 26 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 2: 1R classifier

Correctly Classified Instances 414 23.8892 %

Incorrectly Classified Instances 1319 76.1108 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 26 0 23 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 17 0 94 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 7 0 62 0 118 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 35 0 201 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 16 0 92 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 16 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 6 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 8 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 1 0 13 0 0 0 0 0 0 0 3 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 4 0 22 0 0 0 0 0 0 0 1 16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 4 0 8 0 0 0 0 0 0 0 5 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 16 0 9 0 0 0 0 0 0 0 0 5 0 0 0 0 0 0 10 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 9 0 10 0 0 0 0 0 0 0 5 12 0 0 0 0 0 0 9 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 7 0 7 0 0 0 0 0 0 0 5 11 0 0 0 0 0 0 12 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 10 0 12 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 13 0 6 0 0 0 0 0 0 | s = [23;24)

0 0 0 8 0 36 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 5 0 7 0 0 0 0 0 | t = [24;25)

0 0 0 10 0 54 0 0 0 0 0 0 0 4 10 0 0 0 0 0 0 19 0 4 0 0 0 0 0 0 | u = [25;26)

0 0 0 36 0 50 0 0 0 0 0 0 0 3 8 0 0 0 0 0 0 27 0 11 0 0 0 0 0 0 | v = [26;27)

0 0 0 19 0 37 0 0 0 0 0 0 0 1 5 0 0 0 0 0 0 12 0 4 0 0 0 0 0 0 | w = [27;28)

0 0 0 4 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 30 0 0 0 0 0 0 | x = [28;29)

0 0 0 3 0 3 0 0 0 0 0 0 0 1 4 0 0 0 0 0 0 13 0 7 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 0 0 0 0 0 0 21 0 19 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 0 0 0 0 0 0 12 0 7 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 9 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 3: PART decision list

Number of Rules : 219

Correctly Classified Instances 620 35.7761 %

Incorrectly Classified Instances 1113 64.2239 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 41 4 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 12 30 12 6 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 9 61 24 16 7 3 1 0 0 1 0 0 0 2 3 1 0 4 6 3 5 0 0 0 0 0 | d = [8;9)

0 0 12 13 93 49 7 2 0 0 0 0 0 0 0 2 0 0 0 0 3 4 2 0 0 0 0 0 | e = [9;10)

0 0 15 10 32 142 13 3 2 0 0 0 0 3 0 0 1 0 0 3 5 7 0 0 0 0 0 0 | f = [10;11)

0 0 5 5 2 35 43 8 2 0 0 0 1 4 0 0 0 1 0 1 1 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 4 9 15 14 5 5 0 0 0 1 1 0 0 0 0 2 1 2 3 1 0 0 0 0 0 | h = [12;13)

0 0 0 0 2 0 0 6 5 2 0 0 2 0 0 0 0 0 0 5 3 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 | k = [15;16)

0 0 2 2 1 3 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 | l = [16;17)

0 0 0 0 0 4 1 0 1 0 0 1 3 2 0 0 0 3 0 0 0 2 3 0 0 0 0 0 | m = [17;18)

0 0 0 1 0 5 2 1 0 0 0 0 1 16 5 2 2 3 0 0 2 0 3 0 0 0 0 0 0 | n = [18;19)

0 0 0 1 0 3 1 0 0 0 0 0 0 6 5 2 2 1 0 0 4 2 0 0 4 0 0 0 0 | o = [19;20)

0 0 0 3 2 0 0 0 0 0 0 0 0 0 2 3 12 2 1 0 1 6 2 0 2 2 2 0 0 0 | p = [20;21)

0 0 0 1 0 1 0 0 0 0 0 0 0 2 4 2 3 11 6 0 0 3 4 3 1 1 2 1 0 0 | q = [21;22)

0 0 0 1 0 0 2 0 1 0 0 0 2 4 0 5 5 15 0 1 0 4 1 1 0 0 0 0 0 | r = [22;23)

0 0 0 7 0 0 3 3 2 0 0 0 0 0 0 0 2 1 2 4 0 3 4 0 4 0 5 1 0 1 | s = [23;24)

0 0 2 8 1 4 2 1 7 0 0 0 0 1 2 2 3 1 3 6 3 1 3 6 1 2 0 0 0 | t = [24;25)

0 0 1 7 1 7 1 3 2 0 0 0 0 1 2 9 3 2 2 2 20 24 5 5 1 0 3 0 0 | u = [25;26)

0 0 1 7 1 6 1 1 4 1 0 0 0 2 1 3 1 4 1 5 21 46 8 10 1 3 7 0 0 | v = [26;27)

0 0 1 7 1 3 1 2 2 0 0 0 3 2 0 0 3 1 1 1 11 18 14 4 1 0 2 0 0 | w = [27;28)

0 0 1 2 1 2 0 1 1 0 0 0 0 4 0 4 0 0 2 2 2 7 6 27 2 5 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 2 0 1 1 0 4 2 5 4 8 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 2 0 2 1 1 6 0 11 4 14 1 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 2 0 0 0 0 1 9 0 4 1 5 3 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 1 0 0 6 0 0 0 0 4 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 1 0 0 1 0 | ac = [33;33.70]

Método 4: RIPPER

Number of Rules : 41

Correctly Classified Instances 404 23.3122 %

Incorrectly Classified Instances 1329 76.6878 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 39 0 0 0 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 13 11 0 2 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 3 29 7 103 1 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 2 8 18 155 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 1 1 0 0 0 0 0 0 | e = [9;10)

0 0 2 0 9 211 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 0 | f = [10;11)

0 0 2 0 0 72 31 2 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 0 0 57 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 1 11 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 1 17 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 27 1 0 0 0 0 0 1 6 3 2 1 1 0 0 0 0 1 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 18 0 0 0 0 0 0 0 5 6 0 1 0 0 0 0 0 0 0 1 0 0 0 0 | o = [19;20)

0 0 0 0 0 33 0 0 0 0 0 0 0 0 1 6 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 40 0 0 0 0 0 0 0 1 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 29 0 0 0 0 0 0 0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 1 0 32 0 0 0 0 0 0 0 0 0 0 0 1 6 0 0 0 0 2 0 0 0 0 0 | s = [23;24)

0 0 1 5 0 50 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 1 0 0 0 0 0 | t = [24;25)

0 0 0 1 0 89 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 8 0 1 0 0 0 0 | u = [25;26)

0 0 1 0 1 114 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 16 0 1 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 5 1 1 0 0 0 0 | w = [27;28)

0 0 0 0 0 63 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 1 1 2 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 30 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 0 0 0 | z = [30;31)

0 0 0 0 0 22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1 0 | aa = [31;32)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 | ac = [33;33.70]

<u>Método 5</u>: Decision Tables

Number of Rules : 217

Correctly Classified Instances 582 33.5834 %

Incorrectly Classified Instances 1151 66.4166 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

6 33 5 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

7 3 30 6 10 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

4 6 11 75 13 20 3 0 0 0 0 0 0 0 0 3 0 1 0 6 3 7 1 0 0 0 0 0 0 | d = [8;9)

6 0 10 18 82 51 2 4 0 0 0 0 0 0 0 6 0 0 0 0 6 0 2 0 0 0 0 0 0 | e = [9;10)

24 0 9 11 47 121 8 2 0 0 0 0 2 0 0 0 0 0 0 1 10 0 1 0 0 0 0 0 0 | f = [10;11)

16 0 5 7 1 34 32 5 2 0 0 0 0 2 0 0 0 0 0 2 1 0 1 0 0 0 0 0 0 | g = [11;12)

6 0 0 9 6 12 14 1 9 0 0 1 0 0 0 0 0 0 1 1 3 1 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 1 0 0 6 8 1 0 0 0 1 0 0 0 0 0 5 0 1 1 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

3 0 0 1 3 4 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 1 5 0 0 1 0 0 0 6 2 0 0 3 0 0 0 0 0 2 0 0 0 0 0 0 | m = [17;18)

0 0 0 1 1 8 0 0 0 0 0 0 5 15 5 3 4 0 0 0 1 0 0 0 0 0 0 0 0 | n = [18;19)

2 0 0 2 0 3 1 0 0 0 0 0 0 9 2 1 4 2 0 0 0 1 0 0 4 0 0 0 0 | o = [19;20)

0 0 0 5 3 0 0 1 0 0 0 0 0 4 0 6 6 1 0 0 2 2 0 0 1 9 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 1 4 18 3 0 0 2 4 3 0 1 3 0 0 0 | q = [21;22)

0 0 0 2 0 2 2 0 0 0 0 0 3 1 1 1 9 10 0 3 0 4 0 0 1 3 0 0 0 | r = [22;23)

1 0 0 6 0 0 3 2 4 0 0 0 0 0 1 2 2 1 8 1 0 3 0 6 0 2 0 0 0 | s = [23;24)

2 0 2 10 1 3 2 1 8 0 0 0 0 0 0 1 6 1 2 2 6 5 1 6 0 0 0 0 0 | t = [24;25)

0 0 0 7 4 8 0 2 4 0 0 0 0 0 2 2 7 0 3 6 18 24 4 4 1 4 1 0 0 | u = [25;26)

3 0 1 3 2 7 1 4 6 0 0 0 0 1 0 3 1 3 1 4 26 47 6 7 0 6 3 0 0 | v = [26;27)

5 0 1 4 2 2 1 2 2 0 0 0 0 4 0 1 5 1 0 3 11 13 14 4 0 3 0 0 0 | w = [27;28)

2 0 0 1 2 2 0 2 0 0 0 0 0 2 0 2 0 0 0 4 5 6 5 28 0 8 0 0 0 | x = [28;29)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 2 3 6 2 3 3 10 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 4 0 0 0 0 3 6 0 5 5 22 0 0 0 | z = [30;31)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 1 8 0 4 0 9 0 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 4 4 0 0 0 3 0 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 1 0 0 0 | ac = [33;33.70]

Método 6: REPTree

Size of the tree : 411

Correctly Classified Instances 601 34.6797 %

Incorrectly Classified Instances 1132 65.3203 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 37 9 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 13 31 8 8 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 8 14 64 35 9 7 0 0 0 0 0 0 0 0 6 1 0 0 4 0 2 2 1 0 0 0 0 0 | d = [8;9)

0 0 7 24 76 62 7 1 0 0 0 0 0 0 0 2 0 0 0 0 2 3 2 1 0 0 0 0 0 | e = [9;10)

0 0 11 15 34 155 3 3 3 0 0 0 1 2 0 0 1 0 0 0 2 4 2 0 0 0 0 0 0 | f = [10;11)

0 0 3 10 5 38 36 8 3 0 0 0 0 3 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 10 4 22 8 7 9 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 2 1 0 5 11 0 0 0 0 1 0 0 0 0 0 4 0 1 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | k = [15;16)

0 0 2 2 4 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 2 4 2 0 1 0 0 0 3 4 0 0 3 0 0 0 0 0 1 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 2 2 0 2 0 0 0 3 14 5 4 8 0 0 0 1 0 2 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 9 2 5 5 2 0 0 2 0 0 0 2 0 0 0 | o = [19;20)

0 0 0 4 1 0 0 1 0 0 0 0 0 1 3 17 5 0 0 0 2 1 0 0 0 4 1 0 0 | p = [20;21)

0 0 0 5 0 0 0 0 0 0 0 0 0 0 3 1 7 21 0 0 0 0 4 0 0 0 4 0 0 0 | q = [21;22)

0 0 0 1 0 0 2 0 0 0 0 0 0 2 1 0 8 11 10 1 1 0 3 0 0 0 2 0 0 0 | r = [22;23)

0 0 2 4 0 0 3 3 4 0 0 0 0 0 0 4 1 1 1 1 1 8 0 6 0 3 0 0 0 | s = [23;24)

0 0 1 9 1 6 3 3 8 0 0 0 0 0 1 1 5 0 1 0 2 8 2 8 0 0 0 0 0 | t = [24;25)

0 0 0 7 2 12 0 2 4 0 0 0 0 2 1 5 10 3 1 4 18 22 2 4 0 0 2 0 0 | u = [25;26)

0 0 3 6 0 6 2 3 7 0 0 0 0 2 0 9 4 3 4 6 11 52 3 10 0 2 2 0 0 | v = [26;27)

0 0 2 9 2 2 3 1 2 0 0 0 0 5 0 2 4 0 0 1 12 19 9 5 0 0 0 0 0 | w = [27;28)

0 0 0 1 2 2 1 1 0 0 0 0 0 3 0 3 4 0 1 2 4 8 5 24 0 7 1 0 0 | x = [28;29)

0 0 0 1 0 0 0 0 0 0 0 0 0 2 3 0 2 0 0 1 2 9 1 3 0 7 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 0 1 0 2 13 0 10 1 13 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 4 8 1 5 0 5 0 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 5 5 0 0 0 0 1 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 2 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 7: J48

Number of Leaves : 685

Size of the tree : 761

Correctly Classified Instances 658 37.9688 %

Incorrectly Classified Instances 1075 62.0312 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 45 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 13 33 9 7 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 12 76 21 12 5 3 0 0 0 1 0 0 0 2 0 2 1 1 2 7 1 0 0 0 0 0 0 | d = [8;9)

0 0 12 19 84 55 7 0 0 0 0 0 0 0 0 2 0 0 0 0 4 2 1 1 0 0 0 0 0 | e = [9;10)

0 0 16 13 42 143 7 2 1 0 0 0 2 1 0 0 0 0 0 0 7 2 0 0 0 0 0 0 0 | f = [10;11)

0 0 5 6 3 37 39 9 2 0 0 0 0 3 0 0 0 2 1 0 1 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 7 8 18 12 2 6 0 0 0 0 0 0 1 0 0 1 1 4 2 1 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 1 0 0 6 7 0 0 0 1 0 0 0 0 0 0 6 1 1 1 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | k = [15;16)

0 0 1 2 1 3 1 1 0 0 0 2 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | l = [16;17)

0 0 1 0 0 3 1 0 1 0 0 0 5 3 0 0 1 3 0 0 0 0 2 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 3 3 0 0 0 0 0 3 19 3 3 3 3 0 0 1 0 2 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 3 0 0 0 0 0 0 0 10 5 2 3 2 0 0 2 0 0 0 4 0 0 0 0 | o = [19;20)

0 0 0 2 2 0 0 1 0 0 0 0 0 1 1 15 5 1 0 1 2 2 0 1 1 4 1 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 1 5 1 5 16 6 0 0 1 2 4 0 0 3 1 0 0 | q = [21;22)

0 0 0 2 0 0 2 0 0 0 0 0 4 2 1 5 4 15 0 2 0 4 0 0 0 1 0 0 0 | r = [22;23)

0 0 0 7 0 0 3 3 2 0 0 0 0 0 0 1 2 2 9 1 1 2 1 6 0 1 1 0 0 | s = [23;24)

0 0 1 11 0 3 3 1 7 0 0 0 0 1 1 1 5 1 2 1 7 5 1 7 0 1 0 0 0 | t = [24;25)

0 0 0 7 2 6 0 3 4 0 0 0 0 4 2 4 8 0 3 5 16 22 7 5 1 0 2 0 0 | u = [25;26)

0 0 1 8 1 5 1 3 5 0 0 0 0 2 0 3 2 4 1 9 17 48 7 6 1 4 6 1 0 | v = [26;27)

0 0 1 6 0 2 0 3 3 0 0 0 1 0 0 0 3 1 0 3 9 15 24 3 1 1 2 0 0 | w = [27;28)

0 0 0 1 2 1 1 1 0 0 0 0 0 2 0 6 1 0 2 3 4 6 8 24 1 5 1 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 1 0 1 1 1 6 2 2 5 9 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 1 0 0 1 1 7 1 6 0 21 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 3 6 0 3 0 7 4 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 1 6 0 0 0 1 2 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 2 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 482 27.813 %

Incorrectly Classified Instances 1251 72.187 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 46 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 17 20 13 6 8 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | c = [7;8)

0 7 19 56 8 4 6 4 0 0 1 2 0 0 0 4 0 8 0 17 2 9 6 0 0 0 0 0 0 | d = [8;9)

0 0 36 17 25 48 23 4 0 0 1 4 1 4 0 6 2 1 0 11 2 2 0 0 0 0 0 0 0 | e = [9;10)

0 0 19 9 20 112 21 9 1 0 0 0 2 13 0 0 3 0 0 13 12 2 0 0 0 0 0 0 0 | f = [10;11)

0 0 1 9 6 31 35 10 7 0 0 0 0 4 0 0 3 0 0 2 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 6 0 13 16 5 11 0 0 2 0 0 0 0 1 0 1 8 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 0 16 3 0 0 0 0 0 0 2 0 0 4 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 2 3 1 2 2 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 1 0 0 3 3 0 0 0 0 0 2 5 0 0 4 2 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 1 0 0 2 0 0 0 0 0 0 2 11 11 4 6 3 0 1 2 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 1 0 0 0 0 0 0 0 5 9 6 7 0 0 1 0 1 0 0 0 0 1 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1 14 4 0 0 5 1 1 0 0 0 9 1 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 5 1 6 4 0 0 5 9 0 0 0 6 1 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 3 0 0 0 0 0 12 0 2 4 12 0 0 0 5 0 0 0 4 0 0 0 | r = [22;23)

0 0 0 5 0 0 0 0 0 11 0 0 0 0 1 0 4 1 1 0 0 8 2 0 4 0 5 0 0 0 | s = [23;24)

0 0 0 8 0 2 0 0 12 0 0 0 0 3 1 1 2 1 0 6 9 1 5 6 0 2 0 0 0 | t = [24;25)

0 0 0 5 0 7 0 0 7 0 0 0 0 0 12 1 2 11 4 0 10 11 5 3 6 2 10 4 1 0 | u = [25;26)

0 0 0 7 0 7 0 0 12 0 0 0 0 5 0 8 0 2 2 6 6 29 3 11 6 19 11 1 0 | v = [26;27)

0 0 0 4 1 5 0 0 4 0 0 0 8 0 3 2 4 2 0 4 8 14 3 3 2 7 3 1 0 | w = [27;28)

0 0 0 0 1 3 0 0 1 0 0 0 2 0 0 1 2 0 1 3 2 4 6 24 1 17 0 1 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 4 1 0 2 1 1 1 2 0 16 2 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 1 0 7 0 32 4 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 1 13 6 2 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 7 5 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 0 | ac = [33;33.70]

Método 9: Random Tree

Size of the tree : 4451

Correctly Classified Instances 565 32.6024 %

Incorrectly Classified Instances 1168 67.3976 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

3 40 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 8 30 12 8 3 3 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 4 10 73 27 8 2 5 0 0 0 1 0 0 0 2 2 0 2 7 5 4 1 0 0 0 0 0 | d = [8;9)

0 0 15 22 84 48 7 5 0 0 0 0 0 0 0 1 0 0 0 0 3 1 1 0 0 0 0 0 | e = [9;10)

0 0 8 17 54 112 23 6 0 0 0 0 5 0 1 0 0 0 0 3 5 2 0 0 0 0 0 0 | f = [10;11)

0 1 3 6 9 27 37 10 2 0 0 2 1 0 2 0 0 2 1 2 1 0 2 0 0 0 0 0 | g = [11;12)

0 0 2 6 8 12 15 6 5 0 1 0 1 0 1 1 0 0 2 2 1 1 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 1 0 2 8 3 1 0 0 1 0 0 0 0 0 0 4 1 2 1 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 2 3 2 0 0 1 0 0 0 2 2 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 1 5 0 1 1 0 0 2 2 2 0 0 3 0 0 0 1 0 1 1 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 3 2 1 0 0 0 0 4 14 5 4 5 0 0 0 2 0 3 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 2 2 0 0 0 0 0 0 0 11 5 2 0 1 0 1 4 1 0 0 2 0 0 0 | o = [19;20)

0 0 0 3 5 0 0 1 0 0 0 0 0 3 2 12 2 2 1 0 2 2 0 1 1 1 1 1 0 | p = [20;21)

0 0 0 2 0 0 0 0 0 0 0 0 0 3 5 2 4 12 2 1 2 2 6 1 0 1 1 1 0 | q = [21;22)

0 0 0 0 0 0 2 0 0 0 0 0 0 2 3 1 6 8 13 0 4 0 2 1 0 0 0 0 0 | r = [22;23)

0 0 0 6 0 0 3 2 1 0 0 0 0 0 1 2 0 2 7 4 4 3 0 5 0 1 1 0 0 | s = [23;24)

0 0 0 10 0 5 2 1 4 0 0 0 0 1 2 1 4 1 5 5 3 4 4 5 0 2 0 0 0 | t = [24;25)

0 0 0 4 2 4 1 2 2 0 0 0 0 0 10 6 3 1 5 4 15 26 10 5 0 0 1 0 0 | u = [25;26)

0 0 0 6 3 1 1 2 4 0 0 0 0 0 2 6 3 2 2 9 27 41 8 7 3 2 4 2 0 | v = [26;27)

0 0 1 1 2 3 0 2 3 1 0 0 3 0 1 0 3 0 2 5 8 19 17 5 1 1 0 0 0 | w = [27;28)

0 0 0 4 1 2 1 1 0 0 0 0 2 1 0 5 2 0 3 4 9 5 6 17 2 4 0 0 0 | x = [28;29)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 4 0 1 0 0 2 0 9 4 3 1 6 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 0 1 1 2 4 1 6 5 14 5 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 0 0 1 0 4 5 0 3 0 6 1 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 2 5 0 0 1 0 2 2 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 3 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 608 35.0837 %

Incorrectly Classified Instances 1125 64.9163 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 43 3 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 6 27 10 13 6 2 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 8 70 23 9 4 9 0 0 0 2 0 0 0 2 1 1 1 7 4 5 1 0 1 0 0 0 0 | d = [8;9)

0 0 9 22 86 55 4 3 0 0 0 0 0 0 0 2 0 0 0 0 1 2 1 2 0 0 0 0 0 | e = [9;10)

0 1 9 12 45 126 19 7 0 0 0 0 3 2 1 0 0 0 0 4 4 1 1 1 0 0 0 0 0 | f = [10;11)

0 1 4 4 2 29 47 9 2 0 0 0 1 1 2 0 0 0 1 4 1 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 7 8 10 16 5 5 0 1 0 0 0 1 2 0 0 3 1 1 3 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 2 0 1 4 4 1 1 0 1 0 0 0 0 0 0 3 2 4 2 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 1 0 3 3 0 1 0 0 0 2 2 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 1 5 1 0 0 0 1 0 4 2 0 0 2 1 0 0 0 0 2 1 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 2 1 0 0 0 0 0 0 4 14 6 4 7 1 0 0 1 1 2 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 1 2 0 0 0 0 0 0 8 7 1 1 0 0 1 4 2 1 0 3 0 0 0 0 | o = [19;20)

0 0 0 2 2 0 0 2 0 0 0 0 0 1 0 15 2 4 1 0 4 2 0 1 2 1 1 0 0 | p = [20;21)

0 0 0 1 0 0 0 0 0 0 0 0 2 4 1 2 13 7 0 4 3 3 2 0 1 1 1 0 0 | q = [21;22)

0 0 0 0 0 0 1 0 0 0 0 0 1 1 0 6 8 15 1 4 0 3 2 0 0 0 0 0 0 | r = [22;23)

0 0 0 5 0 0 2 1 1 0 0 0 0 0 0 2 0 2 5 3 6 4 2 5 0 4 0 0 0 | s = [23;24)

0 0 0 11 0 3 1 1 3 0 0 0 0 1 1 1 4 2 2 3 7 5 5 6 1 2 0 0 0 | t = [24;25)

0 0 0 4 0 3 0 1 3 0 0 0 0 1 6 3 4 3 2 3 23 28 6 5 2 0 2 2 0 | u = [25;26)

0 0 0 5 2 1 0 2 2 0 0 0 0 0 1 5 2 5 2 8 24 44 10 8 4 1 5 4 0 | v = [26;27)

0 0 0 0 1 3 0 1 3 1 1 0 1 2 0 0 2 1 2 5 6 20 15 10 2 1 1 0 0 | w = [27;28)

0 0 0 2 1 2 0 1 0 0 0 0 0 3 0 4 0 0 1 5 3 7 9 20 3 8 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 2 0 0 1 1 8 3 2 3 8 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 1 0 2 0 4 1 6 6 15 6 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 2 7 0 4 0 8 0 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 0 0 0 1 2 2 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 1 0 0 0 | ac = [33;33.70]

Método 11: Rede Neural

Time taken to build model: 94.25 seconds

Correctly Classified Instances 556 32.0831 %

Incorrectly Classified Instances 1177 67.9169 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 38 8 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 6 27 9 11 5 3 2 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | c = [7;8)

0 3 9 73 18 12 0 6 0 0 0 2 0 2 0 3 1 0 4 5 5 7 2 1 0 0 0 0 0 0 | d = [8;9)

0 1 9 23 76 51 9 7 0 0 0 0 0 1 0 2 0 0 0 0 2 2 2 1 1 0 0 0 0 0 | e = [9;10)

0 3 10 10 52 104 26 8 0 0 0 2 2 0 1 1 1 1 1 3 3 5 3 0 0 0 0 0 0 0 | f = [10;11)

0 0 4 3 4 33 42 9 1 0 0 1 1 2 1 0 0 1 2 2 0 1 1 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 12 8 10 14 3 6 0 0 1 0 0 0 3 0 0 0 0 3 4 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 3 1 0 7 0 0 0 1 1 0 0 0 0 0 0 5 1 3 1 1 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 2 1 1 2 1 2 0 0 0 2 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 1 0 5 2 0 0 0 0 1 5 2 0 0 1 1 0 0 0 0 1 0 0 0 1 0 0 0 | m = [17;18)

0 0 0 1 1 3 1 0 0 0 0 0 4 10 9 4 6 1 0 0 1 0 2 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 1 0 1 0 0 0 0 0 8 8 1 3 0 0 0 4 3 0 0 2 0 0 0 0 0 | o = [19;20)

0 0 0 2 1 1 0 1 0 0 0 0 0 1 3 10 3 0 0 2 4 4 0 2 1 2 1 2 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 2 4 2 2 8 7 0 5 2 7 2 0 1 1 2 0 0 0 | q = [21;22)

0 0 0 0 0 0 1 0 1 0 0 0 2 0 0 1 11 15 1 2 0 6 0 1 0 1 0 0 0 0 | r = [22;23)

0 0 0 4 0 0 3 0 1 0 0 0 0 1 2 1 0 2 9 2 1 5 0 5 0 6 0 0 0 | s = [23;24)

0 0 0 8 1 3 1 1 4 0 0 0 0 0 1 0 3 4 4 4 5 8 4 7 0 1 0 0 0 | t = [24;25)

0 0 0 3 5 3 1 2 3 0 1 0 0 0 1 6 7 1 1 5 15 25 7 10 0 0 0 3 2 | u = [25;26)

0 0 1 6 2 2 0 2 5 0 0 0 0 0 1 3 2 1 2 6 16 56 11 6 1 3 4 3 2 | v = [26;27)

0 0 0 1 3 2 0 1 5 0 2 0 2 2 1 0 1 0 3 6 6 19 13 8 1 1 0 1 0 | w = [27;28)

0 0 0 2 1 3 1 1 1 0 0 0 0 2 0 1 1 1 0 6 3 8 10 18 2 7 1 0 0 | x = [28;29)

0 0 0 0 0 0 1 0 0 0 0 0 0 1 4 0 0 0 0 2 1 7 3 1 5 5 1 0 0 | y = [29;30)

0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 2 0 1 3 2 0 5 2 5 6 11 7 1 0 | z = [30;31)

0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 0 1 8 1 5 1 5 1 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 4 0 1 0 0 3 3 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 1 0 0 0 | ac = [33;33.70

CONJUNTO 2

Classificação:

Método 1: Zero-R

Correctly Classified Instances 236 13.618 %

Incorrectly Classified Instances 1497 86.382 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 0 0 153 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 0 0 187 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 236 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 64 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 26 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

<u>Método 2</u>: 1R classifier

Correctly Classified Instances 731 42.1812 %

Incorrectly Classified Instances 1002 57.8188 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 76 0 77 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 1 0 186 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 233 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 54 0 54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 0 62 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 24 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 27 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 39 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22 0 0 20 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 53 0 6 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 0 71 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 135 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 69 0 8 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 54 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 0 0 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 41 0 0 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 22 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

Método 3: PART decision list

Number of Rules : 83

Correctly Classified Instances 839 48.4132 %

Incorrectly Classified Instances 894 51.5868 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 33 9 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 13 31 22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 18 29 40 23 42 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 4 58 119 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 2 47 176 10 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 4 43 42 16 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 20 29 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 3 14 6 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 10 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 4 5 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 3 35 4 0 1 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 16 0 4 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 12 26 1 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 34 4 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 11 12 1 8 4 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 27 8 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 31 14 5 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 4 10 25 56 1 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 118 13 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 38 27 4 0 3 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 8 43 0 10 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 0 21 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 2 33 5 2 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 5 17 2 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

Método 4: RIPPER

Number of Rules : 43

Correctly Classified Instances 654 37.738 %

Incorrectly Classified Instances 1079 62.262 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 12 8 4 0 24 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 6 23 14 0 23 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 10 16 30 1 95 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 3 0 182 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 231 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 73 30 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 26 20 18 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 16 6 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 2 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 1 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 5 0 0 0 0 0 5 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 2 14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 1 35 6 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 4 0 0 0 0 0 0 1 10 16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 1 7 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 3 14 3 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 19 0 0 0 0 0 0 0 0 0 0 4 15 1 3 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 26 0 0 0 0 0 0 0 0 0 0 0 2 2 12 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 41 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 3 4 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 15 33 1 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 51 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 69 13 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 26 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 19 25 4 0 1 0 0 0 | w = [27;28)

0 0 0 0 0 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 7 43 0 8 0 0 0 | x = [28;29)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 0 17 1 0 0 | y = [29;30)

0 0 0 0 0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 0 28 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 21 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 | ac = [33;33.70]

Método 5: Decision Tables

Correctly Classified Instances 801 46.2204 %

Incorrectly Classified Instances 932 53.7796 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 34 7 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

1 17 27 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

6 22 23 33 29 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

1 0 0 3 67 116 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

2 0 0 1 62 167 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

2 0 0 0 5 46 43 8 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

1 0 0 0 0 5 27 22 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 7 9 7 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

1 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

2 0 0 0 0 0 0 0 0 0 0 7 1 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

3 0 0 0 0 3 0 0 0 0 0 0 0 1 12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

2 0 0 0 0 0 0 0 0 0 0 0 0 3 34 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 11 15 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 20 19 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 15 28 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

8 0 0 0 0 2 0 0 0 0 0 0 0 0 0 3 11 8 5 5 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 6 24 6 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 1 11 32 9 4 0 0 0 0 0 0 0 | t = [24;25)

3 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 4 11 15 61 3 2 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 114 14 0 0 0 0 0 0 | v = [26;27)

1 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 41 21 3 0 5 0 0 0 | w = [27;28)

3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 10 42 0 6 0 0 0 | x = [28;29)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 0 20 1 0 0 | y = [29;30)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 37 5 0 0 | z = [30;31)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 20 1 0 | aa = [31;32)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 0 1 | ab = [32;33)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 | ac = [33;33.70]

Método 6: REPTree

Size of the tree : 321

Correctly Classified Instances 792 45.7011 %

Incorrectly Classified Instances 941 54.2989 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 26 7 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 11 20 35 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 19 18 41 25 50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 3 49 134 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 3 43 187 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 4 49 31 22 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 25 30 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 5 17 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 0 11 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 2 12 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 1 35 6 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 16 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 28 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 33 1 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 13 10 2 7 4 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 27 7 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 15 28 10 5 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 2 11 15 67 1 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 122 7 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 48 18 3 0 5 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 7 42 1 10 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 0 20 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 1 0 35 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 21 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

Método 7: J48

Number of Leaves : 388

Size of the tree : 431

Correctly Classified Instances 835 48.1823 %

Incorrectly Classified Instances 898 51.8177 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 34 6 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 14 26 26 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 19 23 45 27 38 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 8 57 120 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 5 51 175 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 6 41 41 17 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 26 22 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 7 10 7 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 1 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 5 5 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 2 34 6 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 10 16 0 4 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 13 26 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 35 3 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 14 12 1 8 4 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 29 8 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 33 12 6 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 1 10 26 55 3 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 122 10 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 44 22 5 0 3 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 9 42 0 10 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 0 19 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 2 0 35 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 20 2 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

<u>Método 8</u>: Hoeffding Tree

Correctly Classified Instances 816 47.086 %

Incorrectly Classified Instances 917 52.914 %

=== Confusion Matrix ===

```
  a  b  c  d  e  f  g  h  i  j  k  l  m  n  o  p  q  r  s  t  u  v  w  x  y  z aa ab
ac   <-- classified as

  0  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0 |   a = [5.83;6)

  0 36  5  7  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0 |   b = [6;7)

  0 15 30 21  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0   0 |   c = [7;8)

  0 19 28 41 39 20  6  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0   0 |   d = [8;9)

  0  0  1  3 87 78 18  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0   0 |   e = [9;10)

  0  0  0  0 82 111 41  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0   0 |   f = [10;11)

  0  0  0  0 12 18 54 19  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0
0   0 |   g = [11;12)

  0  0  0  0  0  1 17 33 13  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0   0 |   h = [12;13)

  0  0  0  0  0  0  3  9 12  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0 |   i = [13;14)

  0  0  0  0  0  0  0  0  1  0  0  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0 |   j = [14;15)

  0  0  0  0  0  0  0  0  1  0  0  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0 |   k = [15;16)

  0  0  0  0  0  0  0  0  1  0  0  7  1  2  2  0  0  0  0  0  0  0  0  0  0  0  0  0
0 |   l = [16;17)

  0  0  0  0  0  0  0  0  2  0  0  4  1 13  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0 |   m = [17;18)

  0  0  0  0  0  0  0  0  0  0  0  0  2 34  6  0  1  0  0  0  0  0  0  0  0  0  0  0
0 |   n = [18;19)

  0  0  0  0  0  0  0  0  0  0  0  0  0 12 15  3  1  0  0  0  0  0  0  0  0  0  0  0
0   0 |   o = [19;20)

  0  0  0  0  0  0  0  0  0  0  0  0  0  0  4 13 20  3  0  0  0  0  0  0  0  0  0  0
0   0 |   p = [20;21)

  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0 18 23  3  0  0  0  0  0  0  0  0  0  0
0   0 |   q = [21;22)
```

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 6 19 2 6 3 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 9 20 10 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 14 28 14 3 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 13 32 51 2 0 0 0 1 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 108 14 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 5 37 25 6 1 1 2 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 6 7 43 2 7 1 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 2 18 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 36 6 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 17 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 0 | ac = [33;33.70]

<u>Método 9</u>: Random Tree

Size of the tree : 1831

Correctly Classified Instances 812 46.8552 %

Incorrectly Classified Instances 921 53.1448 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 31 12 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 18 23 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 21 25 45 30 29 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 11 62 111 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 10 61 160 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 6 10 37 39 14 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 5 29 17 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 5 6 12 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 6 3 10 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 1 35 5 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 10 16 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 15 21 2 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 10 31 3 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 11 18 3 4 4 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 6 25 6 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 9 29 13 6 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 2 13 28 46 8 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 111 13 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 37 27 4 2 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 11 41 3 5 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 0 18 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 36 6 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 17 2 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 8 1 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 2 0 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 837 48.2977 %

Incorrectly Classified Instances 896 51.7023 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 30 10 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 14 27 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 19 25 44 27 33 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 7 59 115 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 5 52 170 8 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 3 7 39 42 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 26 22 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 5 5 13 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 0 8 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 5 4 10 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 36 5 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 16 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 14 24 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 32 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 19 2 5 4 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 7 27 4 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 34 14 5 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 14 26 47 10 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 112 14 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 38 23 6 1 2 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 8 44 3 6 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 0 20 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 1 35 7 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 19 2 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 1 | ac = [33;33.70]

Método 11: Rede Neural

Time taken to build model: 37.36 seconds

Correctly Classified Instances 776 44.7778 %

Incorrectly Classified Instances 957 55.2222 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 32 10 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 15 26 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 21 28 40 33 27 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 7 77 95 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 4 90 128 13 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 3 14 32 44 14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 1 0 2 23 27 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 3 13 8 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 1 0 0 8 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 4 5 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 1 35 5 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 16 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 14 24 1 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 11 30 3 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 19 3 4 4 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 8 21 8 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 16 22 15 4 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 4 12 29 42 11 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22 95 18 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 14 30 23 6 1 2 0 0 1 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 7 9 43 4 4 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 9 3 16 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 9 28 7 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 16 3 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 1 1 0 | ac = [33;33.70]

CONJUNTO 3

Classificação:

Método 1: Zero-R

Correctly Classified Instances 236 13.618 %

Incorrectly Classified Instances 1497 86.382 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 0 0 153 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 0 0 187 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 236 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 64 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 26 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 2: 1R classifier

Correctly Classified Instances 731 42.1812 %

Incorrectly Classified Instances 1002 57.8188 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 76 0 77 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 1 0 186 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 233 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 54 0 54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 0 62 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 24 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 27 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 39 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22 0 0 20 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 53 0 6 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 0 71 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 135 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 69 0 8 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 54 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 0 0 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 41 0 0 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 22 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

<u>Método 3</u>: PART decision list

Number of Rules : 211

Correctly Classified Instances 975 56.2608 %

Incorrectly Classified Instances 758 43.7392 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 40 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 11 47 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 4 15 98 31 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 19 108 55 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 2 52 154 23 3 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 4 28 55 18 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 1 19 35 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 5 13 6 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 1 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 1 0 0 0 0 8 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 7 7 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 1 5 32 4 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 8 17 2 2 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 23 13 1 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 28 5 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 13 12 7 5 1 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 17 20 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 31 9 4 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 16 43 34 3 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22 96 15 2 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 36 26 4 1 3 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 6 8 34 9 9 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 12 7 10 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 6 27 7 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 16 5 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 7 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 1 | ac = [33;33.70]

Método 4: RIPPER

Number of Rules : 85

Correctly Classified Instances 938 54.1258 %

Incorrectly Classified Instances 795 45.8742 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 41 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 14 46 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 16 80 15 35 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 23 69 93 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 1 34 184 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 2 39 48 16 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 5 10 38 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 3 3 4 14 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 2 0 0 0 0 0 7 2 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 1 0 0 0 0 0 5 8 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 1 0 0 0 0 0 0 5 25 11 0 0 1 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 1 0 0 0 0 0 0 0 8 18 2 2 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 1 19 17 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 13 24 4 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 6 6 16 9 1 1 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 1 0 0 2 20 15 1 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 10 1 0 0 0 0 0 0 0 0 0 0 0 0 13 27 4 4 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 8 1 0 0 0 0 0 0 0 0 0 0 0 0 6 15 32 38 1 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17 101 15 1 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 30 30 8 1 0 0 0 0 | w = [27;28)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 7 7 40 2 9 0 0 0 | x = [28;29)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 5 18 1 0 0 | y = [29;30)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 7 26 4 1 0 | z = [30;31)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 17 2 0 | aa = [31;32)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 2 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 1 | ac = [33;33.70]

Método 5: Decision Tables

Number of Rules : 186

Correctly Classified Instances 955 55.1068 %

Incorrectly Classified Instances 778 44.8932 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

2 35 8 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

3 10 43 9 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

9 5 12 86 28 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

7 0 0 16 104 58 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

4 0 0 4 43 169 15 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

12 0 0 1 2 37 42 11 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

4 0 0 0 0 6 13 30 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 4 6 14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

3 0 0 0 0 0 0 0 0 0 0 7 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

2 0 0 0 0 2 0 0 0 0 0 4 8 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 4 0 0 0 0 0 0 5 31 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

3 0 0 0 0 2 0 0 0 0 0 0 0 11 10 4 1 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

5 0 0 0 0 1 0 0 0 0 0 0 0 0 2 23 9 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 30 1 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

7 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 14 14 4 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

1 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 4 21 13 0 0 0 0 0 0 0 0 0 | s = [23;24)

2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 18 30 6 1 0 0 0 0 0 0 0 | t = [24;25)

9 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 3 14 35 36 3 0 0 0 0 0 0 | u = [25;26)

5 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 1 13 106 7 0 0 0 0 0 0 | v = [26;27)

7 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 39 18 3 0 1 0 0 0 | w = [27;28)

4 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 8 6 36 2 7 0 0 0 | x = [28;29)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 5 11 1 0 0 | y = [29;30)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 36 3 1 0 | z = [30;31)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 18 3 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 3 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 0 1 | ac = [33;33.70]

Método 6: REPTree

Size of the tree : 501

Correctly Classified Instances 983 56.7224 %

Incorrectly Classified Instances 750 43.2776 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 40 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 12 46 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 6 15 94 25 12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 31 93 60 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 8 48 170 7 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 7 3 38 47 10 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 1 20 28 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 2 22 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 0 10 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 4 9 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 1 4 30 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 13 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 21 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 33 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 15 11 9 2 1 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 14 21 1 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 42 8 3 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 15 33 44 3 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 19 107 9 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 43 20 2 1 3 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 8 5 43 2 7 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 5 15 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 2 3 32 5 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 3 20 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

Método 7: J48

Number of Leaves : 1000

Size of the tree : 1111

Correctly Classified Instances 1030 59.4345 %

Incorrectly Classified Instances 703 40.5655 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 42 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 12 51 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 11 103 25 4 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 25 112 47 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 7 40 169 17 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 3 3 32 53 14 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 0 13 38 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 10 14 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 8 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 7 7 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 1 9 29 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 9 17 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 23 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 33 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 12 14 7 4 2 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 18 19 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 33 10 3 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 15 47 31 3 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 101 19 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 43 20 4 1 3 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 8 7 43 3 5 1 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 7 13 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 4 28 5 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 4 18 3 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 2 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 | ac = [33;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 932 53.7796 %

Incorrectly Classified Instances 801 46.2204 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 46 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 15 38 12 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 14 101 27 1 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 4 35 85 61 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 12 63 141 18 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 4 25 60 11 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 23 23 16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 4 19 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 1 0 0 8 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 2 0 0 3 6 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 3 21 17 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 6 19 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 24 15 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 14 23 7 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 3 12 21 5 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 17 12 9 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 12 34 8 1 0 1 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 11 39 33 6 5 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 23 86 15 8 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 2 14 27 25 6 2 1 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 4 13 36 5 5 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 7 18 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 36 6 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 16 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 8 1 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 0 | ac = [33;33.70]

Método 9: Random Tree

Size of the tree : 5771

Correctly Classified Instances 998 57.588 %

Incorrectly Classified Instances 735 42.412 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

3 36 6 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 10 47 7 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 3 9 106 25 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 26 118 36 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 1 4 51 150 26 2 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 4 5 24 62 11 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 1 4 4 8 43 3 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 2 5 16 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 1 0 7 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 5 10 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 1 3 29 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 3 9 14 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 20 11 1 0 0 0 1 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 7 29 6 0 0 0 0 1 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 4 10 19 4 3 1 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 4 17 16 3 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 13 29 12 1 1 1 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 17 44 30 6 1 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 28 85 14 5 0 0 1 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 5 31 32 6 0 2 0 0 0 0 | w = [27;28)

0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 8 9 35 5 2 1 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 13 9 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 10 23 6 3 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 8 10 5 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 6 4 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 0 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 1089 62.839 %

Incorrectly Classified Instances 644 37.161 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

2 40 4 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 5 54 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 6 114 22 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 21 121 43 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 1 37 176 19 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 1 25 67 12 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 12 41 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 9 14 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 6 9 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 5 30 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 19 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 23 11 2 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 8 27 9 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 10 21 7 2 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 20 16 1 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 14 30 11 1 2 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 16 46 32 3 2 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 14 100 17 3 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 32 34 8 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 6 8 42 7 3 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 8 14 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 25 8 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 15 5 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 4 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 | ac = [33;33.70]

Método 11: Rede Neural

Time taken to build model: 147.67 seconds

Correctly Classified Instances 1012 58.3958 %

Incorrectly Classified Instances 721 41.6042 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 33 8 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

1 5 51 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 12 103 21 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 | d = [8;9)

0 0 1 18 112 54 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 4 46 165 19 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 2 3 28 61 8 3 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 | g = [11;12)

0 0 0 1 0 2 14 38 8 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 1 12 9 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 0 10 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 1 0 0 0 6 7 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 6 25 10 1 0 0 0 0 0 0 0 1 0 0 0 0 0 | n = [18;19)

0 0 0 0 1 0 0 0 0 0 0 0 0 10 15 3 0 1 0 0 1 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 26 10 1 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 12 20 9 0 0 1 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 10 20 4 3 2 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 19 18 1 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 14 29 10 1 1 0 0 0 0 0 | t = [24;25)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 9 45 30 6 3 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 13 95 21 4 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 33 33 4 1 1 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 1 1 6 8 39 9 3 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 9 11 2 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 7 28 6 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 0 4 16 2 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 6 4 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 | ac = [33;33.70]

ELET6 – ATRASO B - ANÁLISE 1

3 Intervalos de Saída: [5.83;15.12),[15.12;24.41),[24.41;33.70]

Conjunto 1: PLD(t), PLD(t-1), PLD(t-2), PLD(t-3), PLD(t-4), PLD(t-5),EAR(t), EAR(t-1), EAR(t-2), EAR(t-3), EAR(t-4), EAR(t-5), CE(t), CE(t-1),CE(t-2), CE(t-3), CE(t-4),CE(t-5)

Conjunto 2: IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), ELET6(t-1), ELET(t-2), ELET6(t-3), ELET(t-4), ELET(t-5)

Conjunto 3: PLD(t), PLD(t-1), PLD(t-2), PLD(t-3), PLD(t-4), PLD(t-5),EAR(t), EAR(t-1), EAR(t-2), EAR(t-3), EAR(t-4), EAR(t-5), CE(t), CE(t-1),CE(t-2), CE(t-3), CE(t-4),CE(t-5), IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), ELET6(t-1), ELET(t-2), ELET6(t-3), ELET(t-4), ELET(t-5)

CONJUNTO 1

Classificação:

Método 1: Zero-R

Correctly Classified Instances 892 51.7101 %

Incorrectly Classified Instances 833 48.2899 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
892   0   0 |   a = [5.83;15.12)
299   0   0 |   b = [15.12;24.41)
534   0   0 |   c = [24.41;33.70]
```

Método 2: 1R classifier

Correctly Classified Instances 1176 68.1739 %

Incorrectly Classified Instances 549 31.8261 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
847   8  37 |   a = [5.83;15.12)
121  81  97 |   b = [15.12;24.41)
226  60 248 |   c = [24.41;33.70]
```

Método 3: PART decision list

Number of Rules : 102

Correctly Classified Instances 1391 80.6377 %

Incorrectly Classified Instances 334 19.3623 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 788  32  72 |   a = [5.83;15.12)
  43 180  76 |   b = [15.12;24.41)
  42  69 423 |   c = [24.41;33.70]
```

Método 4: RIPPER

Number of Rules : 24

Correctly Classified Instances 1329 77.0435 %

Incorrectly Classified Instances 396 22.9565 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 811   9  72 |   a = [5.83;15.12)
  99 134  66 |   b = [15.12;24.41)
 103  47 384 |   c = [24.41;33.70]
```

Método 5: Decision Tables

Number of Rules : 217

Correctly Classified Instances 1374 79.6522 %

Incorrectly Classified Instances 351 20.3478 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 812  29  51 |   a = [5.83;15.12)
  72 156  71 |   b = [15.12;24.41)
  79  49 406 |   c = [24.41;33.70]
```

Método 6: REPTree

Size of the tree : 281

Correctly Classified Instances 1374 79.6522 %

Incorrectly Classified Instances 351 20.3478 %

=== Confusion Matrix ===

a b c <-- classified as

805 21 66 | a = [5.83;15.12)

66 152 81 | b = [15.12;24.41)

69 48 417 | c = [24.41;33.70]

Método 7: J48

Number of Leaves : 289

Size of the tree : 321

Correctly Classified Instances 1429 82.8406 %

Incorrectly Classified Instances 296 17.1594 %

=== Confusion Matrix ===

a b c <-- classified as

798 19 75 | a = [5.83;15.12)

40 192 67 | b = [15.12;24.41)

48 47 439 | c = [24.41;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 1270 73.6232 %

Incorrectly Classified Instances 455 26.3768 %

=== Confusion Matrix ===

a b c <-- classified as

724 110 58 | a = [5.83;15.12)

35 180 84 | b = [15.12;24.41)

69 99 366 | c = [24.41;33.70]

Método 9: Random Tree

Correctly Classified Instances 1316 76.2899 %

Incorrectly Classified Instances 409 23.7101 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
779  52  61 |   a = [5.83;15.12)
 58 162  79 |   b = [15.12;24.41)
 71  88 375 |   c = [24.41;33.70]
```

Método 10: Random Forest

Correctly Classified Instances 1395 80.8696 %

Incorrectly Classified Instances 330 19.1304 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
810  29  53 |   a = [5.83;15.12)
 46 172  81 |   b = [15.12;24.41)
 48  73 413 |   c = [24.41;33.70]
```

Método 11: Rede Neural

Correctly Classified Instances 1403 81.3333 %

Incorrectly Classified Instances 322 18.6667 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
798  38  56 |   a = [5.83;15.12)
 37 179  83 |   b = [15.12;24.41)
 42  66 426 |   c = [24.41;33.70]
```

CONJUNTO 2

Classificação:

Método 1: Zero-R

Correctly Classified Instances 892 51.7101 %

Incorrectly Classified Instances 833 48.2899 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 892   0   0 |   a = [5.83;15.12)
 299   0   0 |   b = [15.12;24.41)
 534   0   0 |   c = [24.41;33.70]
```

Método 2: 1R classifier

Correctly Classified Instances 1657 96.058 %

Incorrectly Classified Instances 68 3.942 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   1 298   0 |   b = [15.12;24.41)
   0  64 470 |   c = [24.41;33.70]
```

Método 3: PART decision list

Correctly Classified Instances 1669 96.7536 %

Incorrectly Classified Instances 56 3.2464 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   1 273  25 |   b = [15.12;24.41)
   0  27 507 |   c = [24.41;33.70]
```

Método 4: RIPPER

Number of Rules : 9

Correctly Classified Instances 1648 95.5362 %

Incorrectly Classified Instances 77 4.4638 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
887   5   0 |   a = [5.83;15.12)
  4 285  10 |   b = [15.12;24.41)
  0  58 476 |   c = [24.41;33.70]
```

Método 5: Decision Tables

Number of Rules : 29

Correctly Classified Instances	1660	96.2319 %
Incorrectly Classified Instances	65	3.7681 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
889   3   0 |   a = [5.83;15.12)
  3 291   5 |   b = [15.12;24.41)
  1  53 480 |   c = [24.41;33.70]
```

Método 6: REPTree

Size of the tree : 71

Correctly Classified Instances	1660	96.2319 %
Incorrectly Classified Instances	65	3.7681 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
889   3   0 |   a = [5.83;15.12)
  1 284  14 |   b = [15.12;24.41)
  0  47 487 |   c = [24.41;33.70]
```

Método 7: J48

Number of Leaves : 55

Size of the tree : 61

Correctly Classified Instances	1661	96.2899 %

Incorrectly Classified Instances 64 3.7101 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   1 274  24 |   b = [15.12;24.41)
   0  36 498 |   c = [24.41;33.70]
```

Método 8: Hoeffding Tree

Correctly Classified Instances 1660 96.2319 %

Incorrectly Classified Instances 65 3.7681 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 887   5   0 |   a = [5.83;15.12)
   4 276  19 |   b = [15.12;24.41)
   0  37 497 |   c = [24.41;33.70]
```

Método 9: Random Tree

Size of the tree : 611

Correctly Classified Instances 1664 96.4638 %

Incorrectly Classified Instances 61 3.5362 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   3 272  24 |   b = [15.12;24.41)
   0  31 503 |   c = [24.41;33.70]
```

Método 10: Random Forest

Correctly Classified Instances 1672 96.9275 %

Incorrectly Classified Instances 53 3.0725 %

=== Confusion Matrix ===

a b c <-- classified as

889 3 0 | a = [5.83;15.12)

1 276 22 | b = [15.12;24.41)

0 27 507 | c = [24.41;33.70]

Método 11: Rede Neural

Correctly Classified Instances 1667 96.6377 %

Incorrectly Classified Instances 58 3.3623 %

=== Confusion Matrix ===

a b c <-- classified as

889 3 0 | a = [5.83;15.12)

2 270 27 | b = [15.12;24.41)

0 26 508 | c = [24.41;33.70]

CONJUNTO 3

Classificação:

Método 1: Zero-R

Correctly Classified Instances 892 51.7101 %

Incorrectly Classified Instances 833 48.2899 %

=== Confusion Matrix ===

a b c <-- classified as

892 0 0 | a = [5.83;15.12)

299 0 0 | b = [15.12;24.41)

534 0 0 | c = [24.41;33.70]

Método 2: 1R classifier

Correctly Classified Instances 1657 96.058 %

Incorrectly Classified Instances 68 3.942 %

=== Confusion Matrix ===

a	b	c	<-- classified as
889	3	0	a = [5.83;15.12)
1	298	0	b = [15.12;24.41)
0	64	470	c = [24.41;33.70]

Método 3: PART decision list

Number of Rules : 25

Correctly Classified Instances	1681	97.4493 %
Incorrectly Classified Instances	44	2.5507 %

=== Confusion Matrix ===

a	b	c	<-- classified as
889	3	0	a = [5.83;15.12)
3	273	23	b = [15.12;24.41)
0	15	519	c = [24.41;33.70]

Método 4: RIPPER

Number of Rules : 13

Correctly Classified Instances	1671	96.8696 %
Incorrectly Classified Instances	54	3.1304 %

=== Confusion Matrix ===

a	b	c	<-- classified as
888	4	0	a = [5.83;15.12)
2	285	12	b = [15.12;24.41)
0	36	498	c = [24.41;33.70]

Método 5: Decision Tables

Number of Rules : 159

Correctly Classified Instances	1659	96.1739 %
Incorrectly Classified Instances	66	3.8261 %

=== Confusion Matrix ===

a	b	c	<-- classified as
890	2	0	a = [5.83;15.12)
10	273	16	b = [15.12;24.41)
7	31	496	c = [24.41;33.70]

Método 6: REPTree

Size of the tree : 31

Correctly Classified Instances	1676	97.1594 %
Incorrectly Classified Instances	49	2.8406 %

=== Confusion Matrix ===

a	b	c	<-- classified as
889	3	0	a = [5.83;15.12)
2	284	13	b = [15.12;24.41)
0	31	503	c = [24.41;33.70]

Método 7: J48

Number of Leaves : 100

Size of the tree : 111

Correctly Classified Instances	1689	97.913 %
Incorrectly Classified Instances	36	2.087 %

=== Confusion Matrix ===

a	b	c	<-- classified as
889	3	0	a = [5.83;15.12)
2	282	15	b = [15.12;24.41)
0	16	518	c = [24.41;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances	1650	95.6522 %
Incorrectly Classified Instances	75	4.3478 %

=== Confusion Matrix ===

a	b	c	<-- classified as
892	0	0	a = [5.83;15.12)
8	259	32	b = [15.12;24.41)
0	35	499	c = [24.41;33.70]

Método 9: Random Tree

Size of the tree : 531

Correctly Classified Instances	1683	97.5652 %
Incorrectly Classified Instances	42	2.4348 %

=== Confusion Matrix ===

a	b	c	<-- classified as
887	5	0	a = [5.83;15.12)
4	281	14	b = [15.12;24.41)
0	19	515	c = [24.41;33.70]

Método 10: Random Forest

Correctly Classified Instances	1699	98.4928 %
Incorrectly Classified Instances	26	1.5072 %

=== Confusion Matrix ===

a	b	c	<-- classified as
891	1	0	a = [5.83;15.12)
2	283	14	b = [15.12;24.41)
0	9	525	c = [24.41;33.70]

Método 11: Rede Neural

Correctly Classified Instances	1702	98.6667 %
Incorrectly Classified Instances	23	1.3333 %

=== Confusion Matrix ===

a	b	c	<-- classified as

891 1 0 | a = [5.83;15.12)

2 286 11 | b = [15.12;24.41)

0 9 525 | c = [24.41;33.70]

ELET6 – ATRASO B - ANÁLISE 2

10 Intervalos de Saída:
[**5.83;8.62),[8.62;11.40),[11.40;14.19),[14.19;16.98),[16.98;19.76),[19.76;22.55),[22.55;25.34),[25.34;28.13),[28.13;30.91),[30.91;33.70]**

Conjunto 1: PLD(t), PLD(t-1), PLD(t-2), PLD(t-3), PLD(t-4), PLD(t-5),EAR(t), EAR(t-1), EAR(t-2), EAR(t-3), EAR(t-4), EAR(t-5), CE(t), CE(t-1),CE(t-2), CE(t-3), CE(t-4),CE(t-5)

Conjunto 2: IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), ELET6(t-1), ELET(t-2), ELET6(t-3), ELET(t-4), ELET(t-5)

Conjunto 3: PLD(t), PLD(t-1), PLD(t-2), PLD(t-3), PLD(t-4), PLD(t-5),EAR(t), EAR(t-1), EAR(t-2), EAR(t-3), EAR(t-4), EAR(t-5), CE(t), CE(t-1),CE(t-2), CE(t-3), CE(t-4),CE(t-5), IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), ELET6(t-1), ELET(t-2), ELET6(t-3), ELET(t-4), ELET(t-5)

CONJUNTO 1

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.8841 %

Incorrectly Classified Instances 1175 68.1159 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

0 195 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

0 550 0 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 145 0 0 0 0 0 0 0 0 | c = [11.40;14.19)

0 17 0 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 91 0 0 0 0 0 0 0 0 | e = [16.98;19.76)

0 111 0 0 0 0 0 0 0 0 | f = [19.76;22.55)

0 146 0 0 0 0 0 0 0 0 | g = [22.55;25.34)

0 298 0 0 0 0 0 0 0 0 | h = [25.34;28.13)

0 136 0 0 0 0 0 0 0 0 | i = [28.13;30.91)

0 36 0 0 0 0 0 0 0 0 | j = [30.91;33.70]

Método 2: 1R classifier

Correctly Classified Instances 782 45.3333 %

Incorrectly Classified Instances 943 54.6667 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

84 97 0 0 0 0 0 14 0 0 | a = [5.83;8.62)

13 508 0 0 0 0 0 29 0 0 | b = [8.62;11.40)

0 145 0 0 0 0 0 0 0 0 | c = [11.40;14.19)

0 17 0 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 43 0 0 41 0 0 7 0 0 | e = [16.98;19.76)

0 22 0 0 26 0 0 63 0 0 | f = [19.76;22.55)

0 83 0 0 16 0 0 32 15 0 | g = [22.55;25.34)

0 149 0 0 28 0 0 98 23 0 | h = [25.34;28.13)

0 20 0 0 11 0 0 54 51 0 | i = [28.13;30.91)

0 0 0 0 3 0 0 29 4 0 | j = [30.91;33.70]

Método 3: PART decision list

Number of Rules : 192

Correctly Classified Instances 1007 58.3768 %

Incorrectly Classified Instances 718 41.6232 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

121 49 7 0 1 2 7 8 0 0 | a = [5.83;8.62)

41 441 22 1 6 5 14 20 0 0 | b = [8.62;11.40)

5 52 53 4 5 0 17 9 0 0 | c = [11.40;14.19)

2 5 5 2 1 0 0 2 0 0 | d = [14.19;16.98)

0 9 2 1 52 13 5 6 3 0 | e = [16.98;19.76)

0 2 2 0 10 49 16 11 19 2 | f = [19.76;22.55)

10 11 8 2 6 20 47 25 16 1 | g = [22.55;25.34)

10 19 7 0 13 15 27 172 31 4 | h = [25.34;28.13)

3 2 1 0 6 13 3 45 61 2 | i = [28.13;30.91)

0 0 0 0 0 1 1 13 12 9 | j = [30.91;33.70]

Método 4: RIPPER

Number of Rules : 41

Correctly Classified Instances 886 51.3623 %

Incorrectly Classified Instances 839 48.6377 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

107 87 0 0 0 0 0 1 0 0 | a = [5.83;8.62)

29 482 16 3 4 2 2 12 0 0 | b = [8.62;11.40)

3 86 45 2 3 0 2 4 0 0 | c = [11.40;14.19)

0 14 3 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 39 0 0 38 7 0 7 0 0 | e = [16.98;19.76)

0 71 1 0 7 18 0 9 5 0 | f = [19.76;22.55)

4 87 1 0 3 8 19 8 16 0 | g = [22.55;25.34)

3 139 6 0 6 4 5 104 26 5 | h = [25.34;28.13)

0 34 0 0 3 1 0 29 67 2 | i = [28.13;30.91)

0 10 0 0 0 0 0 10 10 6 | j = [30.91;33.70]

Método 5: Decision Tables

Number of Rules : 386

Correctly Classified Instances 957 55.4783 %

Incorrectly Classified Instances 768 44.5217 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

125 55 1 2 0 1 6 5 0 0 | a = [5.83;8.62)

91 404 14 1 5 6 12 17 0 0 | b = [8.62;11.40)

16 55 53 2 2 0 13 3 1 0 | c = [11.40;14.19)

3 6 2 1 5 0 0 0 0 0 | d = [14.19;16.98)

1 17 2 2 49 15 1 2 2 0 | e = [16.98;19.76)

2 16 1 0 15 43 11 7 13 3 | f = [19.76;22.55)

12 23 6 0 5 27 41 18 14 0 | g = [22.55;25.34)

16 36 9 0 7 9 25 168 25 3 | h = [25.34;28.13)

6 7 1 0 4 10 5 32 70 1 | i = [28.13;30.91)

1 2 0 0 0 3 0 12 15 3 | j = [30.91;33.70]

Método 6: REPTree

Size of the tree : 391

Correctly Classified Instances 972 56.3478 %

Incorrectly Classified Instances 753 43.6522 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

114 59 0 1 0 0 7 14 0 0 | a = [5.83;8.62)

40 447 13 0 10 6 8 26 0 0 | b = [8.62;11.40)

2 74 43 1 7 0 12 6 0 0 | c = [11.40;14.19)

2 7 4 1 3 0 0 0 0 0 | d = [14.19;16.98)

0 16 7 0 45 17 4 2 0 0 | e = [16.98;19.76)

0 6 0 0 18 39 12 18 17 1 | f = [19.76;22.55)

10 12 9 0 4 20 35 33 23 0 | g = [22.55;25.34)

9 26 12 1 8 8 21 177 34 2 | h = [25.34;28.13)

1 4 1 0 6 13 1 40 70 0 | i = [28.13;30.91)

0 0 0 0 0 0 0 19 16 1 | j = [30.91;33.70]

Método 7: J48

Number of Leaves : 739

Size of the tree : 821

Correctly Classified Instances 1072 62.1449 %

Incorrectly Classified Instances 653 37.8551 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 127  43   5   1   0   2   8   9   0   0 |   a = [5.83;8.62)
  37 447  19   0  10   6  12  19   0   0 |   b = [8.62;11.40)
   3  51  60   4   6   0  15   6   0   0 |   c = [11.40;14.19)
   1   8   4   1   1   0   0   2   0   0 |   d = [14.19;16.98)
   0  15   2   0  51  12   3   6   2   0 |   e = [16.98;19.76)
   1   2   1   0  12  61  12   7  12   3 |   f = [19.76;22.55)
  11   8   4   0   5  23  56  20  19   0 |   g = [22.55;25.34)
   7  16   7   0   7  12  26 190  31   2 |   h = [25.34;28.13)
   0   2   3   0   3  12   4  42  70   0 |   i = [28.13;30.91)
   0   0   0   0   0   1   0  17   9   9 |   j = [30.91;33.70]
```

Método 8: Hoeffding Tree

Correctly Classified Instances 728 42.2029 %

Incorrectly Classified Instances 997 57.7971 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 107  26   3  17   0   7  21  14   0   0 |   a = [5.83;8.62)
  46 282  71  44  19  32  44  12   0   0 |   b = [8.62;11.40)
   2  62  20  16   3   1  41   0   0   0 |   c = [11.40;14.19)
   4   5   0   6   0   2   0   0   0   0 |   d = [14.19;16.98)
   0   9   1   0  50  26   5   0   0   0 |   e = [16.98;19.76)
   0   0   0   0  29  56   7   0   5  14 |   f = [19.76;22.55)
   1  19   0   0  23  33  35  15  16   4 |   g = [22.55;25.34)
   3  38   0   0  24  44  26  80  33  50 |   h = [25.34;28.13)
   0   3   0   0   3  16   2  14  70  28 |   i = [28.13;30.91)
```

0 0 0 0 0 0 0 2 12 22 | j = [30.91;33.70]

Método 9: Random Tree

Size of the tree : 5611

Correctly Classified Instances 912 52.8696 %

Incorrectly Classified Instances 813 47.1304 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

125 50 4 3 0 1 6 6 0 0 | a = [5.83;8.62)

54 407 30 4 8 10 16 19 2 0 | b = [8.62;11.40)

5 44 58 4 7 1 15 11 0 0 | c = [11.40;14.19)

2 8 3 0 1 0 0 3 0 0 | d = [14.19;16.98)

1 11 2 2 44 15 9 3 4 0 | e = [16.98;19.76)

5 6 2 0 18 42 17 12 9 0 | f = [19.76;22.55)

14 19 10 0 5 28 36 28 5 1 | g = [22.55;25.34)

7 18 15 3 9 15 28 156 39 8 | h = [25.34;28.13)

0 3 2 0 3 15 16 56 34 7 | i = [28.13;30.91)

0 0 0 0 0 4 3 15 4 10 | j = [30.91;33.70]

Método 10: Random Forest

Correctly Classified Instances 1004 58.2029 %

Incorrectly Classified Instances 721 41.7971 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

117 59 3 1 0 2 8 5 0 0 | a = [5.83;8.62)

29 460 18 0 8 5 11 18 1 0 | b = [8.62;11.40)

5 44 62 3 7 0 10 13 1 0 | c = [11.40;14.19)

2 7 5 0 1 0 0 2 0 0 | d = [14.19;16.98)

0 11 4 0 52 15 4 5 0 0 | e = [16.98;19.76)

1 6 0 0 18 38 22 12 14 0 | f = [19.76;22.55)

9 9 7 0 5 27 40 39 10 0 | g = [22.55;25.34)

8 15 8 2 4 14 26 175 38 8 | h = [25.34;28.13)

0 2 1 0 2 12 14 51 52 2 | i = [28.13;30.91)

0 0 0 0 0 3 2 12 11 8 | j = [30.91;33.70]

Método 11: Rede Neural

Correctly Classified Instances 1000 57.971 %

Incorrectly Classified Instances 725 42.029 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

125 49 3 2 0 3 5 6 2 0 | a = [5.83;8.62)

36 444 23 5 10 4 11 14 2 1 | b = [8.62;11.40)

4 46 60 5 5 0 10 12 3 0 | c = [11.40;14.19)

2 3 6 3 1 0 0 2 0 0 | d = [14.19;16.98)

1 11 8 0 49 11 5 4 2 0 | e = [16.98;19.76)

1 6 1 0 17 36 27 11 9 3 | f = [19.76;22.55)

8 11 10 0 7 20 44 31 14 1 | g = [22.55;25.34)

3 15 9 1 6 10 33 168 38 15 | h = [25.34;28.13)

1 3 2 0 1 9 13 39 63 5 | i = [28.13;30.91)

0 0 0 0 0 1 3 15 9 8 | j = [30.91;33.70]

CONJUNTO 2

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.8841 %

Incorrectly Classified Instances 1175 68.1159 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

0 195 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

0 550 0 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 145 0 0 0 0 0 0 0 0 | c = [11.40;14.19)

0 17 0 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 91 0 0 0 0 0 0 0 0 | e = [16.98;19.76)

0 111 0 0 0 0 0 0 0 0 | f = [19.76;22.55)

0 146 0 0 0 0 0 0 0 0 | g = [22.55;25.34)

0 298 0 0 0 0 0 0 0 0 | h = [25.34;28.13)

0 136 0 0 0 0 0 0 0 0 | i = [28.13;30.91)

0 36 0 0 0 0 0 0 0 0 | j = [30.91;33.70]

Método 2: 1R classifier

Correctly Classified Instances 782 45.3333 %

Incorrectly Classified Instances 943 54.6667 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

84 97 0 0 0 0 0 14 0 0 | a = [5.83;8.62)

13 508 0 0 0 0 0 29 0 0 | b = [8.62;11.40)

0 145 0 0 0 0 0 0 0 0 | c = [11.40;14.19)

0 17 0 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 43 0 0 41 0 0 7 0 0 | e = [16.98;19.76)

0 22 0 0 26 0 0 63 0 0 | f = [19.76;22.55)

0 83 0 0 16 0 0 32 15 0 | g = [22.55;25.34)

0 149 0 0 28 0 0 98 23 0 | h = [25.34;28.13)

0 20 0 0 11 0 0 54 51 0 | i = [28.13;30.91)

0 0 0 0 3 0 0 29 4 0 | j = [30.91;33.70]

Método 3: PART decision list

Number of Rules : 36

Correctly Classified Instances 1561 90.4928 %

Incorrectly Classified Instances 164 9.5072 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
174	21	0	0	0	0	0	0	0	0	a = [5.83;8.62)
18	521	11	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	2	11	4	0	0	0	0	0	d = [14.19;16.98)
0	0	1	3	83	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	4	102	5	0	0	0	f = [19.76;22.55)
2	0	0	0	0	7	125	12	0	0	g = [22.55;25.34)
0	0	0	0	1	1	11	269	16	0	h = [25.34;28.13)
0	0	0	0	0	0	0	20	111	5	i = [28.13;30.91)
0	0	0	0	0	0	0	0	5	31	j = [30.91;33.70]

Método 4: RIPPER

Number of Rules : 13

Correctly Classified Instances 1572 91.1304 %

Incorrectly Classified Instances 153 8.8696 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	523	11	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	13	3	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	5	100	6	0	0	0	f = [19.76;22.55)
0	0	0	0	0	11	123	12	0	0	g = [22.55;25.34)
0	0	0	0	0	0	14	268	16	0	h = [25.34;28.13)
0	0	0	0	0	0	0	11	118	7	i = [28.13;30.91)
0	0	0	0	0	0	0	0	4	32	j = [30.91;33.70]

Método 5: Decision Tables

Number of Rules : 10

Correctly Classified Instances 1584 91.8261 %

Incorrectly Classified Instances 141 8.1739 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	524	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	13	3	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	4	100	7	0	0	0	f = [19.76;22.55)
0	0	0	0	0	7	127	12	0	0	g = [22.55;25.34)
0	0	0	0	0	0	12	273	13	0	h = [25.34;28.13)
0	0	0	0	0	0	0	11	120	5	i = [28.13;30.91)
0	0	0	0	0	0	0	0	4	32	j = [30.91;33.70]

Método 6: REPTree

Size of the tree : 31

Correctly Classified Instances 1581 91.6522 %

Incorrectly Classified Instances 144 8.3478 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	524	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	13	3	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	4	100	7	0	0	0	f = [19.76;22.55)
0	0	0	0	0	7	127	12	0	0	g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 14 117 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 1 3 32 | j = [30.91;33.70]

Método 7: J48

Number of Leaves : 10

Size of the tree : 11

Correctly Classified Instances 1584 91.8261 %

Incorrectly Classified Instances 141 8.1739 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 1481 85.8551 %

Incorrectly Classified Instances 244 14.1449 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

168 24 3 0 0 0 0 0 0 0 | a = [5.83;8.62)

26 497 27 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 15 127 3 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 2 11 4 0 0 0 0 0 | d = [14.19;16.98)

0 0 2 1 81 7 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 8 92 11 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 14 111 21 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 19 261 18 0 | h = [25.34;28.13)

0 0 0 0 0 0 3 15 104 14 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 7 29 | j = [30.91;33.70]

Método 9: Random Tree

Size of the tree : 3341

Correctly Classified Instances 1481 85.8551 %

Incorrectly Classified Instances 244 14.1449 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

167 28 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

30 505 15 0 0 0 0 0 0 0 | b = [8.62;11.40)

1 25 117 1 1 0 0 0 0 0 | c = [11.40;14.19)

0 0 2 12 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 4 80 7 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 10 91 10 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 12 116 17 1 0 | g = [22.55;25.34)

0 0 0 0 0 0 22 258 17 1 | h = [25.34;28.13)

0 0 0 0 0 0 2 17 108 9 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 9 27 | j = [30.91;33.70]

Método 10: Random Forest

Correctly Classified Instances 1546 89.6232 %

Incorrectly Classified Instances 179 10.3768 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

170 25 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

21 517 12 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 12 132 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 2 12 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 82 6 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 5 99 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 8 121 17 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 15 265 18 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 13 117 6 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 5 31 | j = [30.91;33.70]

Método 11: Rede Neural

Correctly Classified Instances 1541 89.3333 %

Incorrectly Classified Instances 184 10.6667 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

171 24 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 522 12 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 11 132 2 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 3 8 6 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 81 6 0 0 1 0 | e = [16.98;19.76)

0 0 0 0 5 99 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 12 116 18 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 16 267 15 0 | h = [25.34;28.13)

0 0 0 0 0 0 1 13 116 6 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 7 29 | j = [30.91;33.70]

CONJUNTO 3

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.8841 %

Incorrectly Classified Instances 1175 68.1159 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
0	195	0	0	0	0	0	0	0	0	| a = [5.83;8.62)
0	550	0	0	0	0	0	0	0	0	| b = [8.62;11.40)
0	145	0	0	0	0	0	0	0	0	| c = [11.40;14.19)
0	17	0	0	0	0	0	0	0	0	| d = [14.19;16.98)
0	91	0	0	0	0	0	0	0	0	| e = [16.98;19.76)
0	111	0	0	0	0	0	0	0	0	| f = [19.76;22.55)
0	146	0	0	0	0	0	0	0	0	| g = [22.55;25.34)
0	298	0	0	0	0	0	0	0	0	| h = [25.34;28.13)
0	136	0	0	0	0	0	0	0	0	| i = [28.13;30.91)
0	36	0	0	0	0	0	0	0	0	| j = [30.91;33.70]

Método 2: 1R classifier

Correctly Classified Instances 782 45.3333 %

Incorrectly Classified Instances 943 54.6667 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
84	97	0	0	0	0	0	14	0	0	| a = [5.83;8.62)
13	508	0	0	0	0	0	29	0	0	| b = [8.62;11.40)
0	145	0	0	0	0	0	0	0	0	| c = [11.40;14.19)
0	17	0	0	0	0	0	0	0	0	| d = [14.19;16.98)
0	43	0	0	41	0	0	7	0	0	| e = [16.98;19.76)
0	22	0	0	26	0	0	63	0	0	| f = [19.76;22.55)
0	83	0	0	16	0	0	32	15	0	| g = [22.55;25.34)
0	149	0	0	28	0	0	98	23	0	| h = [25.34;28.13)
0	20	0	0	11	0	0	54	51	0	| i = [28.13;30.91)

0 0 0 0 3 0 0 29 4 0 | j = [30.91;33.70]

Método 3: PART decision list

Number of Rules : 43

Correctly Classified Instances 1568 90.8986 %

Incorrectly Classified Instances 157 9.1014 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 11 5 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 83 4 0 0 1 0 | e = [16.98;19.76)

0 0 0 0 5 99 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 2 10 121 13 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 13 272 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 15 117 4 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 6 30 | j = [30.91;33.70]

Método 4: RIPPER

Number of Rules : 18

Correctly Classified Instances 1574 91.2464 %

Incorrectly Classified Instances 151 8.7536 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 522 12 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 4 83 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 5 99 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 10 124 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 1 12 271 14 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 119 6 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 5: Decision Tables

Number of Rules : 10

Correctly Classified Instances 1584 91.8261 %

Incorrectly Classified Instances 141 8.1739 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 6: REPTree

Size of the tree : 11

Correctly Classified Instances 1583 91.7681 %

Incorrectly Classified Instances 142 8.2319 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 523 11 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 1 3 32 | j = [30.91;33.70]

Método 7: J48

Number of Leaves : 10

Size of the tree : 11

Correctly Classified Instances 1582 91.7101 %

Incorrectly Classified Instances 143 8.2899 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 11 5 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 1456 84.4058 %

Incorrectly Classified Instances 269 15.5942 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
164  27   1   3   0   0   0   0   0   0 |   a = [5.83;8.62)
 36 489  24   1   0   0   0   0   0   0 |   b = [8.62;11.40)
  0  16 124   5   0   0   0   0   0   0 |   c = [11.40;14.19)
  0   0   2  12   3   0   0   0   0   0 |   d = [14.19;16.98)
  0   0   2   2  81   6   0   0   0   0 |   e = [16.98;19.76)
  0   0   0   0   7  96   8   0   0   0 |   f = [19.76;22.55)
  0   0   0   0   0  19 107  18   2   0 |   g = [22.55;25.34)
  0   0   0   0   0   0  27 253  18   0 |   h = [25.34;28.13)
  0   0   0   0   0   0   1  23 101  11 |   i = [28.13;30.91)
  0   0   0   0   0   0   0   0   7  29 |   j = [30.91;33.70]
```

<u>Método 9</u>: Random Tree

Size of the tree : 2751

Correctly Classified Instances 1432 83.0145 %

Incorrectly Classified Instances 293 16.9855 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
162  33   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
 32 496  22   0   0   0   0   0   0   0 |   b = [8.62;11.40)
  0  23 120   2   0   0   0   0   0   0 |   c = [11.40;14.19)
  0   0   2  11   4   0   0   0   0   0 |   d = [14.19;16.98)
  0   0   1   3  79   8   0   0   0   0 |   e = [16.98;19.76)
  0   0   0   0   8  83  20   0   0   0 |   f = [19.76;22.55)
  0   0   0   0   0  16 107  23   0   0 |   g = [22.55;25.34)
  0   0   0   0   0   1  17 260  19   1 |   h = [25.34;28.13)
  0   0   0   0   0   0   0  31  92  13 |   i = [28.13;30.91)
  0   0   0   0   0   0   0   2  12  22 |   j = [30.91;33.70]
```

Método 10: Random Forest

Correctly Classified Instances 1547 89.6812 %

Incorrectly Classified Instances 178 10.3188 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 171  24   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  17 524   9   0   0   0   0   0   0   0 |   b = [8.62;11.40)
   0  13 131   1   0   0   0   0   0   0 |   c = [11.40;14.19)
   0   0   3  10   4   0   0   0   0   0 |   d = [14.19;16.98)
   0   0   0   4  82   5   0   0   0   0 |   e = [16.98;19.76)
   0   0   0   0   5  99   7   0   0   0 |   f = [19.76;22.55)
   0   0   0   0   0  11 121  14   0   0 |   g = [22.55;25.34)
   0   0   0   0   0   0  16 269  13   0 |   h = [25.34;28.13)
   0   0   0   0   0   0   0  20 110   6 |   i = [28.13;30.91)
   0   0   0   0   0   0   0   0   6  30 |   j = [30.91;33.70]
```

Método 11: Rede Neural

Correctly Classified Instances 1528 88.5797 %

Incorrectly Classified Instances 197 11.4203 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 168  27   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  20 518  12   0   0   0   0   0   0   0 |   b = [8.62;11.40)
   0  14 130   1   0   0   0   0   0   0 |   c = [11.40;14.19)
   0   0   2  12   3   0   0   0   0   0 |   d = [14.19;16.98)
   0   0   0   3  80   8   0   0   0   0 |   e = [16.98;19.76)
   0   0   0   0   4  96  11   0   0   0 |   f = [19.76;22.55)
   0   0   0   0   0  12 116  17   1   0 |   g = [22.55;25.34)
   0   0   0   0   0   0  14 267  17   0 |   h = [25.34;28.13)
```

0 0 0 0 0 0 1 16 113 6 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 8 28 | j = [30.91;33.70]

ELET6 – ATRASO B - ANÁLISE 3

29 Intervalos de Saída:

[5.83;6),[6;7),[7;8),[8;9),[9;10),[10;11),[11;12),[12;13),[13;14),[14;15),[15;16),[16;17),[17;18),[18;19),[19;20),[20;21),[21;22),[22;23),[23;24),[24;25),[25;26),[26;27),[27;28),[28;29),[29;30),[30;31),[31;32),[32;33),[33;33.70]

Conjunto 1: PLD(t), PLD(t-1), PLD(t-2), PLD(t-3), PLD(t-4), PLD(t-5),EAR(t), EAR(t-1), EAR(t-2), EAR(t-3), EAR(t-4), EAR(t-5), CE(t), CE(t-1),CE(t-2), CE(t-3), CE(t-4),CE(t-5)

Conjunto 2: IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), ELET6(t-1), ELET(t-2), ELET6(t-3), ELET(t-4), ELET(t-5)

Conjunto 3: PLD(t), PLD(t-1), PLD(t-2), PLD(t-3), PLD(t-4), PLD(t-5),EAR(t), EAR(t-1), EAR(t-2), EAR(t-3), EAR(t-4), EAR(t-5), CE(t), CE(t-1),CE(t-2), CE(t-3), CE(t-4),CE(t-5), IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), ELET6(t-1), ELET(t-2), ELET6(t-3), ELET(t-4), ELET(t-5)

CONJUNTO 1

Classificação:

Método 1: Zero-R

Correctly Classified Instances 236 13.6812 %

Incorrectly Classified Instances 1489 86.3188 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 0 0 153 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 0 0 187 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 236 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 64 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

<u>Método 2</u>: 1R classifier

Correctly Classified Instances 420 24.3478 %

Incorrectly Classified Instances 1305 75.6522 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 26 0 23 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 16 0 94 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 6 0 63 0 118 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 31 0 205 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 15 0 93 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 16 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 6 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 8 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 14 0 0 0 0 0 0 0 0 1 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 4 0 22 0 0 0 0 0 0 0 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 4 0 8 0 0 0 0 0 0 0 2 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 17 0 8 0 0 0 0 0 0 0 1 3 0 0 0 0 0 0 11 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 9 0 10 0 0 0 0 0 0 0 4 13 0 0 0 0 0 0 9 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 7 0 7 0 0 0 0 0 0 0 4 10 0 0 0 0 0 0 13 0 1 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 10 0 12 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 13 0 6 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 8 0 36 0 0 0 0 0 0 0 2 1 0 0 0 0 0 0 5 0 7 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 11 0 54 0 0 0 0 0 0 0 2 11 0 0 0 0 0 0 19 0 4 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 34 0 51 0 0 0 0 0 0 0 1 11 0 0 0 0 0 0 27 0 11 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 18 0 38 0 0 0 0 0 0 0 0 5 0 0 0 0 0 0 13 0 4 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 4 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 30 0 0 0 0 0 0 | x = [28;29)

0 0 0 4 0 3 0 0 0 0 0 0 0 2 2 0 0 0 0 0 0 13 0 7 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 0 0 0 0 0 0 19 0 20 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 13 0 6 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 9 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 3: PART decision list

Number of Rules : 283

Correctly Classified Instances 616 35.7101 %

Incorrectly Classified Instances 1109 64.2899 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 38 7 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 10 34 4 4 5 4 0 0 0 0 1 0 0 0 0 0 0 2 0 0 0 2 0 0 0 0 0 0 | c = [7;8)

0 5 13 61 24 16 4 5 0 0 0 1 0 0 1 3 3 1 1 3 1 8 1 2 0 0 0 0 0 | d = [8;9)

0 0 11 20 80 51 4 8 1 0 0 0 0 0 0 4 0 0 0 0 3 2 3 0 0 0 0 0 0 | e = [9;10)

0 0 9 16 41 133 10 3 0 0 0 3 2 5 0 0 0 0 1 1 4 5 2 1 0 0 0 0 0 | f = [10;11)

0 0 3 8 9 29 37 8 0 0 0 0 0 4 1 0 0 1 1 2 3 0 1 0 1 0 0 0 0 | g = [11;12)

0 0 3 8 8 13 11 5 5 0 1 0 1 0 0 0 0 0 1 4 2 2 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 2 0 1 7 7 0 0 0 0 1 0 0 0 0 1 1 2 3 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | k = [15;16)

0 0 1 0 3 3 1 2 0 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 4 6 0 0 0 0 0 2 0 1 0 3 3 0 0 1 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 2 2 0 1 0 0 0 0 22 3 2 1 5 0 1 1 1 2 0 0 0 0 0 | n = [18;19)

0 0 0 2 1 3 0 0 1 0 0 0 1 5 12 3 1 0 0 0 1 0 0 0 0 1 0 0 | o = [19;20)

0 0 0 2 1 0 0 1 0 0 0 0 0 1 2 15 3 1 1 0 2 2 2 3 2 1 1 0 | p = [20;21)

0 0 0 2 0 0 0 0 0 0 0 0 2 2 2 4 12 5 2 2 2 1 5 1 1 1 1 0 | q = [21;22)

0 0 0 1 0 0 2 0 0 0 0 0 1 0 1 2 8 18 1 1 1 1 2 3 0 0 0 0 | r = [22;23)

0 0 2 3 0 1 2 1 2 0 0 0 0 0 0 1 4 3 4 5 1 3 1 6 1 2 0 0 | s = [23;24)

0 0 0 11 1 3 2 1 4 0 0 0 0 2 1 1 6 1 4 3 6 1 3 9 0 0 0 0 | t = [24;25)

0 0 0 7 3 7 0 3 1 0 0 0 0 0 3 1 6 1 2 4 28 23 5 5 0 1 0 1 0 | u = [25;26)

0 0 1 2 3 3 1 1 5 0 0 0 1 0 2 1 2 1 4 3 24 48 8 14 2 7 1 1 0 | v = [26;27)

0 0 2 7 3 0 1 0 3 0 0 0 2 2 0 1 1 2 2 1 9 17 14 7 1 0 1 2 0 | w = [27;28)

0 0 0 1 0 2 1 1 1 0 0 0 0 0 0 6 2 1 2 6 2 10 8 21 0 5 0 0 0 | x = [28;29)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 2 3 1 0 0 1 4 4 2 1 5 7 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 3 2 0 3 0 7 4 1 8 4 10 2 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 4 3 0 3 1 3 6 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 4 3 0 0 1 0 1 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 0 1 0 0 0 0 | ac = [33;33.70]

Método 4: RIPPER

Number of Rules : 51

Correctly Classified Instances 430 24.9275 %

Incorrectly Classified Instances 1295 75.0725 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 43 0 3 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 14 9 6 3 32 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 6 3 38 10 93 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 | d = [8;9)

0 0 5 14 27 132 3 0 1 0 0 0 0 1 0 2 0 0 0 0 0 1 1 0 0 0 0 0 | e = [9;10)

0 0 7 2 17 189 12 4 0 0 0 0 1 2 0 0 0 0 0 0 0 2 0 0 0 0 0 0 | f = [10;11)

0 0 4 3 0 63 33 1 0 0 0 0 1 2 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 3 1 41 13 1 2 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 21 0 0 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 2 9 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 12 2 0 0 0 0 0 2 1 0 0 1 0 0 0 1 0 1 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 23 3 0 0 0 0 0 0 9 4 2 2 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 1 0 19 0 0 0 0 0 0 0 4 6 0 0 0 0 0 1 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 1 0 30 0 0 0 0 0 0 0 1 0 7 0 0 0 0 0 0 0 0 1 0 0 0 0 | p = [20;21)

0 0 0 0 0 36 0 0 0 0 0 0 0 1 3 0 1 0 2 0 0 1 0 0 0 0 1 0 0 | q = [21;22)

0 0 0 0 0 27 0 0 0 0 0 0 0 1 0 1 0 3 9 1 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 1 1 0 28 0 0 0 0 0 0 0 0 0 0 0 0 0 10 0 0 0 0 2 0 0 0 0 0 | s = [23;24)

0 0 0 6 1 45 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 3 0 0 0 0 | t = [24;25)

0 0 0 1 0 87 0 0 0 0 0 0 0 0 0 0 0 2 0 1 0 3 4 0 1 0 1 1 0 | u = [25;26)

0 0 1 0 1 111 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 2 15 1 2 0 0 1 0 0 | v = [26;27)

0 0 2 2 0 59 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 5 2 1 0 0 0 | w = [27;28)

0 0 0 1 0 60 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 0 0 5 0 0 0 0 | x = [28;29)

0 0 0 0 0 24 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 2 0 2 0 0 | y = [29;30)

0 0 0 0 0 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 4 0 10 1 0 0 | z = [30;31)

0 0 0 0 0 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 2 6 0 0 | aa = [31;32)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 | ac = [33;33.70]

Método 5: Decision Tables

Number of Rules : 288

Correctly Classified Instances 606 35.1304 %

Incorrectly Classified Instances 1119 64.8696 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

7 36 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

3 4 34 8 5 10 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

6 4 12 73 17 20 2 0 0 0 0 1 0 0 0 3 0 1 0 0 4 7 1 2 0 0 0 0 0 | d = [8;9)

12 0 10 23 76 54 3 0 0 0 0 0 0 0 0 3 0 0 0 0 4 1 1 0 0 0 0 0 0 | e = [9;10)

16 0 10 11 40 135 13 0 0 0 0 0 1 0 0 0 0 0 0 0 9 1 0 0 0 0 0 0 0 | f = [10;11)

3 1 3 5 3 38 44 4 1 0 0 0 0 1 0 0 0 0 1 3 1 0 0 0 0 0 0 0 0 | g = [11;12)

5 0 1 7 4 16 14 2 9 0 0 0 0 1 0 0 0 0 0 1 2 2 0 0 0 0 0 0 0 | h = [12;13)

1 0 0 3 0 1 1 5 4 2 0 0 0 1 0 0 0 0 0 1 5 1 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

1 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 3 3 4 2 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 2 2 0 0 0 0 0 5 4 0 0 2 3 0 0 0 0 2 0 0 0 0 0 0 | m = [17;18)

0 0 0 1 2 5 3 0 0 0 0 0 2 16 6 0 3 2 0 0 1 1 1 0 0 0 0 0 0 | n = [18;19)

1 0 0 3 0 2 1 0 0 0 0 0 0 9 8 1 3 0 0 0 0 1 0 0 2 0 0 0 0 | o = [19;20)

1 0 0 5 9 0 0 0 0 0 0 0 0 2 3 0 5 2 0 0 1 2 0 3 0 2 5 0 0 | p = [20;21)

0 0 0 3 0 0 0 0 0 0 0 0 1 2 4 5 15 3 0 0 2 4 3 0 1 1 1 0 0 | q = [21;22)

1 0 0 1 0 0 1 0 1 0 0 0 2 0 3 5 7 13 1 1 0 4 0 2 0 0 0 0 0 | r = [22;23)

1 0 2 4 0 1 2 2 5 0 0 0 0 0 0 1 2 1 7 4 1 3 0 5 0 0 1 0 0 | s = [23;24)

1 0 1 11 0 9 2 3 4 0 0 0 0 0 2 1 4 0 4 2 2 4 0 9 0 0 0 0 0 | t = [24;25)

1 0 0 11 0 11 1 1 6 0 0 0 0 2 3 3 4 0 1 4 19 26 0 7 1 0 0 0 0 | u = [25;26)

5 0 0 11 1 8 1 1 5 0 0 0 0 0 2 0 1 3 0 6 14 54 7 10 1 3 2 0 0 | v = [26;27)

2 0 2 4 2 6 3 1 4 0 0 0 1 5 0 0 0 0 0 1 12 13 15 4 0 2 1 0 0 | w = [27;28)

2 0 0 2 1 3 0 0 1 0 0 0 0 2 0 1 0 0 1 5 6 5 5 25 0 3 7 0 0 | x = [28;29)

2 0 0 1 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1 4 3 4 2 11 0 0 0 | y = [29;30)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 8 1 10 5 15 3 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 0 0 1 2 0 6 0 4 5 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 1 0 0 2 2 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 1 0 0 0 0 | ac = [33;33.70]

<u>Método 6</u>: REPTree

Size of the tree : 331

Correctly Classified Instances 554 32.1159 %

Incorrectly Classified Instances 1171 67.8841 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 44 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 14 23 4 12 8 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 6 15 72 25 8 11 1 0 0 0 2 0 0 0 5 0 0 0 2 1 3 1 1 0 0 0 0 0 | d = [8;9)

0 0 14 28 58 59 11 1 0 0 0 0 0 1 0 2 0 0 0 0 7 3 3 0 0 0 0 0 0 | e = [9;10)

0 0 15 14 35 133 13 1 1 0 0 0 1 6 0 0 1 0 0 0 8 5 3 0 0 0 0 0 0 | f = [10;11)

0 0 3 14 4 35 37 2 6 0 0 0 0 2 1 0 1 0 0 0 1 1 1 0 0 0 0 0 0 | g = [11;12)

0 0 3 8 2 22 11 3 7 0 0 0 1 0 1 0 0 0 0 1 3 2 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 3 1 0 2 8 0 0 0 0 1 0 0 0 0 0 3 0 6 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 2 2 3 3 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 5 3 0 0 0 0 1 2 3 1 0 3 2 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 1 0 8 2 0 0 0 0 0 4 15 3 3 6 0 0 0 0 1 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 1 0 2 3 0 0 0 0 0 0 5 4 4 6 1 1 0 2 0 0 0 2 0 0 0 0 | o = [19;20)

0 0 0 2 0 0 0 0 0 0 0 0 0 3 0 16 4 0 0 1 2 4 1 2 0 4 1 0 0 | p = [20;21)

0 0 0 3 0 2 0 0 0 0 0 0 1 4 2 2 12 2 2 0 8 2 2 0 0 3 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 1 0 0 0 2 3 2 3 10 7 0 1 1 8 1 1 0 2 0 0 0 | r = [22;23)

0 0 2 2 0 0 1 1 7 0 0 0 0 1 0 7 0 0 4 0 1 6 0 7 0 3 0 0 0 | s = [23;24)

0 0 2 9 1 7 0 0 10 0 0 0 0 3 0 0 4 0 0 2 4 7 2 7 0 1 0 0 0 | t = [24;25)

0 0 0 9 2 8 0 2 6 0 0 0 0 2 2 8 9 2 0 1 14 28 1 5 0 2 0 0 0 | u = [25;26)

0 0 4 7 0 7 0 0 13 0 0 0 0 4 0 6 1 3 1 3 11 55 4 10 1 3 1 1 0 | v = [26;27)

0 0 3 11 0 6 2 0 6 0 0 0 1 2 0 2 4 0 1 1 8 19 9 3 0 0 0 0 0 | w = [27;28)

0 0 0 4 2 6 0 0 0 0 0 0 0 2 0 2 4 0 0 1 3 11 3 23 2 3 3 0 0 | x = [28;29)

0 0 0 2 0 0 0 0 0 0 0 0 0 1 2 1 1 0 1 0 3 6 3 5 1 5 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 4 0 2 0 2 10 0 11 3 10 3 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 2 5 2 4 0 4 2 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 3 3 2 0 0 1 0 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 7: J48

Number of Leaves : 1126

Size of the tree : 1251

Correctly Classified Instances 653 37.8551 %

Incorrectly Classified Instances 1072 62.1449 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 45 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 15 23 6 9 7 3 0 0 0 0 1 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 | c = [7;8)

0 5 8 69 23 16 4 3 1 0 0 2 0 0 0 4 3 0 1 3 2 6 3 0 0 0 0 0 0 | d = [8;9)

0 0 11 28 79 50 6 3 0 0 0 1 0 0 0 2 0 0 0 0 3 1 2 1 0 0 0 0 0 | e = [9;10)

0 0 10 9 36 150 11 4 1 0 0 2 3 0 0 0 0 0 0 2 5 0 3 0 0 0 0 0 0 | f = [10;11)

0 0 3 8 4 29 47 7 1 0 0 0 0 1 1 0 0 1 2 0 2 2 0 0 0 0 0 0 0 | g = [11;12)

0 0 2 4 6 18 12 8 2 0 0 0 0 1 0 0 0 0 1 4 2 2 2 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 3 0 1 2 7 0 0 0 1 0 0 0 0 1 2 1 2 3 1 0 0 0 0 0 0 | i = [13;14)

0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 1 1 2 4 1 0 0 0 0 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 7 1 0 0 0 0 1 2 2 1 0 3 2 0 0 0 0 1 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 2 3 0 1 0 1 0 2 20 3 4 4 1 0 0 0 1 1 0 0 0 0 0 | n = [18;19)

0 0 0 1 0 3 1 0 0 0 0 0 0 7 10 1 3 0 1 1 2 0 0 0 1 0 0 0 | o = [19;20)

0 0 0 3 0 0 0 0 1 0 0 0 0 1 0 14 6 3 0 0 2 2 1 2 1 3 1 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 1 4 12 11 1 2 0 0 5 1 0 2 1 | q = [21;22)

0 0 0 1 0 0 0 0 0 0 0 0 0 4 1 0 4 8 13 1 3 2 3 0 1 0 0 1 0 | r = [22;23)

0 0 1 0 0 0 2 0 2 0 0 0 0 0 0 3 2 3 12 4 2 1 2 7 0 0 1 0 | s = [23;24)

0 0 0 11 1 5 1 3 4 0 0 0 0 0 0 2 7 2 7 1 3 3 2 7 0 0 0 0 | t = [24;25)

0 0 0 6 1 9 0 1 3 0 0 0 0 0 5 2 6 1 3 4 21 22 4 7 1 1 4 | u = [25;26)

0 0 1 6 2 2 2 0 3 0 0 0 0 0 1 3 2 3 2 1 22 54 8 11 1 6 3 2 0 | v = [26;27)

0 0 2 5 4 0 0 1 5 1 1 0 0 1 0 0 2 0 2 1 7 13 23 5 1 2 2 0 0 | w = [27;28)

0 0 0 3 1 2 1 1 0 0 0 0 1 0 0 5 1 0 1 3 3 8 8 24 0 5 2 0 0 | x = [28;29)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 2 0 1 0 0 1 5 3 5 1 2 10 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 6 0 0 0 0 3 5 1 8 3 16 1 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 0 0 0 0 3 3 0 1 1 5 0 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 2 3 1 0 0 1 2 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 1 0 0 0 | ac = [33;33.70]

<u>Método 8</u>: Hoeffding Tree

Correctly Classified Instances 476 27.5942 %

Incorrectly Classified Instances 1249 72.4058 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 18 16 14 5 8 0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | c = [7;8)

0 7 17 57 3 5 2 9 0 0 1 8 0 0 0 7 0 5 0 19 0 2 11 0 0 0 0 0 0 | d = [8;9)

0 0 37 12 25 39 13 14 0 2 0 10 1 3 0 7 2 2 0 11 4 4 1 0 0 0 0 0 0 | e = [9;10)

0 0 20 6 17 113 14 14 3 0 0 5 2 11 0 0 4 0 0 13 9 3 2 0 0 0 0 0 0 | f = [10;11)

0 0 3 9 4 27 35 11 8 0 0 0 1 6 0 0 1 0 0 1 2 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 8 2 12 12 2 9 0 0 5 1 0 0 0 0 0 1 11 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 0 14 4 2 0 0 0 0 0 1 0 1 2 1 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 2 2 0 2 1 0 0 0 0 4 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 3 4 0 0 0 0 1 1 7 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 2 13 13 4 6 1 0 4 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 1 0 0 0 0 0 0 4 12 4 8 0 0 2 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 4 1 16 3 0 0 4 0 1 0 0 0 10 1 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 4 2 7 4 0 0 0 7 0 0 0 6 2 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 3 0 0 0 0 10 0 2 4 14 0 0 0 5 0 0 0 4 0 0 0 | r = [22;23)

0 0 0 5 0 0 0 0 11 0 0 0 0 1 0 6 1 1 0 0 8 0 0 4 0 5 0 0 0 | s = [23;24)

0 0 0 8 2 1 0 0 11 0 0 0 0 3 0 1 3 1 2 7 7 0 5 6 0 1 1 0 0 | t = [24;25)

0 0 0 5 0 5 0 0 7 0 0 0 0 11 5 5 8 0 1 14 10 1 5 4 5 8 7 0 0 | u = [25;26)

0 0 0 8 1 4 0 0 13 0 0 0 0 5 3 13 5 0 1 4 6 21 8 7 11 20 4 1 0 | v = [26;27)

0 0 0 4 1 4 0 0 5 0 0 0 7 1 2 4 6 1 0 4 6 13 4 3 1 8 4 0 0 | w = [27;28)

0 0 0 0 0 4 0 0 1 0 0 0 1 0 0 3 1 0 0 5 2 3 6 24 0 19 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 0 0 2 0 3 1 1 0 18 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 2 0 7 0 31 2 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 17 2 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 1 1 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 | ac = [33;33.70]

Método 9: Random Tree

Size of the tree : 7391

Correctly Classified Instances 536 31.0725 %

Incorrectly Classified Instances 1189 68.9275 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

3 34 10 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 8 27 13 8 6 2 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 4 11 60 24 12 5 3 0 0 0 2 0 0 0 7 1 0 2 9 4 8 1 0 0 0 0 0 0 | d = [8;9)

0 0 11 26 81 39 12 6 0 1 0 0 0 0 0 2 0 0 0 0 3 3 1 2 0 0 0 0 0 | e = [9;10)

0 0 8 16 45 117 25 9 1 0 1 0 1 3 0 2 0 0 0 3 2 1 1 1 0 0 0 0 0 | f = [10;11)

0 1 3 7 2 30 41 13 2 0 0 0 1 0 1 0 0 1 2 1 1 0 2 0 0 0 0 0 0 | g = [11;12)

0 0 3 7 8 13 10 7 3 0 0 1 1 1 0 1 0 0 1 4 3 0 1 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 0 1 1 3 3 2 1 0 1 0 0 1 0 2 2 1 2 1 3 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | k = [15;16)

0 0 1 3 2 1 1 1 0 0 0 2 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 1 3 1 1 1 0 0 1 7 2 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 1 0 4 3 0 0 1 0 0 4 11 5 3 3 3 0 1 1 1 2 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 1 0 1 2 0 0 0 0 0 1 6 8 0 2 1 2 1 3 3 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 3 4 0 0 0 0 0 0 0 0 3 1 8 4 4 2 0 5 2 1 1 1 1 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 1 0 0 0 0 0 2 1 5 3 11 6 2 3 3 2 3 2 1 0 0 0 0 0 | q = [21;22)

0 0 0 1 0 0 0 0 2 0 0 0 2 4 1 5 9 9 2 1 1 2 0 1 0 0 2 0 0 0 | r = [22;23)

0 0 0 3 0 1 3 1 0 0 0 0 0 0 0 5 0 1 5 8 3 3 3 4 0 1 1 0 0 0 | s = [23;24)

0 0 0 11 1 4 0 3 2 0 0 0 0 1 1 1 5 0 8 2 8 4 1 4 1 2 0 0 0 0 | t = [24;25)

0 0 0 5 1 4 1 1 1 0 0 0 0 1 3 6 4 1 8 8 19 22 6 4 1 3 2 0 0 0 | u = [25;26)

0 0 0 8 4 0 1 1 4 0 0 0 0 2 3 1 4 5 5 4 29 36 8 8 5 3 1 3 0 0 | v = [26;27)

0 0 2 3 1 1 0 0 5 0 1 0 1 2 1 1 3 1 3 4 3 12 17 12 4 0 1 0 0 0 | w = [27;28)

0 0 0 1 2 0 0 0 0 0 0 0 1 2 0 4 2 0 7 6 7 11 8 14 4 0 0 0 0 0 | x = [28;29)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 2 1 3 0 0 2 5 6 1 2 6 1 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 3 0 2 1 4 7 2 5 3 11 3 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 5 2 1 3 1 4 2 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 1 2 1 0 0 1 1 2 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 2 0 0 0 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 619 35.8841 %

Incorrectly Classified Instances 1106 64.1159 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 45 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 12 20 10 9 8 3 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 12 67 23 16 4 6 0 0 0 2 0 0 0 4 1 0 1 5 4 1 2 0 0 0 0 0 | d = [8;9)

0 0 9 21 90 47 4 6 0 0 0 0 0 0 0 2 0 0 0 0 1 4 2 1 0 0 0 0 | e = [9;10)

0 0 9 14 41 133 18 6 0 0 1 0 0 4 2 0 0 0 0 2 1 2 2 1 0 0 0 0 | f = [10;11)

0 0 4 5 2 31 46 11 1 0 0 0 0 1 1 0 0 0 2 2 0 0 2 0 0 0 0 0 | g = [11;12)

0 0 2 5 4 16 12 8 3 0 0 1 2 0 0 0 0 0 0 2 4 2 3 0 0 0 0 0 | h = [12;13)

0 0 0 0 2 0 1 2 2 1 2 0 1 0 0 0 0 1 1 1 4 3 3 1 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 | k = [15;16)

0 0 2 2 2 2 0 2 0 0 0 0 2 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 4 0 1 0 0 0 1 7 3 0 0 2 1 0 0 0 0 1 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 3 1 0 0 0 0 0 5 15 4 5 6 2 0 1 0 0 1 0 0 0 0 0 0 | n = [18;19)

0 0 0 1 0 1 3 0 0 0 0 0 1 7 6 2 2 0 0 1 4 3 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 4 2 0 0 0 0 0 0 0 0 0 4 0 7 3 3 2 1 4 1 0 4 1 3 1 0 0 | p = [20;21)

0 0 0 1 0 0 0 0 0 0 0 0 0 3 4 4 2 7 8 1 3 3 2 3 1 0 2 1 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 1 0 0 0 2 0 0 3 8 17 0 3 0 5 1 2 0 0 0 0 0 | r = [22;23)

0 0 0 3 0 0 3 0 0 0 0 0 0 0 0 0 2 2 1 9 3 3 6 3 5 0 1 1 0 0 | s = [23;24)

0 0 0 12 1 5 1 2 3 0 0 0 0 1 1 0 7 3 2 1 7 3 2 8 0 0 0 0 0 | t = [24;25)

0 0 0 5 2 3 0 1 2 0 0 0 0 1 3 3 3 2 4 4 25 26 6 6 0 2 1 1 1 | u = [25;26)

0 0 0 6 3 0 0 0 2 0 0 0 0 1 1 1 3 1 4 3 21 54 10 13 4 5 1 2 0 | v = [26;27)

0 0 2 1 0 0 0 1 3 0 1 1 0 4 0 0 2 1 1 4 9 14 21 7 3 1 1 1 0 | w = [27;28)

0 0 0 2 1 3 0 0 1 0 0 0 1 2 0 5 1 0 3 6 4 6 8 20 2 4 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 1 9 7 2 2 7 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 0 1 0 5 6 0 8 7 14 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 4 4 0 1 0 7 2 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 2 1 0 0 1 2 1 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 1 0 | ac = [33;33.70]

Método 11: Rede Neural

Correctly Classified Instances 630 36.5217 %

Incorrectly Classified Instances 1095 63.4783 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 40 6 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 6 35 7 6 6 2 2 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 2 8 75 26 12 3 1 0 1 0 2 0 0 0 4 2 2 1 8 3 1 1 0 0 0 0 1 0 | d = [8;9)

0 1 6 24 78 47 9 3 0 0 0 2 1 0 0 5 1 1 1 0 4 2 1 1 0 0 0 0 0 | e = [9;10)

0 0 4 20 40 124 19 7 1 0 0 3 1 6 0 0 1 0 0 1 1 4 2 0 1 0 0 1 0 | f = [10;11)

0 0 3 4 6 25 51 9 1 0 0 0 0 2 0 0 1 0 2 1 0 0 3 0 0 0 0 0 0 | g = [11;12)

0 0 3 6 7 11 15 8 3 0 1 0 1 0 0 0 0 0 4 2 1 1 1 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 1 2 1 5 3 2 0 0 0 1 0 0 0 0 0 3 1 4 1 1 0 0 0 0 0 | i = [13;14)

0 0 0 1 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 2 1 1 2 2 0 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 2 0 0 0 0 | l = [16;17)

0 0 0 1 0 1 0 2 0 1 0 2 7 3 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 | m = [17;18)

0 0 0 0 1 3 2 0 1 1 0 0 1 14 5 4 2 1 0 1 6 0 1 0 0 0 0 0 0 | n = [18;19)

0 0 0 1 0 2 0 1 0 0 0 0 0 8 8 3 1 0 0 1 5 1 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 2 2 0 0 1 0 0 0 0 0 3 1 11 6 2 2 0 3 1 0 2 1 1 1 1 0 | p = [20;21)

0 0 0 0 1 0 0 1 0 0 0 0 1 1 3 2 13 7 0 2 3 1 3 2 0 5 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 1 7 20 1 3 2 2 0 0 1 2 1 0 0 | r = [22;23)

0 0 0 3 0 0 2 0 1 0 0 0 0 0 0 1 3 1 8 9 2 4 2 4 0 1 1 0 0 | s = [23;24)

0 0 0 9 1 1 1 3 4 1 0 0 0 0 1 1 4 2 9 2 10 3 1 5 0 0 1 0 0 | t = [24;25)

0 0 0 6 3 4 0 0 3 0 0 0 0 2 2 3 4 2 5 3 28 16 5 5 2 4 1 2 1 | u = [25;26)

1 0 0 2 1 5 1 1 0 1 0 0 0 2 0 2 5 2 4 5 16 48 12 10 4 7 2 3 1 | v = [26;27)

0 0 0 2 2 2 2 3 2 0 0 0 1 2 1 0 6 1 0 2 8 15 14 8 2 2 2 1 0 | w = [27;28)

0 0 0 2 2 3 0 0 2 0 0 0 1 0 0 3 1 1 3 7 5 7 7 17 3 5 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 2 0 1 2 3 2 2 3 9 2 2 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 0 1 0 2 6 2 3 6 17 1 1 1 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 1 1 2 1 0 6 4 2 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 2 2 0 0 2 1 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 2 1 0 0 | ac = [33;33.70]

CONJUNTO 2

Classificação:

Método 1: Zero-R

Correctly Classified Instances	236	13.6812 %
Incorrectly Classified Instances	1489	86.3188 %

=== Confusion Matrix ===

```
  a  b  c  d  e  f  g  h  i  j  k  l  m  n  o  p  q  r  s  t  u  v  w  x  y  z aa ab ac  <-- classified as
  0  0  0  0  0  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  a = [5.83;6)
  0  0  0  0  0 48  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  b = [6;7)
  0  0  0  0  0 66  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  c = [7;8)
  0  0  0  0  0 153  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  d = [8;9)
  0  0  0  0  0 187  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  e = [9;10)
  0  0  0  0  0 236  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  f = [10;11)
  0  0  0  0  0 108  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  g = [11;12)
  0  0  0  0  0 64  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  h = [12;13)
  0  0  0  0  0 25  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  i = [13;14)
  0  0  0  0  0  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  j = [14;15)
  0  0  0  0  0  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  k = [15;16)
  0  0  0  0  0 13  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  l = [16;17)
  0  0  0  0  0 20  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  m = [17;18)
  0  0  0  0  0 43  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  n = [18;19)
  0  0  0  0  0 31  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  o = [19;20)
  0  0  0  0  0 40  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  p = [20;21)
  0  0  0  0  0 45  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  q = [21;22)
```

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

<u>Método 2</u>: 1R classifier

Correctly Classified Instances 420 24.3478 %

Incorrectly Classified Instances 1305 75.6522 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 26 0 23 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 16 0 94 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 6 0 63 0 118 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 31 0 205 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 15 0 93 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 16 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 6 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 8 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 14 0 0 0 0 0 0 0 1 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 4 0 22 0 0 0 0 0 0 0 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 4 0 8 0 0 0 0 0 0 0 2 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 17 0 8 0 0 0 0 0 0 0 1 3 0 0 0 0 0 0 0 11 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 9 0 10 0 0 0 0 0 0 0 4 13 0 0 0 0 0 0 0 9 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 7 0 7 0 0 0 0 0 0 0 4 10 0 0 0 0 0 0 0 13 0 1 0 0 0 0 0 0 | r = [22;23)

0 0 0 10 0 12 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 13 0 6 0 0 0 0 0 0 | s = [23;24)

0 0 0 8 0 36 0 0 0 0 0 0 0 2 1 0 0 0 0 0 0 0 5 0 7 0 0 0 0 0 0 | t = [24;25)

0 0 0 11 0 54 0 0 0 0 0 0 0 2 11 0 0 0 0 0 0 19 0 4 0 0 0 0 0 | u = [25;26)

0 0 0 34 0 51 0 0 0 0 0 0 0 1 11 0 0 0 0 0 0 27 0 11 0 0 0 0 0 | v = [26;27)

0 0 0 18 0 38 0 0 0 0 0 0 0 0 5 0 0 0 0 0 0 13 0 4 0 0 0 0 0 | w = [27;28)

0 0 0 4 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 30 0 0 0 0 0 | x = [28;29)

0 0 0 4 0 3 0 0 0 0 0 0 0 2 2 0 0 0 0 0 0 13 0 7 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 0 0 0 0 0 0 19 0 20 0 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 13 0 6 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 9 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 3: PART decision list

Number of Rules : 160

Correctly Classified Instances 817 47.3623 %

Incorrectly Classified Instances 908 52.6377 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 31 13 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 17 29 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 13 26 53 28 31 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 13 72 96 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 10 55 154 15 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 2 5 42 30 27 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 21 29 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 7 5 12 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 7 4 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 4 6 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 3 36 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 1 0 10 16 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 18 18 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 15 22 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 14 19 4 3 1 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 10 26 2 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 12 35 3 5 1 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 6 12 22 46 9 1 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17 95 23 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 30 31 4 0 3 1 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 3 5 6 44 2 6 2 0 0 | x = [28;29)

0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 1 19 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 6 33 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 4 10 5 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 2 2 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

Método 4: RIPPER

Number of Rules : 52

Correctly Classified Instances 754 43.7101 %

Incorrectly Classified Instances 971 56.2899 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 30 13 3 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 12 40 9 0 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 13 27 50 10 52 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 9 21 154 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 2 34 194 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 3 51 33 20 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 11 20 21 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 9 3 2 10 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 4 1 0 0 0 0 3 1 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 5 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 4 35 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 1 0 0 0 0 0 0 1 9 16 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 6 0 0 0 0 0 0 0 0 4 16 12 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 7 0 0 0 0 0 0 0 0 0 18 15 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 17 0 0 0 0 0 0 0 0 0 3 8 13 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 1 6 9 1 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 22 0 0 0 0 0 0 0 0 0 0 0 0 1 5 26 1 3 1 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 24 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 14 51 1 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 102 7 1 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 30 22 7 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 5 47 4 1 0 0 0 | x = [28;29)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 0 14 1 0 0 | y = [29;30)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 0 22 6 0 0 | z = [30;31)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 10 5 0 | aa = [31;32)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 1 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 | ac = [33;33.70]

Método 5: Decision Tables

Number of Rules : 110

Correctly Classified Instances 877 50.8406 %

Incorrectly Classified Instances 848 49.1594 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 37 10 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

2 16 36 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 13 27 52 25 35 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 8 61 117 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 42 188 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

3 0 0 0 0 48 49 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 1 28 30 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 7 14 3 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

4 0 0 0 0 0 0 0 0 0 0 6 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

3 0 0 0 0 1 0 0 0 0 0 1 0 13 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

2 0 0 0 0 0 0 0 0 0 0 0 0 1 38 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 15 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 2 10 26 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 7 33 3 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 3 13 13 7 4 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 13 22 4 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 15 35 4 3 0 1 0 0 0 0 0 | t = [24;25)

4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 14 19 55 1 1 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 110 12 4 0 0 0 0 0 | v = [26;27)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 32 33 3 0 2 0 0 0 | w = [27;28)

2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 6 12 41 1 5 0 0 0 0 | x = [28;29)

2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 1 19 0 0 0 | y = [29;30)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 37 4 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 17 0 0 | aa = [31;32)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 0 1 | ab = [32;33)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 | ac = [33;33.70]

Método 6: REPTree

Size of the tree : 511

Correctly Classified Instances 832 48.2319 %

Incorrectly Classified Instances 893 51.7681 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 35 7 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 17 29 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 19 29 37 32 35 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 9 72 103 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 1 63 162 9 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 5 44 31 26 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 17 41 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 5 15 4 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 0 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 2 12 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 1 3 36 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 11 15 2 2 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 18 20 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 16 23 5 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 14 13 2 9 2 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 27 7 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 41 7 5 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 16 18 59 1 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 121 7 1 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 44 24 4 0 4 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 9 43 3 5 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 0 18 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 2 1 34 6 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 17 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

<u>Método 7</u>: J48

Number of Leaves : 703

Size of the tree : 781

Correctly Classified Instances 853 49.4493 %

Incorrectly Classified Instances 872 50.5507 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 32 15 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 17 34 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 15 30 46 32 28 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 20 70 91 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 8 60 155 11 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 7 42 31 25 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 12 30 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 6 5 13 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 0 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 5 5 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 1 1 38 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 10 16 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 17 20 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 28 7 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 17 18 4 1 1 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 17 19 2 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 18 33 2 5 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 5 11 28 51 1 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 109 12 1 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 40 28 5 0 2 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 6 9 44 3 5 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 0 19 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 36 7 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 15 1 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 1 2 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 0 0 | ac = [33;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 821 47.5942 %

Incorrectly Classified Instances 904 52.4058 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 38 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 19 41 4 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 21 25 53 30 19 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 13 88 66 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 1 87 99 45 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 12 20 47 26 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 19 33 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 1 9 12 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 1 0 0 8 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 2 0 0 3 2 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 1 0 0 0 1 31 6 3 1 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 8 21 1 1 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 20 17 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 21 14 8 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 10 17 4 5 3 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 13 16 10 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 17 22 15 3 1 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 11 35 45 3 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 15 99 17 1 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 7 29 31 7 3 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 7 8 39 9 2 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 10 12 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 34 8 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 14 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 9 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 0 | ac = [33;33.70]

Método 9: Random Tree

Size of the tree : 5611

Correctly Classified Instances 790 45.7971 %

Incorrectly Classified Instances 935 54.2029 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 32 14 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 26 19 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 13 20 65 25 27 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 24 80 79 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 16 62 145 12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 7 7 39 39 15 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 27 22 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 3 5 15 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 6 5 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 2 7 10 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 1 5 32 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 8 17 4 1 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 25 13 1 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 18 14 12 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 12 14 9 4 1 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 4 11 20 5 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 18 21 12 5 1 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 6 10 25 42 13 1 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 23 87 21 3 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 14 24 28 9 1 1 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 7 8 39 10 3 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 15 3 11 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 34 8 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 9 5 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 0 2 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 847 49.1014 %

Incorrectly Classified Instances 878 50.8986 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 27 16 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 18 25 23 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 11 17 71 22 26 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 19 73 91 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 9 62 148 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 4 4 34 51 14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 1 22 30 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 2 6 15 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 7 4 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 3 13 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 4 33 5 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 10 16 2 2 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 24 14 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 17 19 8 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 24 1 4 1 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 12 26 3 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 14 26 13 3 2 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 15 30 40 11 2 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 23 86 24 2 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 12 25 31 7 0 1 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 8 43 10 1 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 6 12 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 37 6 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 10 5 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 0 | ac = [33;33.70]

Método 11: Rede Neural

Correctly Classified Instances 812 47.0725 %

Incorrectly Classified Instances 913 52.9275 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 28 12 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 19 22 23 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 12 12 70 28 26 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 | d = [8;9)

0 0 0 19 79 87 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 11 80 129 14 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 3 10 31 43 16 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 4 21 25 13 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 4 5 13 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 1 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 1 0 0 9 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 2 7 10 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 1 1 34 5 0 2 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 7 19 3 2 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 21 17 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 14 19 10 0 0 1 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 22 3 3 3 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 18 13 7 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 15 24 13 4 1 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 4 5 11 31 41 8 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 84 20 1 0 0 0 0 0 | v = [26;27)

0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 14 24 27 8 1 1 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 9 43 10 1 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 8 10 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 29 6 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 6 7 7 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 7 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 0 1 | ac = [33;33.70]

CONJUNTO 3

Classificação:

Método 1: Zero-R

Correctly Classified Instances 236 13.6812 %

Incorrectly Classified Instances 1489 86.3188 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 0 0 153 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 0 0 187 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 236 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 64 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

<u>Método 2</u>: 1R classifier

Correctly Classified Instances 420 24.3478 %

Incorrectly Classified Instances 1305 75.6522 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 26 0 23 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 16 0 94 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 6 0 63 0 118 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 31 0 205 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 15 0 93 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 16 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 6 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 8 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 14 0 0 0 0 0 0 0 1 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 4 0 22 0 0 0 0 0 0 0 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 4 0 8 0 0 0 0 0 0 0 2 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 17 0 8 0 0 0 0 0 0 0 1 3 0 0 0 0 0 0 11 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 9 0 10 0 0 0 0 0 0 0 4 13 0 0 0 0 0 0 9 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 7 0 7 0 0 0 0 0 0 0 4 10 0 0 0 0 0 0 13 0 1 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 10 0 12 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 13 0 6 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 8 0 36 0 0 0 0 0 0 0 2 1 0 0 0 0 0 0 5 0 7 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 11 0 54 0 0 0 0 0 0 0 2 11 0 0 0 0 0 0 19 0 4 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 34 0 51 0 0 0 0 0 0 0 1 11 0 0 0 0 0 0 27 0 11 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 18 0 38 0 0 0 0 0 0 0 0 5 0 0 0 0 0 0 13 0 4 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 4 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 30 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 4 0 3 0 0 0 0 0 0 0 2 2 0 0 0 0 0 0 13 0 7 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 0 0 0 0 0 0 19 0 20 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 13 0 6 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 9 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 3: PART decision list

Number of Rules : 239

Correctly Classified Instances 985 57.1014 %

Incorrectly Classified Instances 740 42.8986 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 37 9 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 14 44 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 6 10 97 29 9 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 26 115 40 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 11 64 138 22 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 6 4 26 55 14 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 | g = [11;12)

0 0 0 0 0 1 11 37 13 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 1 4 19 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 1 7 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 6 8 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 7 30 5 0 1 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 20 1 3 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 24 12 1 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 14 23 8 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 12 16 6 3 3 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 19 17 1 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 15 29 11 2 1 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 11 56 24 4 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 29 86 20 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 30 33 4 2 1 0 0 | w = [27;28)

0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 6 6 42 4 5 1 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 5 6 16 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 7 30 4 1 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 11 3 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 3 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 | ac = [33;33.70]

Método 4: RIPPER

Number of Rules : 93

Correctly Classified Instances 901 52.2319 %

Incorrectly Classified Instances 824 47.7681 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 39 4 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 14 37 13 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 8 17 85 16 26 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 27 64 92 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 6 36 167 26 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 5 45 37 18 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 5 17 28 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 2 0 5 17 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 2 0 0 0 1 1 5 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 5 8 5 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 6 33 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 9 19 0 3 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 20 17 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 19 11 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 5 12 15 6 1 1 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 1 22 15 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 7 1 0 0 0 0 0 0 0 0 0 0 0 0 1 12 29 6 1 0 2 0 0 0 0 | t = [24;25)

0 0 0 0 0 7 1 0 0 0 0 0 0 0 0 0 0 0 0 1 2 19 34 34 3 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 20 94 17 2 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 25 35 9 0 1 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 10 42 5 7 0 0 | x = [28;29)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 8 15 0 0 1 | y = [29;30)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 5 29 6 0 0 | z = [30;31)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 4 11 3 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 3 2 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 | ac = [33;33.70]

Método 5: Decision Tables

Number of Rules : 316

Correctly Classified Instances 916 53.1014 %

Incorrectly Classified Instances 809 46.8986 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

2 37 7 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

4 16 38 6 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

14 4 11 84 26 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

6 0 0 20 98 59 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

15 0 0 4 42 157 18 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

14 0 0 0 7 37 39 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

4 0 0 0 0 4 14 32 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

2 0 0 0 0 1 1 8 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

1 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

3 0 0 0 0 1 0 0 0 0 1 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

4 0 0 0 0 1 0 0 0 0 0 2 9 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

2 0 0 0 0 2 0 0 0 0 0 0 10 26 3 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

3 0 0 0 0 1 0 0 0 0 0 0 0 11 12 3 1 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

3 0 0 0 0 1 0 0 0 0 0 0 0 0 1 20 15 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 10 30 2 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

3 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 16 15 5 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 24 10 0 0 0 0 0 0 0 0 0 | s = [23;24)

3 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 17 28 6 1 0 0 0 0 0 0 0 | t = [24;25)

11 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 3 11 36 32 5 0 0 0 0 0 0 | u = [25;26)

4 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 103 6 2 0 0 0 0 0 | v = [26;27)

5 0 0 0 0 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 6 39 17 1 1 1 0 0 0 | w = [27;28)

3 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 7 4 33 9 6 0 0 0 | x = [28;29)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 5 13 1 0 0 | y = [29;30)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 36 4 0 0 | z = [30;31)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 14 1 0 | aa = [31;32)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 2 | ac = [33;33.70]

<u>Método 6</u>: REPTree

Size of the tree : 391

Correctly Classified Instances 940 54.4928 %

Incorrectly Classified Instances 785 45.5072 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 38 7 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 21 32 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 8 12 103 23 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 33 90 60 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 12 52 157 13 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 2 9 37 43 14 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 20 28 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 5 19 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 2 1 0 6 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 12 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 4 34 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 13 14 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 24 13 1 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 18 26 1 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 12 14 9 2 1 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 18 18 1 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 9 36 8 3 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 2 15 33 46 2 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 19 103 13 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 38 20 6 0 3 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 7 42 0 10 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 2 18 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 4 2 31 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 4 15 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 0 | ac = [33;33.70]

<u>Método 7</u>: J48

Number of Leaves : 1261

Size of the tree : 1401

Correctly Classified Instances 1045 60.5797 %

Incorrectly Classified Instances 680 39.4203 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 40 5 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 9 49 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 11 101 30 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 25 118 42 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 6 49 165 13 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 2 30 60 13 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 11 40 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 8 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 2 6 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 6 9 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 4 37 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 7 21 3 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 23 12 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 26 10 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 12 18 7 2 1 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 21 15 1 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 15 29 10 3 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 15 47 30 3 1 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 19 93 20 1 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 32 30 9 1 1 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 7 7 44 3 6 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 6 13 1 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 6 30 6 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 4 11 4 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 5 2 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 | ac = [33;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 916 53.1014 %

Incorrectly Classified Instances 809 46.8986 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 15 36 13 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 13 107 24 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 6 39 90 52 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 15 72 123 23 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 1 29 50 21 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 23 23 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 2 19 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 1 0 0 8 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 2 0 0 2 7 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 1 0 0 0 3 18 19 1 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 23 3 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 26 12 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 11 24 8 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 9 21 7 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 20 8 10 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 16 25 13 1 0 3 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 17 39 32 2 4 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 17 80 17 10 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 9 27 30 7 1 2 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 3 2 11 40 3 6 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 9 17 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 39 4 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 11 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 1 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 0 | ac = [33;33.70]

Método 9: Random Tree

Size of the tree : 6491

Correctly Classified Instances 911 52.8116 %

Incorrectly Classified Instances 814 47.1884 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 36 9 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 13 37 14 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 3 14 100 27 6 2 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 2 28 103 51 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 11 43 150 28 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 1 0 2 6 27 54 17 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 1 0 2 14 39 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 2 10 11 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 1 1 7 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 1 0 0 3 9 5 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 6 27 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 13 14 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 2 18 13 2 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 9 21 12 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 2 13 20 2 2 1 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 20 9 3 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 16 20 10 5 5 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 12 46 33 4 1 1 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 23 83 18 4 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 29 28 11 3 1 0 0 0 | w = [27;28)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 8 9 29 10 6 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 8 5 13 2 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 13 21 7 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 4 8 6 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 5 3 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 1120 64.9275 %

Incorrectly Classified Instances 605 35.0725 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 45 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 11 49 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 6 4 120 20 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 23 124 39 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 4 32 180 17 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 0 29 67 8 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 12 37 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 9 15 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 8 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 5 9 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 5 30 7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 8 19 4 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 25 11 1 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 8 24 12 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 27 2 3 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 22 13 2 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 16 27 13 2 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 11 54 31 1 1 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 17 103 12 2 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 28 37 8 2 1 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 7 9 42 5 4 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 11 11 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 36 5 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 8 5 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 1 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 0 | ac = [33;33.70]

<u>Método 11</u>: Rede Neural

Correctly Classified Instances 951 55.1304 %

Incorrectly Classified Instances 774 44.8696 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 37 8 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 11 42 12 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 3 11 98 17 19 0 0 0 0 0 2 1 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 23 85 71 2 1 0 0 0 1 1 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | e = [9;10)

0 0 1 2 28 177 21 4 0 0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 2 38 55 9 3 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 1 22 26 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 8 14 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 1 0 0 0 0 7 4 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 4 6 7 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 1 0 0 0 0 0 0 0 0 6 23 11 2 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 1 6 17 4 1 0 0 0 0 0 0 0 0 0 0 0 1 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 24 11 0 0 0 0 0 0 1 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 13 20 8 0 1 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 1 0 0 0 0 0 0 0 3 2 11 19 5 1 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 17 16 1 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 2 0 1 11 25 16 1 1 1 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 13 46 29 6 3 0 0 1 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 3 15 95 19 1 0 0 0 1 0 | v = [26;27)

0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 3 3 24 32 10 0 2 1 1 0 | w = [27;28)

0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 2 0 0 0 2 3 6 10 35 4 4 0 1 0 | x = [28;29)

0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 1 1 0 0 0 2 8 6 10 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 7 33 4 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 7 10 2 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 2 4 2 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 0 | ac = [33;33.70]

ELET6 – ATRASO C - ANÁLISE 1

Intervalos de Saída:

[5,83;15,12),[15,12;24,41),[24,41;33,70]

Conjunto 1: PLD(t), EAR(t), CE(t), PLD(t-1), EAR(t-1), CE(t-1), PLD(t-2), EAR(t-2), CE(t-2), PLD(t-3), EAR(t-3), CE(t-3), PLD(t-4), EAR(t-4), CE(t-4), PLD(t-5), EAR(t-5), CE(t-5), PLD(t-6), EAR(t-6), CE(t-6), PLD(t-7), EAR(t-7), CE(t-7), PLD(t-8), EAR(t-8), CE(t-8)

Conjunto 2: IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), IBOV(t-6), IBOV(t-7), IBOV(t-8), ELET6(t-1), ELET6(t-2), ELET6(t-3), ELET6(t-4), ELET6(t-5), ELET6(t-6), ELET6(t-7), ELET6(t-8)

Conjunto 3: PLD(t), EAR(t), CE(t), PLD(t-1), EAR(t-1), CE(t-1), PLD(t-2), EAR(t-2), CE(t-2), PLD(t-3), EAR(t-3), CE(t-3), PLD(t-4), EAR(t-4), CE(t-4), PLD(t-5), EAR(t-5), CE(t-5), PLD(t-6), EAR(t-6), CE(t-6), PLD(t-7), EAR(t-7), CE(t-7), PLD(t-8), EAR(t-8), CE(t-8), IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), IBOV(t-6), IBOV(t-7), IBOV(t-8), ELET6(t-1), ELET6(t-2), ELET6(t-3), ELET6(t-4), ELET6(t-5), ELET6(t-6), ELET6(t-7), ELET6(t-8)

CONJUNTO 1

Classificação:

Método 1: Zero-R

Correctly Classified Instances	892	51.7101 %
Incorrectly Classified Instances	833	48.2899 %

=== Confusion Matrix ===

a	b	c	<-- classified as
892	0	0	a = [5.83;15.12)
299	0	0	b = [15.12;24.41)
534	0	0	c = [24.41;33.70]

Método 2: 1R classifier

Correctly Classified Instances	1176	68.1739 %
Incorrectly Classified Instances	549	31.8261 %

=== Confusion Matrix ===

a	b	c	<-- classified as
847	8	37	a = [5.83;15.12)
121	81	97	b = [15.12;24.41)
226	60	248	c = [24.41;33.70]

Método 3: PART decision list

Number of Rules : 121

Time taken to build model: 0.05 seconds

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances	1409	81.6812 %
Incorrectly Classified Instances	316	18.3188 %

=== Confusion Matrix ===

a	b	c	<-- classified as	
793	24	75	a	= [5.83;15.12)
39	203	57	b	= [15.12;24.41)
50	71	413	c	= [24.41;33.70]

Método 4: RIPPER

Number of Rules : 23

Time taken to build model: 0.24 seconds

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances	1329	77.0435 %
Incorrectly Classified Instances	396	22.9565 %

=== Confusion Matrix ===

a	b	c	<-- classified as

807 15 70 | a = [5.83;15.12)

87 154 58 | b = [15.12;24.41)

97 69 368 | c = [24.41;33.70]

Método 5: Decision Tables

Number of Rules : 316

Correctly Classified Instances 1425 82.6087 %

Incorrectly Classified Instances 300 17.3913 %

=== Confusion Matrix ===

a b c <-- classified as

829 18 45 | a = [5.83;15.12)

68 186 45 | b = [15.12;24.41)

91 33 410 | c = [24.41;33.70]

Método 6: REPTree

Size of the tree : 311

Correctly Classified Instances 1401 81.2174 %

Incorrectly Classified Instances 324 18.7826 %

=== Confusion Matrix ===

a b c <-- classified as

806 25 61 | a = [5.83;15.12)

50 174 75 | b = [15.12;24.41)

57 56 421 | c = [24.41;33.70]

Método 7: J48

Number of Leaves : 469

Size of the tree : 521

Correctly Classified Instances 1497 86.7826 %

Incorrectly Classified Instances 228 13.2174 %

=== Confusion Matrix ===

a b c <-- classified as

826 15 51 | a = [5.83;15.12)

35 210 54 | b = [15.12;24.41)

35 38 461 | c = [24.41;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 1279 74.1449 %

Incorrectly Classified Instances 446 25.8551 %

=== Confusion Matrix ===

a b c <-- classified as

725 108 59 | a = [5.83;15.12)

31 190 78 | b = [15.12;24.41)

70 100 364 | c = [24.41;33.70]

Método 9: Random Tree

Size of the tree : 2981

Correctly Classified Instances 1395 80.8696 %

Incorrectly Classified Instances 330 19.1304 %

=== Confusion Matrix ===

a b c <-- classified as

792 40 60 | a = [5.83;15.12)

37 204 58 | b = [15.12;24.41)

49 86 399 | c = [24.41;33.70]

Método 10: Random Forest

Correctly Classified Instances 1480 85.7971 %

Incorrectly Classified Instances 245 14.2029 %

=== Confusion Matrix ===

a b c <-- classified as

833 20 39 | a = [5.83;15.12)

30 202 67 | b = [15.12;24.41)

35 54 445 | c = [24.41;33.70]

Método 11: Rede Neural

Correctly Classified Instances 1471 85.2754 %

Incorrectly Classified Instances 254 14.7246 %

=== Confusion Matrix ===

a b c <-- classified as

831 22 39 | a = [5.83;15.12)

31 183 85 | b = [15.12;24.41)

40 37 457 | c = [24.41;33.70]

CONJUNTO 2

Classificação:

Método 1: Zero-R

Correctly Classified Instances 892 51.7101 %

Incorrectly Classified Instances 833 48.2899 %

=== Confusion Matrix ===

a b c <-- classified as

892 0 0 | a = [5.83;15.12)

299 0 0 | b = [15.12;24.41)

534 0 0 | c = [24.41;33.70]

Método 2: 1R classifier

Correctly Classified Instances 1657 96.058 %

Incorrectly Classified Instances 68 3.942 %

=== Confusion Matrix ===

a b c <-- classified as

889 3 0 | a = [5.83;15.12)

1 298 0 | b = [15.12;24.41)

0 64 470 | c = [24.41;33.70]

Método 3: PART decision list

Number of Rules : 23

Correctly Classified Instances 1665 96.5217 %

Incorrectly Classified Instances 60 3.4783 %

=== Confusion Matrix ===

a b c <-- classified as

889 3 0 | a = [5.83;15.12)

1 270 28 | b = [15.12;24.41)

0 28 506 | c = [24.41;33.70]

Método 4: RIPPER

Number of Rules : 9

Correctly Classified Instances 1652 95.7681 %

Incorrectly Classified Instances 73 4.2319 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 888   4   0 |   a = [5.83;15.12)
   4 286   9 |   b = [15.12;24.41)
   0  56 478 |   c = [24.41;33.70]
```

Método 5: Decision Tables

Number of Rules : 32

Correctly Classified Instances	1658	96.1159 %
Incorrectly Classified Instances	67	3.8841 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   3 289   7 |   b = [15.12;24.41)
   1  53 480 |   c = [24.41;33.70]
```

Método 6: REPTree

Size of the tree : 41

Correctly Classified Instances	1663	96.4058 %
Incorrectly Classified Instances	62	3.5942 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   1 278  20 |   b = [15.12;24.41)
   0  38 496 |   c = [24.41;33.70]
```

Método 7: J48

Number of Leaves : 109

Size of the tree : 121

Correctly Classified Instances 1664 96.4638 %

Incorrectly Classified Instances 61 3.5362 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   1 273  25 |   b = [15.12;24.41)
   0  32 502 |   c = [24.41;33.70]
```

Método 8: Hoeffding Tree

Correctly Classified Instances 1653 95.8261 %

Incorrectly Classified Instances 72 4.1739 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 885   7   0 |   a = [5.83;15.12)
   6 271  22 |   b = [15.12;24.41)
   0  37 497 |   c = [24.41;33.70]
```

Método 9: Random Tree

Size of the tree : 621

Correctly Classified Instances 1670 96.8116 %

Incorrectly Classified Instances 55 3.1884 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 887   5   0 |   a = [5.83;15.12)
   2 275  22 |   b = [15.12;24.41)
   0  26 508 |   c = [24.41;33.70]
```

Método 10: Random Forest

Correctly Classified Instances 1680 97.3913 %

Incorrectly Classified Instances 45 2.6087 %

=== Confusion Matrix ===

a b c <-- classified as

889 3 0 | a = [5.83;15.12)

3 275 21 | b = [15.12;24.41)

0 18 516 | c = [24.41;33.70]

Método 11: Rede Neural

Correctly Classified Instances 1671 96.8696 %

Incorrectly Classified Instances 54 3.1304 %

=== Confusion Matrix ===

a b c <-- classified as

889 3 0 | a = [5.83;15.12)

3 270 26 | b = [15.12;24.41)

0 22 512 | c = [24.41;33.70]

CONJUNTO 3

Classificação:

Método 1: Zero-R

Correctly Classified Instances 892 51.7101 %

Incorrectly Classified Instances 833 48.2899 %

=== Confusion Matrix ===

a b c <-- classified as

892 0 0 | a = [5.83;15.12)

299 0 0 | b = [15.12;24.41)

534 0 0 | c = [24.41;33.70]

Método 2: 1R classifier

Correctly Classified Instances 1657 96.058 %

Incorrectly Classified Instances 68 3.942 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   1 298   0 |   b = [15.12;24.41)
   0  64 470 |   c = [24.41;33.70]
```

Método 3: PART decision list

Number of Rules : 26

Correctly Classified Instances 1680 97.3913 %

Incorrectly Classified Instances 45 2.6087 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   3 273  23 |   b = [15.12;24.41)
   0  16 518 |   c = [24.41;33.70]
```

Método 4: RIPPER

Number of Rules : 15

Correctly Classified Instances 1676 97.1594 %

Incorrectly Classified Instances 49 2.8406 %

=== Confusion Matrix ===

```
  a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
```

7 282 10 | b = [15.12;24.41)

1 28 505 | c = [24.41;33.70]

Método 5: Decision Tables

Number of Rules : 59

Correctly Classified Instances 1657 96.058 %

Incorrectly Classified Instances 68 3.942 %

=== Confusion Matrix ===

a b c <-- classified as

890 2 0 | a = [5.83;15.12)

10 264 25 | b = [15.12;24.41)

8 23 503 | c = [24.41;33.70]

Método 6: REPTree

Size of the tree : 51

Correctly Classified Instances 1676 97.1594 %

Incorrectly Classified Instances 49 2.8406 %

=== Confusion Matrix ===

a b c <-- classified as

889 3 0 | a = [5.83;15.12)

2 281 16 | b = [15.12;24.41)

0 28 506 | c = [24.41;33.70]

Método 7: J48

Number of Leaves : 91

Size of the tree : 101

Correctly Classified Instances 1700 98.5507 %

Incorrectly Classified Instances 25 1.4493 %

=== Confusion Matrix ===

```
   a   b   c   <-- classified as
 889   3   0 |   a = [5.83;15.12)
   1 288  10 |   b = [15.12;24.41)
   0  11 523 |   c = [24.41;33.70]
```

Método 8: Hoeffding Tree

Correctly Classified Instances 1647 95.4783 %

Incorrectly Classified Instances 78 4.5217 %

=== Confusion Matrix ===

```
   a   b   c   <-- classified as
 892   0   0 |   a = [5.83;15.12)
   8 256  35 |   b = [15.12;24.41)
   0  35 499 |   c = [24.41;33.70]
```

Método 9: Random Tree

Size of the tree : 501

Correctly Classified Instances 1685 97.6812 %

Incorrectly Classified Instances 40 2.3188 %

=== Confusion Matrix ===

```
   a   b   c   <-- classified as
 887   5   0 |   a = [5.83;15.12)
   1 279  19 |   b = [15.12;24.41)
   0  15 519 |   c = [24.41;33.70]
```

Método 10: Random Forest

Correctly Classified Instances 1700 98.5507 %

Incorrectly Classified Instances 25 1.4493 %

=== Confusion Matrix ===

a b c <-- classified as

892 0 0 | a = [5.83;15.12)

1 285 13 | b = [15.12;24.41)

0 11 523 | c = [24.41;33.70]

Método 11: Rede Neural

Correctly Classified Instances 1698 98.4348 %

Incorrectly Classified Instances 27 1.5652 %

=== Confusion Matrix ===

a b c <-- classified as

892 0 0 | a = [5.83;15.12)

2 286 11 | b = [15.12;24.41)

0 14 520 | c = [24.41;33.70]

ELET6 – ATRASO C - ANÁLISE 2

10 Intervalos de Saída:

[5.83;8.62), [8.62;11.40), [11.40;14.19), [14.19;16.98), [16.98;19.76), [19.76;22.55), [22.55;25.34), [25.34;28.13), [28.13;30.91), [30.91;33.70]

Conjunto 1: PLD(t), EAR(t), CE(t), PLD(t-1), EAR(t-1), CE(t-1), PLD(t-2), EAR(t-2), CE(t-2), PLD(t-3), EAR(t-3), CE(t-3), PLD(t-4), EAR(t-4), CE(t-4), PLD(t-5), EAR(t-5), CE(t-5), PLD(t-6), EAR(t-6), CE(t-6), PLD(t-7), EAR(t-7), CE(t-7), PLD(t-8), EAR(t-8), CE(t-8)

Conjunto 2: IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), IBOV(t-6), IBOV(t-7), IBOV(t-8), ELET6(t-1), ELET6(t-2), ELET6(t-3), ELET6(t-4), ELET6(t-5), ELET6(t-6), ELET6(t-7), ELET6(t-8)

Conjunto 3: PLD(t), EAR(t), CE(t), PLD(t-1), EAR(t-1), CE(t-1), PLD(t-2), EAR(t-2), CE(t-2), PLD(t-3), EAR(t-3), CE(t-3), PLD(t-4), EAR(t-4), CE(t-4), PLD(t-5), EAR(t-5), CE(t-5), PLD(t-6), EAR(t-6), CE(t-6), PLD(t-7), EAR(t-7), CE(t-7), PLD(t-8), EAR(t-8), CE(t-8), IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), IBOV(t-6), IBOV(t-7), IBOV(t-8), ELET6(t-1), ELET6(t-2), ELET6(t-3), ELET6(t-4), ELET6(t-5), ELET6(t-6), ELET6(t-7), ELET6(t-8)

CONJUNTO 1

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.8841 %

Incorrectly Classified Instances 1175 68.1159 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
  0 195   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  0 550   0   0   0   0   0   0   0   0 |   b = [8.62;11.40)
  0 145   0   0   0   0   0   0   0   0 |   c = [11.40;14.19)
  0  17   0   0   0   0   0   0   0   0 |   d = [14.19;16.98)
  0  91   0   0   0   0   0   0   0   0 |   e = [16.98;19.76)
  0 111   0   0   0   0   0   0   0   0 |   f = [19.76;22.55)
  0 146   0   0   0   0   0   0   0   0 |   g = [22.55;25.34)
  0 298   0   0   0   0   0   0   0   0 |   h = [25.34;28.13)
  0 136   0   0   0   0   0   0   0   0 |   i = [28.13;30.91)
  0  36   0   0   0   0   0   0   0   0 |   j = [30.91;33.70]
```

Método 2: 1R classifier

Correctly Classified Instances 777 45.0435 %

Incorrectly Classified Instances 948 54.9565 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
 85  94   0   0   0   0   0  16   0   0 |   a = [5.83;8.62)
```

13 506 0 0 0 0 0 31 0 0 | b = [8.62;11.40)

0 145 0 0 0 0 0 0 0 0 | c = [11.40;14.19)

0 17 0 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 43 0 0 42 0 0 6 0 0 | e = [16.98;19.76)

0 22 0 0 27 0 0 62 0 0 | f = [19.76;22.55)

0 82 0 0 16 0 0 33 15 0 | g = [22.55;25.34)

0 151 0 0 31 0 0 93 23 0 | h = [25.34;28.13)

0 20 0 0 11 0 0 54 51 0 | i = [28.13;30.91)

0 0 0 0 3 0 0 30 3 0 | j = [30.91;33.70]

Método 3: PART decision list

Number of Rules : 228

Correctly Classified Instances 1055 61.1594 %

Incorrectly Classified Instances 670 38.8406 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

131 51 2 0 0 1 2 7 1 0 | a = [5.83;8.62)

22 450 26 1 5 7 9 26 4 0 | b = [8.62;11.40)

9 40 68 8 2 0 10 7 1 0 | c = [11.40;14.19)

4 2 3 4 3 0 0 1 0 0 | d = [14.19;16.98)

2 16 1 0 57 9 2 4 0 0 | e = [16.98;19.76)

1 8 0 0 9 51 20 6 15 1 | f = [19.76;22.55)

6 11 6 0 2 20 58 28 15 0 | g = [22.55;25.34)

7 20 13 1 8 9 25 165 43 7 | h = [25.34;28.13)

2 2 2 1 3 14 7 43 58 4 | i = [28.13;30.91)

0 0 0 0 0 5 0 11 7 13 | j = [30.91;33.70]

Método 4: RIPPER

Number of Rules : 58

Correctly Classified Instances 929 53.8551 %

Incorrectly Classified Instances 796 46.1449 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
126  63   1   1   0   0   0   4   0   0 |   a = [5.83;8.62)
 27 464  24   8   2   7   2  16   0   0 |   b = [8.62;11.40)
  3  69  58   4   4   1   2   4   0   0 |   c = [11.40;14.19)
  0   9   3   4   1   0   0   0   0   0 |   d = [14.19;16.98)
  0  31   0   0  51   7   2   0   0   0 |   e = [16.98;19.76)
  0  44   1   0   5  41   4  12   4   0 |   f = [19.76;22.55)
  4  71   4   0   1  21  19  11  15   0 |   g = [22.55;25.34)
  3 144   5   0   4   9   8  90  30   5 |   h = [25.34;28.13)
  2  31   0   0   4   1   2  28  66   2 |   i = [28.13;30.91)
  0   8   0   0   0   1   0  13   4  10 |   j = [30.91;33.70]
```

<u>Método 5</u>: Decision Tables

Correctly Classified Instances 967 56.058 %

Incorrectly Classified Instances 758 43.942 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
131  53   1   1   0   2   3   4   0   0 |   a = [5.83;8.62)
 90 404  12   2   5   6   9  22   0   0 |   b = [8.62;11.40)
 16  57  60   0   0   0   8   3   1   0 |   c = [11.40;14.19)
  4   8   0   1   4   0   0   0   0   0 |   d = [14.19;16.98)
  6  21   2   1  48   8   2   2   1   0 |   e = [16.98;19.76)
  7  20   0   0  12  37  10  12  13   0 |   f = [19.76;22.55)
 13  14   2   0   2  22  51  26  16   0 |   g = [22.55;25.34)
 27  41   4   0   4   8  21 162  31   0 |   h = [25.34;28.13)
```

8 9 1 0 0 14 3 29 69 3 | i = [28.13;30.91)

0 1 0 0 0 4 0 13 14 4 | j = [30.91;33.70]

Método 6: REPTree

Size of the tree : 331

Correctly Classified Instances 1022 59.2464 %

Incorrectly Classified Instances 703 40.7536 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

130 47 2 0 0 0 1 14 1 0 | a = [5.83;8.62)

41 448 17 1 9 11 2 20 1 0 | b = [8.62;11.40)

3 61 55 0 6 0 11 9 0 0 | c = [11.40;14.19)

1 10 4 0 2 0 0 0 0 0 | d = [14.19;16.98)

0 14 2 0 57 11 3 4 0 0 | e = [16.98;19.76)

1 6 0 0 11 54 14 16 8 1 | f = [19.76;22.55)

6 14 5 0 2 25 42 35 17 0 | g = [22.55;25.34)

11 22 10 0 6 20 22 176 29 2 | h = [25.34;28.13)

1 4 0 0 5 16 5 46 57 2 | i = [28.13;30.91)

0 0 0 0 0 3 0 25 5 3 | j = [30.91;33.70]

Método 7: J48

Number of Leaves : 1009

Size of the tree : 1121

Correctly Classified Instances 1141 66.1449 %

Incorrectly Classified Instances 584 33.8551 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

146 34 7 0 0 1 4 3 0 0 | a = [5.83;8.62)

32 451 31 1 7 8 7 13 0 0 | b = [8.62;11.40)

6 37 79 5 3 0 7 8 0 0 | c = [11.40;14.19)

1 4 3 8 1 0 0 0 0 0 | d = [14.19;16.98)

0 9 4 3 63 11 0 1 0 0 | e = [16.98;19.76)

0 5 0 0 10 63 14 10 9 0 | f = [19.76;22.55)

6 9 5 0 1 22 63 28 12 0 | g = [22.55;25.34)

4 19 6 0 2 10 24 192 33 8 | h = [25.34;28.13)

2 3 0 0 1 12 6 38 66 8 | i = [28.13;30.91)

0 0 0 0 0 2 0 13 11 10 | j = [30.91;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 733 42.4928 %

Incorrectly Classified Instances 992 57.5072 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

108 27 0 18 0 6 22 14 0 0 | a = [5.83;8.62)

44 274 76 55 13 36 38 14 0 0 | b = [8.62;11.40)

2 55 26 17 4 0 41 0 0 0 | c = [11.40;14.19)

2 3 1 8 1 1 1 0 0 0 | d = [14.19;16.98)

0 7 1 0 52 25 6 0 0 0 | e = [16.98;19.76)

0 0 0 0 27 56 7 0 1 20 | f = [19.76;22.55)

1 15 0 3 23 35 35 14 17 3 | g = [22.55;25.34)

1 37 0 0 24 42 30 82 33 49 | h = [25.34;28.13)

0 3 0 0 4 15 2 11 63 38 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 7 29 | j = [30.91;33.70]

Método 9: Random Tree

Size of the tree : 5691

Correctly Classified Instances 972 56.3478 %

Incorrectly Classified Instances 753 43.6522 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
 130  46   4   4   0   1   5   4   1   0 |   a = [5.83;8.62)
  42 429  31   3   7   9  11  16   2   0 |   b = [8.62;11.40)
   5  45  72   2   6   1   7   7   0   0 |   c = [11.40;14.19)
   0   4   3   6   4   0   0   0   0   0 |   d = [14.19;16.98)
   1   8   5   5  47  15   2   6   2   0 |   e = [16.98;19.76)
   1   9   0   0  13  44  21  12  10   1 |   f = [19.76;22.55)
   5  14  11   0   5  21  45  33  12   0 |   g = [22.55;25.34)
   5  24  10   2  11  12  31 158  41   4 |   h = [25.34;28.13)
   2   2   1   0   6  16  14  55  35   5 |   i = [28.13;30.91)
   0   0   0   0   0   4   0  24   2   6 |   j = [30.91;33.70]
```

Método 10: Random Forest

Correctly Classified Instances 1119 64.8696 %

Incorrectly Classified Instances 606 35.1304 %

=== Confusion Matrix ===

```
  a   b   c   d   e   f   g   h   i   j   <-- classified as
 131  49   3   0   0   1   5   5   1   0 |   a = [5.83;8.62)
  20 477  12   0   7   8   6  19   1   0 |   b = [8.62;11.40)
   4  33  93   1   2   0   5   7   0   0 |   c = [11.40;14.19)
   0  10   5   0   2   0   0   0   0   0 |   d = [14.19;16.98)
   0   9   1   1  62  14   2   2   0   0 |   e = [16.98;19.76)
   0   3   0   0  15  54  19   7  11   2 |   f = [19.76;22.55)
   3   9   6   0   1  29  50  36  11   1 |   g = [22.55;25.34)
   6   8   7   0   4   7  25 189  42  10 |   h = [25.34;28.13)
   1   2   1   0   2  17  13  46  54   0 |   i = [28.13;30.91)
   0   0   0   0   0   5   0  14   8   9 |   j = [30.91;33.70]
```

Método 11: Rede Neural

Correctly Classified Instances 1122 65.0435 %

Incorrectly Classified Instances 603 34.9565 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 141  41   2   0   0   1   4   6   0   0 |   a = [5.83;8.62)
  37 459  19   0   6   7   5  17   0   0 |   b = [8.62;11.40)
   3  34  87   3   5   0   6   7   0   0 |   c = [11.40;14.19)
   0   6   1   5   4   0   0   1   0   0 |   d = [14.19;16.98)
   0   4   5   1  63  11   2   5   0   0 |   e = [16.98;19.76)
   2   5   2   0  13  52  16  11   9   1 |   f = [19.76;22.55)
   3   5   4   0   7  19  55  38  15   0 |   g = [22.55;25.34)
   3  10   6   2   9   9  22 189  40   8 |   h = [25.34;28.13)
   1   2   0   0   2  12   9  43  60   7 |   i = [28.13;30.91)
   0   0   0   0   1   2   0  17   5  11 |   j = [30.91;33.70]
```

CONJUNTO 2

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.8841 %

Incorrectly Classified Instances 1175 68.1159 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
```

0 195 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

0 550 0 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 145 0 0 0 0 0 0 0 0 | c = [11.40;14.19)

0 17 0 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 91 0 0 0 0 0 0 0 0 | e = [16.98;19.76)

0 111 0 0 0 0 0 0 0 0 | f = [19.76;22.55)

0 146 0 0 0 0 0 0 0 0 | g = [22.55;25.34)

0 298 0 0 0 0 0 0 0 0 | h = [25.34;28.13)

0 136 0 0 0 0 0 0 0 0 | i = [28.13;30.91)

0 36 0 0 0 0 0 0 0 0 | j = [30.91;33.70]

Método 2: 1R classifier

Correctly Classified Instances 1584 91.8261 %

Incorrectly Classified Instances 141 8.1739 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 3: PART decision list

Number of Rules : 46

Correctly Classified Instances 1563 90.6087 %

Incorrectly Classified Instances 162 9.3913 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 174  20   1   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  14 524  10   0   0   1   0   1   0   0 |   b = [8.62;11.40)
   0  11 133   1   0   0   0   0   0   0 |   c = [11.40;14.19)
   0   1   1  12   3   0   0   0   0   0 |   d = [14.19;16.98)
   0   0   0   8  79   4   0   0   0   0 |   e = [16.98;19.76)
   0   0   0   0   4 101   5   1   0   0 |   f = [19.76;22.55)
   0   0   0   0   0   9 121  16   0   0 |   g = [22.55;25.34)
   0   0   0   0   0   1  11 274  12   0 |   h = [25.34;28.13)
   0   0   0   0   0   0   0  16 115   5 |   i = [28.13;30.91)
   0   0   0   0   0   0   0   0   6  30 |   j = [30.91;33.70]
```

<u>Método 4</u>: RIPPER

Number of Rules : 13

Correctly Classified Instances 1574 91.2464 %

Incorrectly Classified Instances 151 8.7536 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 177  18   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  16 524  10   0   0   0   0   0   0   0 |   b = [8.62;11.40)
   0  10 134   1   0   0   0   0   0   0 |   c = [11.40;14.19)
   0   0   1  13   3   0   0   0   0   0 |   d = [14.19;16.98)
   0   0   0   4  83   4   0   0   0   0 |   e = [16.98;19.76)
   0   0   0   0   4 101   6   0   0   0 |   f = [19.76;22.55)
   0   0   0   0   0  13 121  12   0   0 |   g = [22.55;25.34)
```

0 0 0 0 0 0 12 270 16 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 119 6 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 5: Decision Tables

Number of Rules : 10

Correctly Classified Instances 1584 91.8261 %

Incorrectly Classified Instances 141 8.1739 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 6: REPTree

Size of the tree : 31

Correctly Classified Instances 1580 91.5942 %

Incorrectly Classified Instances 145 8.4058 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 5 99 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 125 14 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 12 119 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 7: J48

Number of Leaves : 10

Size of the tree : 11

Correctly Classified Instances 1584 91.8261 %

Incorrectly Classified Instances 141 8.1739 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 1428 82.7826 %

Incorrectly Classified Instances 297 17.2174 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 165  25   5   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  36 474  40   0   0   0   0   0   0   0 |   b = [8.62;11.40)
   0  14 126   5   0   0   0   0   0   0 |   c = [11.40;14.19)
   0   0   2  11   4   0   0   0   0   0 |   d = [14.19;16.98)
   0   0   4   1  79   7   0   0   0   0 |   e = [16.98;19.76)
   0   0   0   0  10  90  11   0   0   0 |   f = [19.76;22.55)
   0   0   0   0   0  17  99  29   1   0 |   g = [22.55;25.34)
   0   0   0   0   0   0  24 256  18   0 |   h = [25.34;28.13)
   0   0   0   0   0   0   4  19  97  16 |   i = [28.13;30.91)
   0   0   0   0   0   0   0   0   5  31 |   j = [30.91;33.70]
```

Método 9: Random Tree

Size of the tree : 3781

Correctly Classified Instances 1459 84.5797 %

Incorrectly Classified Instances 266 15.4203 %

=== Confusion Matrix ===

```
   a   b   c   d   e   f   g   h   i   j   <-- classified as
 165  30   0   0   0   0   0   0   0   0 |   a = [5.83;8.62)
  32 502  16   0   0   0   0   0   0   0 |   b = [8.62;11.40)
   0  19 125   1   0   0   0   0   0   0 |   c = [11.40;14.19)
   0   0   3  10   4   0   0   0   0   0 |   d = [14.19;16.98)
   0   0   0   2  83   6   0   0   0   0 |   e = [16.98;19.76)
   0   0   0   0   9  91  11   0   0   0 |   f = [19.76;22.55)
   0   0   0   0   0  13 109  23   1   0 |   g = [22.55;25.34)
```

0 0 0 0 0 1 24 248 24 1 | h = [25.34;28.13)

0 0 0 0 0 0 1 26 100 9 | i = [28.13;30.91)

0 0 0 0 0 0 0 1 9 26 | j = [30.91;33.70]

Método 10: Random Forest

Correctly Classified Instances 1546 89.6232 %

Incorrectly Classified Instances 179 10.3768 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

173 22 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 523 11 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 13 130 2 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 2 11 4 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 2 85 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 5 99 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 10 122 13 1 0 | g = [22.55;25.34)

0 0 0 0 0 0 19 258 21 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 17 114 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 5 31 | j = [30.91;33.70]

Método 11: Rede Neural

Correctly Classified Instances 1505 87.2464 %

Incorrectly Classified Instances 220 12.7536 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

166 29 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

21 518 11 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 16 128 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 11 5 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 2 83 6 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 96 11 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 12 114 19 1 0 | g = [22.55;25.34)

0 0 0 0 0 0 19 256 23 0 | h = [25.34;28.13)

0 0 0 0 0 1 0 23 108 4 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 11 25 | j = [30.91;33.70]

CONJUNTO 3

Classificação:

Método 1: Zero-R

Correctly Classified Instances 550 31.8841 %

Incorrectly Classified Instances 1175 68.1159 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

0 195 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

0 550 0 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 145 0 0 0 0 0 0 0 0 | c = [11.40;14.19)

0 17 0 0 0 0 0 0 0 0 | d = [14.19;16.98)

0 91 0 0 0 0 0 0 0 0 | e = [16.98;19.76)

0 111 0 0 0 0 0 0 0 0 | f = [19.76;22.55)

0 146 0 0 0 0 0 0 0 0 | g = [22.55;25.34)

0 298 0 0 0 0 0 0 0 0 | h = [25.34;28.13)

0 136 0 0 0 0 0 0 0 0 | i = [28.13;30.91)

0 36 0 0 0 0 0 0 0 0 | j = [30.91;33.70]

Método 2: 1R classifier

Correctly Classified Instances 1584 91.8261 %

Incorrectly Classified Instances 141 8.1739 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	524	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	13	3	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	4	100	7	0	0	0	f = [19.76;22.55)
0	0	0	0	0	7	127	12	0	0	g = [22.55;25.34)
0	0	0	0	0	0	12	273	13	0	h = [25.34;28.13)
0	0	0	0	0	0	0	11	120	5	i = [28.13;30.91)
0	0	0	0	0	0	0	0	4	32	j = [30.91;33.70]

Método 3: PART decision list

Number of Rules : 54

Correctly Classified Instances 1552 89.971 %

Incorrectly Classified Instances 173 10.029 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
175	19	0	0	0	0	0	0	1	0	a = [5.83;8.62)
22	517	11	0	0	0	0	0	0	0	b = [8.62;11.40)
0	13	131	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	11	3	2	0	0	0	0	d = [14.19;16.98)
0	0	0	4	83	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	3	98	10	0	0	0	f = [19.76;22.55)
0	0	0	0	0	10	118	15	3	0	g = [22.55;25.34)
0	0	0	0	0	0	14	271	13	0	h = [25.34;28.13)
0	0	0	0	0	0	0	15	116	5	i = [28.13;30.91)
0	0	0	0	0	0	0	0	4	32	j = [30.91;33.70]

Método 4: RIPPER

Number of Rules : 17

Correctly Classified Instances 1569 90.9565 %

Incorrectly Classified Instances 156 9.0435 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
20	519	11	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	12	4	0	0	0	0	0	d = [14.19;16.98)
0	0	0	4	83	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	6	98	7	0	0	0	f = [19.76;22.55)
0	0	0	1	0	10	123	12	0	0	g = [22.55;25.34)
0	0	0	0	0	0	12	272	14	0	h = [25.34;28.13)
0	0	0	0	0	0	0	11	119	6	i = [28.13;30.91)
0	0	0	0	0	0	0	0	4	32	j = [30.91;33.70]

Método 5: Decision Tables

Number of Rules : 10

Correctly Classified Instances 1584 91.8261 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	524	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	13	3	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 4 32 | j = [30.91;33.70]

Método 6: REPTree

Size of the tree : 11

Correctly Classified Instances 1584 91.8261 %

Incorrectly Classified Instances 141 8.1739 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

177 18 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

16 524 10 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 10 134 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 1 13 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 3 84 4 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 4 100 7 0 0 0 | f = [19.76;22.55)

0 0 0 0 0 7 127 12 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 12 273 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 11 120 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 1 3 32 | j = [30.91;33.70]

Método 7: J48

Number of Leaves : 19

Size of the tree : 21

Correctly Classified Instances 1582 91.7101 %

Incorrectly Classified Instances 143 8.2899 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
177	18	0	0	0	0	0	0	0	0	a = [5.83;8.62)
16	524	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	10	134	1	0	0	0	0	0	0	c = [11.40;14.19)
0	0	1	11	5	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	84	4	0	0	0	0	e = [16.98;19.76)
0	0	0	0	4	100	7	0	0	0	f = [19.76;22.55)
0	0	0	0	0	7	127	12	0	0	g = [22.55;25.34)
0	0	0	0	0	0	12	273	13	0	h = [25.34;28.13)
0	0	0	0	0	0	0	11	120	5	i = [28.13;30.91)
0	0	0	0	0	0	0	0	4	32	j = [30.91;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances	1422	82.4348 %
Incorrectly Classified Instances	303	17.5652 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
160	28	2	5	0	0	0	0	0	0	a = [5.83;8.62)
42	477	30	1	0	0	0	0	0	0	b = [8.62;11.40)
0	16	124	5	0	0	0	0	0	0	c = [11.40;14.19)
0	0	2	12	3	0	0	0	0	0	d = [14.19;16.98)
0	0	2	3	79	5	2	0	0	0	e = [16.98;19.76)
0	0	0	0	7	97	7	0	0	0	f = [19.76;22.55)
0	0	0	0	0	24	99	20	3	0	g = [22.55;25.34)
0	0	0	0	0	0	33	244	21	0	h = [25.34;28.13)
0	0	0	0	0	0	3	22	99	12	i = [28.13;30.91)
0	0	0	0	0	0	0	0	5	31	j = [30.91;33.70]

Método 9: Random Tree

Size of the tree : 2331

Correctly Classified Instances 1435 83.1884 %

Incorrectly Classified Instances 290 16.8116 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
157	36	1	1	0	0	0	0	0	0	a = [5.83;8.62)
35	496	17	0	2	0	0	0	0	0	b = [8.62;11.40)
1	21	121	1	1	0	0	0	0	0	c = [11.40;14.19)
0	0	2	12	3	0	0	0	0	0	d = [14.19;16.98)
0	0	2	4	75	10	0	0	0	0	e = [16.98;19.76)
0	0	0	0	9	92	10	0	0	0	f = [19.76;22.55)
0	0	0	0	0	18	105	23	0	0	g = [22.55;25.34)
0	0	0	0	0	0	24	251	23	0	h = [25.34;28.13)
0	0	0	0	0	0	3	21	101	11	i = [28.13;30.91)
0	0	0	0	0	0	0	1	10	25	j = [30.91;33.70]

Método 10: Random Forest

Correctly Classified Instances 1545 89.5652 %

Incorrectly Classified Instances 180 10.4348 %

=== Confusion Matrix ===

a	b	c	d	e	f	g	h	i	j	<-- classified as
171	23	1	0	0	0	0	0	0	0	a = [5.83;8.62)
17	523	10	0	0	0	0	0	0	0	b = [8.62;11.40)
0	14	129	2	0	0	0	0	0	0	c = [11.40;14.19)
0	0	2	12	3	0	0	0	0	0	d = [14.19;16.98)
0	0	0	3	82	6	0	0	0	0	e = [16.98;19.76)
0	0	0	0	5	98	8	0	0	0	f = [19.76;22.55)

0 0 0 0 0 13 118 15 0 0 | g = [22.55;25.34)

0 0 0 0 0 0 15 270 13 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 19 112 5 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 6 30 | j = [30.91;33.70]

Método 11: Rede Neural

Correctly Classified Instances 1525 88.4058 %

Incorrectly Classified Instances 200 11.5942 %

=== Confusion Matrix ===

a b c d e f g h i j <-- classified as

168 27 0 0 0 0 0 0 0 0 | a = [5.83;8.62)

20 518 12 0 0 0 0 0 0 0 | b = [8.62;11.40)

0 15 129 1 0 0 0 0 0 0 | c = [11.40;14.19)

0 0 2 12 3 0 0 0 0 0 | d = [14.19;16.98)

0 0 0 2 84 5 0 0 0 0 | e = [16.98;19.76)

0 0 0 0 5 96 9 1 0 0 | f = [19.76;22.55)

0 0 0 0 0 18 110 17 1 0 | g = [22.55;25.34)

0 0 0 0 0 0 10 271 17 0 | h = [25.34;28.13)

0 0 0 0 0 0 0 19 111 6 | i = [28.13;30.91)

0 0 0 0 0 0 0 0 10 26 | j = [30.91;33.70]

ELET6 – ATRASO C - ANÁLISE 3

29 Intervalos de Saída:

[5.83;8.62), [8.62;11.40), [11.40;14.19), [14.19;16.98), [16.98;19.76), [19.76;22.55), [22.55;25.34), [25.34;28.13), [28.13;30.91), [30.91;33.70]

Conjunto 1: PLD(t), EAR(t), CE(t), PLD(t-1), EAR(t-1), CE(t-1), PLD(t-2), EAR(t-2), CE(t-2), PLD(t-3), EAR(t-3), CE(t-3), PLD(t-4), EAR(t-4), CE(t-4), PLD(t-5), EAR(t-

5), CE(t-5), PLD(t-6), EAR(t-6), CE(t-6), PLD(t-7), EAR(t-7), CE(t-7), PLD(t-8), EAR(t-8), CE(t-8)

Conjunto 2: IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), IBOV(t-6), IBOV(t-7), IBOV(t-8), ELET6(t-1), ELET6(t-2), ELET6(t-3), ELET6(t-4), ELET6(t-5), ELET6(t-6), ELET6(t-7), ELET6(t-8)

Conjunto 3: PLD(t), EAR(t), CE(t), PLD(t-1), EAR(t-1), CE(t-1), PLD(t-2), EAR(t-2), CE(t-2), PLD(t-3), EAR(t-3), CE(t-3), PLD(t-4), EAR(t-4), CE(t-4), PLD(t-5), EAR(t-5), CE(t-5), PLD(t-6), EAR(t-6), CE(t-6), PLD(t-7), EAR(t-7), CE(t-7), PLD(t-8), EAR(t-8), CE(t-8), IBOV(t), IBOV(t-1), IBOV(t-2), IBOV(t-3), IBOV(t-4), IBOV(t-5), IBOV(t-6), IBOV(t-7), IBOV(t-8), ELET6(t-1), ELET6(t-2), ELET6(t-3), ELET6(t-4), ELET6(t-5), ELET6(t-6), ELET6(t-7), ELET6(t-8)

CONJUNTO 1

Classificação:

Método 1: Zero-R

Correctly Classified Instances 236 13.6812 %

Incorrectly Classified Instances 1489 86.3188 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 0 0 153 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 0 0 187 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 236 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 64 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 2: 1R classifier

Correctly Classified Instances 413 23.942 %

Incorrectly Classified Instances 1312 76.058 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 28 0 21 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 16 0 90 0 47 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 6 0 65 0 115 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 31 0 199 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 15 0 91 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 15 0 48 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 5 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 7 0 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 13 1 0 0 0 0 0 0 3 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 2 0 20 2 0 0 0 0 0 0 5 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 4 0 8 0 0 0 0 0 0 0 0 6 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 17 0 8 0 0 0 0 0 0 0 1 3 0 0 0 0 0 0 11 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 8 0 8 2 0 0 0 0 0 0 0 6 11 0 0 0 0 0 0 0 10 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 7 0 7 0 0 0 0 0 0 0 0 7 6 0 0 0 0 0 0 0 14 0 1 0 0 0 0 0 0 | r = [22;23)

0 0 0 11 0 10 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 11 0 8 0 0 0 0 0 0 | s = [23;24)

0 0 0 7 0 37 0 0 0 0 0 0 0 0 2 1 0 0 0 0 0 0 0 5 0 7 0 0 0 0 0 0 | t = [24;25)

0 0 0 13 0 52 1 0 0 0 0 0 0 0 5 10 0 0 0 0 0 0 0 16 0 4 0 0 0 0 0 0 | u = [25;26)

0 0 0 32 0 50 1 0 0 0 0 0 0 0 6 8 0 0 0 0 0 0 0 27 0 11 0 0 0 0 0 0 | v = [26;27)

0 0 0 16 0 39 0 0 0 0 0 0 0 0 2 4 0 0 0 0 0 0 0 13 0 4 0 0 0 0 0 0 | w = [27;28)

0 0 0 4 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 30 0 0 0 0 0 0 | x = [28;29)

0 0 0 6 0 3 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 13 0 7 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 0 0 0 0 0 0 0 19 0 20 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 13 0 6 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 9 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 | ac = [33;33.70]

Método 3: PART decision list

Number of Rules : 292

Correctly Classified Instances 683 39.5942 %

Incorrectly Classified Instances 1042 60.4058 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

2 31 14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

2 10 33 6 8 3 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 | c = [7;8)

0 3 13 75 29 15 2 2 0 0 0 0 0 0 0 2 0 1 0 2 2 5 2 0 0 0 0 0 0 | d = [8;9)

0 0 7 27 76 47 8 3 0 0 0 0 1 0 0 5 0 1 0 2 3 5 2 0 0 0 0 0 0 | e = [9;10)

0 0 6 10 32 147 14 6 2 0 0 1 1 1 1 0 0 0 0 1 4 8 1 1 0 0 0 0 0 | f = [10;11)

0 0 3 4 10 26 37 14 0 0 0 0 3 4 0 0 0 0 0 3 1 1 2 0 0 0 0 0 0 | g = [11;12)

0 0 3 3 3 9 15 18 5 0 0 0 0 1 0 0 0 0 0 0 4 2 1 0 0 0 0 0 0 | h = [12;13)

0 0 0 2 1 0 0 7 9 0 0 0 0 0 0 0 1 0 0 2 2 1 0 0 0 0 0 0 0 | i = [13;14)

0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 2 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 1 1 1 1 1 0 0 0 5 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 3 2 1 0 0 0 1 6 0 2 0 1 0 0 0 1 0 3 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 3 3 1 0 0 0 0 3 18 6 1 5 1 0 1 0 1 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 3 2 1 0 0 1 0 0 0 0 8 11 2 0 0 0 0 0 0 0 0 1 2 0 0 0 | o = [19;20)

0 0 0 3 3 0 0 0 0 0 0 0 0 1 4 14 4 2 0 0 2 0 1 0 1 4 1 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 3 18 8 0 2 2 0 2 3 0 1 0 2 0 | q = [21;22)

0 0 0 1 0 0 1 1 0 0 0 0 1 0 1 1 10 9 2 1 1 6 4 2 0 0 0 1 0 | r = [22;23)

0 0 3 1 3 0 0 1 1 0 0 0 0 0 0 2 0 1 14 3 2 5 0 4 0 1 0 1 0 | s = [23;24)

0 0 0 6 2 1 0 5 0 0 0 1 0 1 0 2 6 2 6 4 5 6 5 7 0 0 0 0 0 | t = [24;25)

0 0 0 4 3 2 0 3 1 0 0 0 0 0 3 5 6 3 1 4 33 19 1 9 2 1 1 0 0 | u = [25;26)

0 0 1 6 3 2 2 2 1 0 0 0 1 1 0 1 0 4 4 8 15 53 10 8 3 7 2 1 0 | v = [26;27)

0 0 2 1 4 4 2 1 1 0 0 1 1 2 0 1 2 1 5 2 5 11 22 8 0 1 1 0 0 | w = [27;28)

0 0 0 3 0 2 1 0 0 0 0 0 1 0 0 2 3 1 3 7 3 5 10 21 1 4 1 1 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 1 5 3 4 8 5 1 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 3 0 1 2 3 5 1 8 4 12 3 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 3 0 3 0 0 4 8 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 1 2 3 1 0 0 0 0 1 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 0 0 0 0 0 0 | ac = [33;33.70]

<u>Método 4</u>: RIPPER

Number of Rules : 76

Correctly Classified Instances 521 30.2029 %

Incorrectly Classified Instances 1204 69.7971 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 39 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 11 36 0 1 16 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 10 42 15 74 1 0 0 0 0 0 0 0 0 3 0 0 0 0 0 1 0 2 0 0 0 0 0 | d = [8;9)

1 0 8 20 32 111 1 2 1 0 0 2 0 1 0 4 0 0 0 0 0 4 0 0 0 0 0 0 0 | e = [9;10)

0 0 1 4 18 185 18 2 0 0 0 3 1 3 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | f = [10;11)

0 0 1 1 1 53 39 6 1 0 0 0 2 2 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 1 1 0 49 5 4 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 0 15 0 0 8 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 1 1 5 0 0 0 0 0 2 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 10 1 0 0 0 0 0 7 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 20 2 0 0 0 0 0 3 13 3 0 0 1 0 0 0 0 1 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 17 0 0 0 0 0 0 0 4 8 0 0 1 0 0 1 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 3 0 23 0 0 0 0 0 0 0 0 0 11 2 0 0 0 0 0 1 0 0 0 0 0 0 | p = [20;21)

0 0 0 2 0 33 0 0 0 0 0 0 3 1 0 1 2 2 0 0 1 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 2 0 18 0 0 0 0 0 0 1 1 0 0 3 16 0 0 1 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 3 0 26 0 0 0 0 0 0 0 0 0 0 1 1 10 0 0 0 0 1 0 0 0 0 0 | s = [23;24)

0 0 1 7 0 39 0 2 0 0 0 0 0 0 0 0 1 0 5 0 0 0 0 4 0 0 0 0 0 | t = [24;25)

0 0 0 1 1 71 0 1 0 0 0 0 0 0 0 0 3 0 1 0 10 6 0 2 1 1 3 0 0 | u = [25;26)

0 0 0 2 2 94 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 25 3 2 1 1 2 0 0 | v = [26;27)

0 0 2 5 0 51 1 0 0 0 0 0 0 1 0 0 1 0 1 1 0 8 4 2 0 1 0 0 0 | w = [27;28)

0 0 0 5 0 50 1 0 0 0 0 0 1 0 0 0 0 0 1 0 1 1 0 8 0 1 0 0 0 | x = [28;29)

0 0 0 0 0 19 0 0 0 0 0 0 0 0 2 0 0 1 0 1 2 0 0 0 1 5 0 0 0 | y = [29;30)

0 0 0 0 0 22 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 4 0 3 4 10 2 0 0 | z = [30;31)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 9 0 0 | aa = [31;32)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 | ac = [33;33.70]

<u>Método 5</u>: Decision Tables

Number of Rules : 465

Correctly Classified Instances 646 37.4493 %

Incorrectly Classified Instances 1079 62.5507 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

4 39 3 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

8 9 32 8 4 3 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

14 3 11 68 21 18 0 1 0 0 0 0 0 0 1 3 0 0 0 3 3 6 0 1 0 0 0 0 0 | d = [8;9)

17 0 5 19 85 42 2 3 0 0 0 2 0 1 0 3 0 0 0 0 4 4 0 0 0 0 0 0 0 | e = [9;10)

24 0 0 16 39 137 4 2 0 0 0 0 1 3 0 0 3 0 0 0 6 1 0 0 0 0 0 0 0 | f = [10;11)

11 0 2 7 2 24 45 5 0 0 0 0 2 3 0 0 0 1 0 1 0 3 2 0 0 0 0 0 0 | g = [11;12)

9 0 0 11 4 13 10 6 5 0 0 0 0 0 0 0 0 0 0 3 0 1 2 0 0 0 0 0 0 | h = [12;13)

2 0 0 0 0 5 2 2 7 1 0 0 0 0 0 0 0 0 0 0 5 1 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

1 0 0 0 3 1 3 0 1 0 0 3 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 | l = [16;17)

2 0 0 0 1 1 6 0 0 0 0 0 4 3 0 0 0 2 0 0 0 0 1 0 0 0 0 0 | m = [17;18)

3 0 0 1 5 4 2 0 0 0 0 0 3 15 5 0 4 1 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

1 0 0 4 0 0 0 0 0 0 0 0 2 8 9 2 4 0 0 0 0 1 0 0 0 0 0 0 | o = [19;20)

1 0 0 4 3 1 0 0 0 0 0 0 0 1 1 9 4 3 1 0 2 6 0 0 0 2 2 0 | p = [20;21)

0 0 0 0 0 4 0 0 0 0 0 0 0 2 1 2 16 8 0 0 2 5 3 0 0 1 1 0 | q = [21;22)

2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 6 19 1 0 2 4 4 0 0 0 0 0 | r = [22;23)

1 0 1 1 0 1 1 0 0 0 0 0 0 0 0 1 2 2 14 6 0 6 2 3 0 0 1 0 | s = [23;24)

3 0 1 10 1 6 1 1 0 0 0 0 0 0 0 1 4 0 4 7 2 9 0 9 0 0 0 0 0 | t = [24;25)

6 0 0 11 1 12 0 0 1 0 0 0 0 1 2 4 7 0 0 12 18 20 0 3 2 1 0 0 0 | u = [25;26)

9 0 0 6 2 7 1 0 0 0 0 0 0 3 3 5 1 3 3 5 9 58 5 10 0 4 1 0 0 | v = [26;27)

6 0 1 6 2 5 2 0 2 0 0 0 4 0 1 2 2 1 3 2 6 14 10 7 0 2 0 0 0 | w = [27;28)

3 0 0 6 2 3 0 0 0 0 0 0 0 0 0 2 1 0 1 3 0 8 6 27 0 3 4 0 0 | x = [28;29)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 3 5 2 7 3 7 0 0 0 | y = [29;30)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 1 2 0 2 0 1 10 0 14 3 9 2 0 0 | z = [30;31)

2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 0 0 0 5 0 1 0 3 6 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 5 0 0 0 1 2 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 0 0 0 0 0 0 | ac = [33;33.70]

<u>Método 6</u>: REPTree

Size of the tree : 421

Correctly Classified Instances 599 34.7246 %

Incorrectly Classified Instances 1126 65.2754 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 38 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 10 38 5 5 5 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | c = [7;8)

0 6 13 78 19 20 2 1 0 0 1 1 0 0 0 4 1 0 0 3 1 2 0 0 1 0 0 0 0 | d = [8;9)

0 0 11 23 63 60 8 0 0 0 0 2 1 0 0 6 0 0 0 0 5 6 2 0 0 0 0 0 0 | e = [9;10)

0 0 8 12 42 133 13 3 0 0 0 3 3 5 0 0 0 0 0 0 6 7 1 0 0 0 0 0 0 | f = [10;11)

0 0 3 11 9 33 36 5 1 0 0 0 0 6 1 0 0 0 0 0 0 1 2 0 0 0 0 0 0 | g = [11;12)

0 0 3 6 2 20 10 5 5 0 0 1 0 1 1 1 0 0 0 0 2 7 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 1 2 0 7 2 0 0 0 0 1 0 0 0 0 0 1 0 11 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 3 3 1 0 0 0 0 4 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 1 6 3 0 0 0 0 0 3 3 0 0 2 2 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 1 4 4 0 0 0 0 0 5 17 3 0 7 0 0 0 1 1 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 1 2 0 0 0 0 0 0 8 2 5 9 0 0 0 1 1 0 0 2 0 0 0 0 | o = [19;20)

0 0 0 1 0 2 0 0 0 0 0 0 0 2 0 22 3 1 0 0 1 0 1 0 0 5 2 0 0 | p = [20;21)

0 0 0 4 0 3 0 0 0 0 0 0 1 1 0 3 19 1 0 0 6 0 1 1 0 4 1 0 0 | q = [21;22)

0 0 0 4 0 0 0 0 1 0 0 0 1 2 0 4 9 10 2 1 1 4 1 1 0 1 0 0 0 | r = [22;23)

0 0 2 2 0 0 1 1 4 0 0 0 0 0 0 6 2 1 6 1 3 4 1 7 0 1 0 0 0 | s = [23;24)

0 0 3 8 0 5 1 3 1 0 0 0 0 2 0 1 6 1 1 1 3 13 2 7 0 1 0 0 0 | t = [24;25)

0 0 0 10 4 9 4 2 3 0 0 0 0 0 1 9 6 1 0 1 16 24 3 3 0 2 3 0 0 | u = [25;26)

0 0 2 9 1 8 2 2 3 0 0 0 0 2 0 5 1 3 4 5 7 56 6 11 3 0 4 1 0 | v = [26;27)

0 0 2 5 0 6 1 1 3 0 0 0 1 3 0 3 3 2 0 1 10 16 9 9 0 1 2 0 0 | w = [27;28)

0 0 0 7 0 5 0 0 0 0 0 0 0 1 0 3 4 0 0 1 1 7 4 26 0 5 5 0 0 | x = [28;29)

0 0 0 2 0 0 0 0 0 0 0 0 0 1 0 1 2 0 3 0 2 5 6 4 2 3 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 5 3 1 2 1 0 6 0 14 2 8 2 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 1 3 3 1 2 1 2 5 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 0 0 2 2 2 0 0 1 0 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 1 0 0 | ac = [33;33.70]

Método 7: J48

Number of Leaves : 1540

Size of the tree : 1711

Correctly Classified Instances 768 44.5217 %

Incorrectly Classified Instances 957 55.4783 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 45 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 16 34 8 4 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 | c = [7;8)

0 5 10 89 22 8 2 1 0 0 0 0 0 0 0 2 2 1 0 2 5 3 1 0 0 0 0 0 0 | d = [8;9)

0 0 5 28 90 47 3 1 0 0 0 1 1 0 0 3 1 0 0 0 1 4 1 1 0 0 0 0 0 | e = [9;10)

0 0 4 11 48 140 14 2 0 0 0 2 2 3 1 0 0 0 1 3 2 3 0 0 0 0 0 0 0 | f = [10;11)

0 0 4 3 8 21 49 10 1 0 0 1 1 3 1 0 0 0 0 2 2 1 1 0 0 0 0 0 0 | g = [11;12)

0 0 1 1 5 6 13 22 6 0 1 0 0 1 0 0 0 0 0 2 4 2 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 1 0 1 9 7 0 0 0 0 0 0 0 0 0 1 1 1 3 0 1 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 3 1 0 0 0 1 0 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 6 0 0 0 0 0 3 8 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 2 2 0 0 0 0 0 2 29 2 1 2 0 0 0 1 1 1 0 0 0 0 0 0 | n = [18;19)

0 0 0 2 1 2 1 0 0 0 0 0 0 7 13 1 0 0 1 0 0 1 1 0 0 1 0 0 0 | o = [19;20)

0 0 0 2 3 0 0 0 0 0 0 0 0 0 4 13 4 2 1 1 2 1 0 2 0 4 1 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 1 6 13 9 2 1 1 1 2 1 0 1 0 2 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 3 13 17 4 2 0 0 0 1 0 0 0 0 0 | r = [22;23)

0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 2 1 4 19 5 1 4 0 3 0 0 1 0 0 | s = [23;24)

0 0 1 6 1 3 0 4 1 0 0 0 0 0 0 3 6 3 6 4 6 4 2 7 2 0 0 0 0 | t = [24;25)

0 0 0 7 3 5 3 3 0 0 0 0 0 1 3 3 6 0 0 6 31 17 4 5 0 1 3 0 0 | u = [25;26)

0 0 1 7 2 1 1 3 1 0 0 0 0 1 0 0 2 2 3 5 19 49 14 8 2 7 5 2 0 | v = [26;27)

0 0 1 6 1 3 1 0 0 0 0 0 0 1 1 1 0 0 2 2 6 11 27 10 0 3 1 1 0 | w = [27;28)

0 0 0 2 1 4 0 0 0 0 0 0 1 0 1 3 3 0 0 6 2 7 9 25 0 4 0 1 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 3 2 3 2 10 8 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 3 0 1 1 0 5 1 7 5 15 2 0 1 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 5 1 2 0 0 1 10 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 3 1 0 0 1 0 2 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 3 0 0 0 | ac = [33;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 501 29.0435 %

Incorrectly Classified Instances 1224 70.9565 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 17 19 14 2 10 0 0 0 0 0 2 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 | c = [7;8)

0 7 15 62 5 4 1 4 0 0 4 6 0 0 0 10 0 3 2 18 0 0 12 0 0 0 0 0 0 | d = [8;9)

0 0 34 10 25 38 11 17 1 0 1 12 1 3 0 8 2 2 0 10 6 1 5 0 0 0 0 0 0 | e = [9;10)

0 0 22 5 16 105 20 18 6 0 0 7 3 9 0 0 5 0 1 11 6 1 1 0 0 0 0 0 0 | f = [10;11)

0 0 3 8 3 28 38 8 7 1 0 0 2 6 0 0 1 0 1 1 1 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 4 8 1 6 17 2 12 0 0 4 1 0 0 0 0 0 1 8 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 2 0 0 0 15 4 0 0 0 0 0 0 0 0 1 2 1 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 1 3 0 2 0 0 0 0 0 4 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 1 2 0 0 0 0 2 4 7 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 2 14 13 3 7 0 0 4 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 4 13 4 7 0 0 3 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 4 1 18 2 0 0 2 0 0 0 0 1 9 3 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 14 2 1 13 2 0 0 0 3 0 0 2 6 2 0 | q = [21;22)

0 0 0 0 0 0 0 0 3 0 0 0 0 9 0 7 4 15 0 0 0 0 0 0 0 4 0 0 | r = [22;23)

0 0 0 5 0 0 0 0 9 0 0 0 0 1 0 7 1 1 6 0 3 0 0 4 0 5 0 0 | s = [23;24)

0 0 0 7 2 0 0 0 11 0 0 0 0 4 0 1 3 0 4 10 6 0 3 6 0 1 1 0 | t = [24;25)

0 0 0 6 1 5 0 0 7 0 0 0 0 11 6 7 7 0 1 14 7 0 6 4 5 4 10 0 | u = [25;26)

0 0 0 11 0 1 0 0 13 0 0 0 0 5 5 11 4 0 1 8 7 14 8 10 12 16 9 0 | v = [26;27)

0 0 0 5 0 0 0 0 4 0 0 0 8 1 1 2 6 1 0 7 8 9 4 3 7 7 5 0 | w = [27;28)

0 0 0 0 1 2 0 0 0 0 0 0 1 1 0 3 1 0 0 8 1 0 5 21 3 18 4 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 4 4 0 1 1 0 0 2 1 16 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 0 0 4 1 33 4 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 11 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 5 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 0 | ac = [33;33.70]

Método 9: Random Tree

Size of the tree : 7671

Correctly Classified Instances 602 34.8986 %

Incorrectly Classified Instances 1123 65.1014 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

2 37 8 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 7 32 9 6 6 2 1 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 | c = [7;8)

0 4 8 69 24 12 3 4 0 0 0 2 0 0 1 3 0 0 1 7 4 6 2 2 1 0 0 0 0 | d = [8;9)

0 0 5 26 85 44 8 4 0 0 0 0 1 0 2 3 0 0 0 1 4 2 2 0 0 0 0 0 0 | e = [9;10)

0 0 1 8 53 126 18 10 2 0 0 2 1 4 1 0 0 0 0 1 4 2 2 1 0 0 0 0 0 | f = [10;11)

0 0 3 3 7 27 44 14 0 0 0 2 1 1 0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 | g = [11;12)

0 0 1 7 6 9 9 18 2 1 0 0 1 0 0 0 0 0 2 4 1 1 2 0 0 0 0 0 0 | h = [12;13)

0 0 0 1 0 2 1 5 7 0 0 0 1 0 0 0 1 2 1 2 1 1 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 2 1 3 2 0 0 0 0 3 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 1 3 1 0 0 0 0 2 3 2 4 0 2 1 0 0 0 0 1 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 2 2 1 0 0 0 0 4 13 10 1 4 0 0 2 1 0 2 0 0 1 0 0 0 | n = [18;19)

0 0 0 1 1 0 2 0 1 0 0 0 0 9 11 0 2 0 1 0 3 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 4 4 0 0 0 0 0 0 0 0 2 0 10 3 2 4 1 5 1 0 1 0 1 1 1 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 1 6 0 4 9 8 3 4 1 2 2 2 0 2 0 1 0 | q = [21;22)

0 0 0 1 0 1 0 0 1 0 0 0 1 4 0 2 11 13 1 1 0 4 1 1 0 0 0 0 0 | r = [22;23)

0 0 0 1 0 0 3 0 1 0 0 0 0 0 0 3 2 1 13 7 2 4 3 2 0 0 0 0 0 | s = [23;24)

0 0 1 5 4 2 1 2 2 0 0 0 0 0 1 0 7 0 9 2 8 8 2 4 0 1 0 0 0 | t = [24;25)

0 0 0 5 2 5 3 2 1 1 0 0 0 2 4 2 5 0 7 1 27 20 3 4 3 0 2 0 2 | u = [25;26)

0 0 0 6 1 2 0 2 2 0 0 0 0 1 1 3 1 0 6 9 24 42 14 10 2 2 3 3 1 | v = [26;27)

0 0 1 4 2 2 1 1 1 0 1 0 1 2 0 0 4 1 3 4 4 12 18 9 4 1 0 2 0 | w = [27;28)

0 0 0 0 1 0 1 0 0 0 0 0 1 0 0 6 3 0 5 9 7 11 12 6 2 3 2 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 4 1 1 1 1 7 4 1 2 8 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 5 0 0 1 6 4 3 6 7 9 1 0 1 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 0 0 2 4 0 3 1 1 3 2 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 0 3 2 0 0 0 1 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 1 0 0 0 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 780 45.2174 %

Incorrectly Classified Instances 945 54.7826 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 45 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 11 39 6 5 4 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 11 85 27 8 0 1 0 0 0 1 0 0 0 3 1 0 0 5 1 2 0 3 0 0 0 0 0 | d = [8;9)

0 0 4 24 99 46 4 1 0 0 0 0 1 0 0 5 0 0 0 0 1 0 1 1 0 0 0 0 0 | e = [9;10)

0 0 1 7 29 170 14 5 0 0 0 0 1 3 1 0 0 0 0 2 0 0 2 1 0 0 0 0 0 | f = [10;11)

0 0 3 1 3 25 60 8 1 0 0 0 0 2 1 0 0 0 2 1 0 1 0 0 0 0 0 0 0 | g = [11;12)

0 0 2 4 7 10 11 14 7 0 0 0 0 0 0 0 0 0 0 4 3 1 1 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 0 4 5 1 0 0 1 0 0 0 0 0 0 4 4 4 1 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | k = [15;16)

0 0 0 1 1 1 0 0 0 0 0 6 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 4 0 0 0 0 0 2 7 4 0 0 1 1 0 0 0 0 1 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 3 1 0 0 0 0 0 3 20 6 2 5 1 0 1 0 0 1 0 0 0 0 0 0 | n = [18;19)

0 0 0 1 0 1 0 0 0 0 0 0 1 7 12 2 0 0 2 0 5 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 2 2 0 0 0 0 0 0 0 0 0 0 2 18 2 3 3 0 3 1 0 1 0 2 1 0 | p = [20;21)

0 0 0 1 0 0 0 0 0 0 0 0 3 5 0 3 11 7 2 4 0 2 3 1 0 3 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 2 7 20 1 2 1 3 2 2 0 1 0 0 0 | r = [22;23)

0 0 0 2 0 0 1 0 0 0 0 0 0 0 0 4 2 1 10 4 5 7 1 4 0 0 1 0 0 | s = [23;24)

0 0 0 8 0 4 0 4 3 0 0 0 0 1 0 0 8 2 6 2 4 8 1 8 0 0 0 0 0 | t = [24;25)

0 0 0 6 3 3 0 1 1 0 0 0 0 0 2 4 3 0 3 7 31 25 1 7 0 0 2 0 2 | u = [25;26)

0 0 0 6 1 0 0 1 2 0 0 0 0 0 0 1 1 3 4 4 16 61 8 13 2 6 3 3 0 | v = [26;27)

0 0 2 2 0 1 0 1 2 0 0 0 0 3 0 0 0 0 1 2 5 24 18 11 2 2 0 2 0 | w = [27;28)

0 0 0 4 0 1 0 0 0 0 0 0 1 0 0 5 5 0 2 8 5 7 11 14 2 3 0 1 0 | x = [28;29)

0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 3 4 1 7 13 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 0 0 4 7 1 7 3 19 0 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 4 5 0 0 0 3 6 2 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 0 0 0 2 1 1 0 1 1 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 1 1 0 0 | ac = [33;33.70]

Método 11: Rede Neural

Correctly Classified Instances 749 43.4203 %

Incorrectly Classified Instances 976 56.5797 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 43 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 4 44 8 4 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 | c = [7;8)

0 3 7 90 22 11 1 1 1 0 0 3 0 0 0 3 0 0 0 5 3 2 0 1 0 0 0 0 0 | d = [8;9)

0 0 6 25 87 42 11 3 0 0 0 1 0 0 0 3 0 0 1 2 2 2 2 0 0 0 0 0 0 | e = [9;10)

0 0 3 12 38 144 21 5 1 0 1 0 2 2 0 0 0 0 0 2 3 2 0 0 0 0 0 0 0 | f = [10;11)

0 1 1 1 4 21 53 15 1 0 0 1 0 6 1 0 0 0 0 0 2 0 0 1 0 0 0 0 0 | g = [11;12)

0 0 2 3 3 9 16 20 4 0 0 0 0 0 0 0 0 0 2 1 1 1 0 0 0 0 1 0 1 | h = [12;13)

0 0 0 0 0 1 0 3 12 0 0 0 1 0 0 0 0 0 1 1 2 4 0 0 0 0 0 0 0 | i = [13;14)

0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 | j = [14;15)

0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 1 1 0 0 0 0 0 0 0 6 3 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 | l = [16;17)

0 0 0 0 0 1 3 0 0 0 0 4 4 6 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 1 4 2 0 0 0 0 1 5 18 4 2 2 0 0 1 0 0 3 0 0 0 0 0 0 | n = [18;19)

0 0 0 1 1 1 1 0 0 0 0 0 0 5 14 3 0 2 0 0 3 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 1 3 0 0 0 0 0 0 0 0 2 3 12 5 1 1 1 4 0 0 2 1 1 2 1 0 | p = [20;21)

0 0 1 0 0 1 0 1 0 0 0 0 2 3 0 2 7 9 0 2 5 1 4 2 2 3 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 2 9 19 2 3 2 2 0 1 0 1 0 0 0 | r = [22;23)

0 0 0 0 1 0 0 1 1 0 0 0 0 1 0 3 2 1 14 6 3 2 0 6 0 1 0 0 0 | s = [23;24)

0 0 0 5 0 1 0 3 2 0 0 0 0 0 0 2 4 0 8 11 9 2 1 8 1 1 0 0 1 | t = [24;25)

0 0 2 5 1 4 0 1 1 0 0 0 1 0 4 3 3 0 4 4 31 22 1 3 2 3 3 1 2 | u = [25;26)

0 0 0 3 2 0 2 1 4 0 0 0 3 0 0 3 1 0 6 4 14 54 13 8 5 8 1 1 2 | v = [26;27)

0 0 1 1 4 2 0 1 1 0 0 0 1 1 1 0 4 1 2 2 4 19 17 6 2 2 1 5 0 | w = [27;28)

0 0 1 4 3 2 1 0 0 1 0 0 2 0 0 4 2 0 2 2 9 5 7 16 4 3 0 1 0 | x = [28;29)

0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 2 1 0 1 0 7 2 0 8 8 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 2 3 0 0 0 4 4 1 4 10 15 2 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 2 2 0 2 0 3 9 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 0 0 1 2 1 0 0 0 1 1 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 2 0 0 0 | ac = [33;33.70]

CONJUNTO 2

Classificação:

Método 1: Zero-R

Correctly Classified Instances 236 13.6812 %

Incorrectly Classified Instances 1489 86.3188 %

=== Confusion Matrix ===

```
  a  b  c  d  e  f  g  h  i  j  k  l  m  n  o  p  q  r  s  t  u  v  w  x  y  z aa ab ac  <-- classified as
  0  0  0  0  0  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  a = [5.83;6)
  0  0  0  0  0 48  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  b = [6;7)
  0  0  0  0  0 66  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  c = [7;8)
  0  0  0  0  0 153  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  d = [8;9)
  0  0  0  0  0 187  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  e = [9;10)
  0  0  0  0  0 236  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  f = [10;11)
  0  0  0  0  0 108  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  g = [11;12)
  0  0  0  0  0 64  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  h = [12;13)
  0  0  0  0  0 25  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  i = [13;14)
  0  0  0  0  0  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  j = [14;15)
  0  0  0  0  0  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  k = [15;16)
  0  0  0  0  0 13  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  l = [16;17)
  0  0  0  0  0 20  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  m = [17;18)
  0  0  0  0  0 43  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  n = [18;19)
  0  0  0  0  0 31  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  o = [19;20)
  0  0  0  0  0 40  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  p = [20;21)
  0  0  0  0  0 45  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  q = [21;22)
```

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

<u>Método 2</u>: 1R classifier

Correctly Classified Instances 726 42.087 %

Incorrectly Classified Instances 999 57.913 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 76 0 77 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 1 0 186 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 233 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 54 0 54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 0 62 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 24 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 27 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 39 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22 0 0 20 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 53 0 6 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 0 71 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 135 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 69 0 8 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 54 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 0 0 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 41 0 0 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 17 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

Método 3: PART decision list

Number of Rules : 205

Correctly Classified Instances 832 48.2319 %

Incorrectly Classified Instances 893 51.7681 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 33 9 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 24 23 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

1 12 16 68 20 31 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 16 63 100 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 8 46 156 24 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 5 8 35 39 16 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 9 40 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 5 2 17 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 3 0 3 3 1 2 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 5 2 8 4 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 4 31 7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 5 6 16 3 1 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 20 15 1 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 24 6 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 13 18 3 5 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 14 20 3 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 16 29 7 2 1 1 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 7 10 32 40 10 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 26 88 20 1 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 12 30 27 5 2 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 11 45 3 3 1 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 10 1 16 0 0 1 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 3 33 5 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 6 8 3 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 3 2 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 | ac = [33;33.70]

<u>Método 4</u>: RIPPER

Number of Rules : 68

Correctly Classified Instances 803 46.5507 %

Incorrectly Classified Instances 922 53.4493 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 31 11 5 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 13 35 15 0 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 16 24 55 9 48 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 1 1 12 15 157 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 1 16 209 6 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 1 51 26 25 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 9 41 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 5 3 4 11 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 3 0 0 0 0 0 5 3 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 4 6 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 5 34 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 3 8 17 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 22 12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 16 22 7 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 4 12 12 6 6 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 17 2 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 30 6 4 1 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 14 16 44 10 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 89 21 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 27 27 10 1 0 1 0 0 | w = [27;28)

0 0 0 0 0 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 7 39 3 8 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 2 21 0 0 1 | y = [29;30)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 36 4 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 3 11 5 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 1 | ac = [33;33.70]

Método 5: Decision Tables

Number of Rules : 212

Correctly Classified Instances 855 49.5652 %

Incorrectly Classified Instances 870 50.4348 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 38 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

3 17 34 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 13 27 51 28 33 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 5 64 117 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 45 185 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

1 0 0 0 2 49 42 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

2 0 0 0 0 1 25 33 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 6 14 3 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

4 0 0 0 0 1 0 0 1 0 0 5 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

2 0 0 0 0 1 0 0 0 0 0 1 0 13 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

1 0 0 0 0 0 0 0 0 0 0 0 0 2 37 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 14 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 2 11 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 31 3 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

2 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 4 12 13 6 4 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 9 27 4 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17 34 4 3 0 1 0 0 0 0 0 0 | t = [24;25)

4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 14 15 56 3 1 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 110 12 4 0 0 0 0 0 0 | v = [26;27)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 4 34 32 3 0 1 0 0 0 0 | w = [27;28)

2 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 7 11 40 1 5 0 0 0 0 0 | x = [28;29)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 1 20 0 0 1 | y = [29;30)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 37 4 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 4 16 0 0 | aa = [31;32)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 0 2 | ab = [32;33)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 | ac = [33;33.70]

Método 6: REPTree

Size of the tree : 571

Correctly Classified Instances 850 49.2754 %

Incorrectly Classified Instances 875 50.7246 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 32 11 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 16 27 23 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 16 22 46 38 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 10 88 87 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 5 61 161 7 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 10 42 31 21 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 19 30 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 4 6 14 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 0 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 3 6 8 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 3 32 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 12 13 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 21 13 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 15 22 6 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 12 13 5 5 3 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 13 22 6 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 34 7 4 1 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 8 12 20 56 3 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 111 12 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 38 30 5 1 1 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 6 10 45 0 6 0 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 3 17 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 2 32 6 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 17 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

Método 7: J48

Number of Leaves : 1036

Size of the tree : 1151

Correctly Classified Instances 873 50.6087 %

Incorrectly Classified Instances 852 49.3913 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 36 10 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 19 32 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 13 9 75 21 30 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 14 66 103 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 4 53 160 17 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 2 6 41 38 18 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 1 6 43 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 2 4 4 14 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 1 0 8 1 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 4 8 6 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 2 5 29 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 10 15 2 2 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 21 14 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 13 22 8 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 19 13 4 3 3 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 15 14 5 0 1 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 15 29 5 4 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 4 17 27 42 8 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 18 98 18 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 32 33 5 0 1 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 13 45 3 3 0 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 0 19 0 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 33 5 2 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 12 3 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 1 2 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2 0 0 | ac = [33;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 803 46.5507 %

Incorrectly Classified Instances 922 53.4493 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 45 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 24 32 7 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 15 21 70 22 21 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 1 2 19 88 57 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 6 86 91 48 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 14 20 39 33 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 4 14 34 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 9 12 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 1 0 0 8 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 3 0 0 4 1 9 2 1 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 2 0 0 0 0 21 15 5 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 8 21 1 1 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 26 8 1 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 20 14 9 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 12 18 6 1 3 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 23 5 10 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 19 18 15 3 0 1 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 14 9 29 44 3 2 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 13 93 16 1 1 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 6 27 26 12 2 1 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 1 6 9 37 9 2 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 4 14 10 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 32 7 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 11 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 1 0 | ac = [33;33.70]

Método 9: Random Tree

Size of the tree : 7131

Correctly Classified Instances 804 46.6087 %

Incorrectly Classified Instances 921 53.3913 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 29 17 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 23 22 17 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

2 7 22 68 27 21 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 3 23 68 89 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 21 64 126 24 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 7 9 32 38 20 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 4 18 35 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 2 3 3 14 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 3 3 5 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 2 6 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 1 1 32 7 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 6 21 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 28 7 2 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 14 18 1 2 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 12 17 6 5 1 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 20 11 4 0 0 1 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 14 27 15 1 2 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 12 34 34 9 2 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 25 80 23 3 1 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 15 18 31 9 2 0 0 0 1 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 4 9 41 11 1 0 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 8 15 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 3 31 7 0 1 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 10 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 2 5 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 1 0 0 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 919 53.2754 %

Incorrectly Classified Instances 806 46.7246 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 30 15 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 20 27 18 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

2 3 11 88 17 26 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 17 67 100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 13 63 139 19 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 5 5 35 45 14 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 16 39 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 2 2 19 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 1 0 1 6 3 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 5 3 11 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 2 35 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 21 3 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 29 8 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 20 12 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 25 6 1 1 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 22 11 6 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 32 13 1 1 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 9 44 31 8 3 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 95 22 3 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 10 24 34 7 1 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 4 12 42 5 3 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 6 12 11 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 34 7 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 10 3 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 7 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 | ac = [33;33.70]

Método 11: Rede Neural

Correctly Classified Instances 851 49.3333 %

Incorrectly Classified Instances 874 50.6667 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 22 17 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 20 27 17 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 12 78 28 25 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 18 85 80 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 18 77 122 18 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 1 7 10 27 42 17 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 21 34 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 1 1 2 19 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 1 8 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 2 9 8 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 1 2 33 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 9 17 3 1 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 24 11 1 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 12 20 11 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 10 21 3 3 3 0 0 1 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 17 12 7 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 11 32 11 2 1 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 10 40 31 9 3 0 0 0 0 1 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 27 82 21 1 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 14 19 32 11 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 12 40 5 5 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 7 13 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 7 30 4 2 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 6 8 6 0 | aa = [31;32)

0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 2 4 1 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 1 1 | ac = [33;33.70]

CONJUNTO 3

Classificação:

Método 1: Zero-R

Correctly Classified Instances 236 13.6812 %

Incorrectly Classified Instances 1489 86.3188 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 0 0 153 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 0 0 187 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 236 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 64 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 59 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 101 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 135 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 78 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 31 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30)

0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31)

0 0 0 0 0 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32)

0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;33.70]

<u>Método 2</u>: 1R classifier

Correctly Classified Instances 726 42.087 %

Incorrectly Classified Instances 999 57.913 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 0 0 66 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 0 0 76 0 77 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 1 0 186 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 0 0 233 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 0 54 0 54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 0 62 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 24 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 3 0 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 27 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 39 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 45 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22 0 0 20 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 53 0 6 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 0 71 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 135 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 69 0 8 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 54 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 30 0 0 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 41 0 0 5 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 17 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 | ac = [33;33.70]

<u>Método 3</u>: PART decision list

Number of Rules : 233

Correctly Classified Instances 1010 58.5507 %

Incorrectly Classified Instances 715 41.4493 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 38 6 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 11 48 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 4 9 105 32 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 29 111 46 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 5 54 158 18 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 5 29 57 14 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 1 16 36 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 1 12 11 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 7 5 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 4 9 5 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 5 32 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 2 8 17 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 23 12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 26 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 2 10 20 5 3 1 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 24 14 1 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 12 32 10 1 3 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 14 39 32 9 2 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 24 84 27 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 26 34 9 0 3 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 4 1 9 43 7 4 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 11 11 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 6 4 29 4 0 1 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 6 11 3 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 5 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 0 | ac = [33;33.70]

Método 4: RIPPER

Number of Rules : 102

Correctly Classified Instances 966 56 %

Incorrectly Classified Instances 759 44 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 40 6 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 13 46 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 6 10 92 20 23 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

1 2 1 21 74 87 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 | e = [9;10)

0 0 0 3 18 192 21 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 | f = [10;11)

0 0 0 0 5 30 46 24 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 | g = [11;12)

0 0 0 0 0 1 13 36 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 | h = [12;13)

0 0 0 0 0 0 1 7 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 | j = [14;15)

0 0 0 0 0 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 | k = [15;16)

0 0 0 0 0 1 0 0 0 1 0 7 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 5 9 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 6 32 4 0 0 1 0 0 0 0 0 0 0 0 0 0
0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 1 8 20 0 2 0 0 0 0 0 0 0 0 0 0 0
0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 23 12 1 0 0 0 0 0 0 0 0 0
0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 13 24 7 0 0 0 0 0 0 0 0 0
0 0 | q = [21;22)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 2 16 11 4 5 0 0 0 0 0 0 0
0 0 | r = [22;23)

0 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 3 21 12 1 0 0 0 0 0 0
0 0 | s = [23;24)

0 0 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 2 13 33 5 2 1 0 0 0 0
0 0 | t = [24;25)

0 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 1 6 22 27 40 1 0 0 0 0
0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 19 92 21 1 0 0 0
0 0 | v = [26;27)

0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 34 24 11 1 1 0 0 0 | w = [27;28)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 3 7 46 2 7 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 14 11 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 4 32 6 0 0 | z = [30;31)

0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 4 9 3 0 | aa = [31;32)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 0 1 | ab = [32;33)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 | ac = [33;33.70]

<u>Método 5</u>: Decision Tables

Number of Rules : 309

Correctly Classified Instances 926 53.6812 %

Incorrectly Classified Instances 799 46.3188 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 40 6 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

5 12 41 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

14 6 9 75 32 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

4 0 0 22 100 59 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

5 0 0 2 50 164 13 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

9 0 0 0 6 29 48 14 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

3 0 0 0 0 5 15 32 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 2 1 11 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

2 0 0 0 0 2 0 0 0 0 0 8 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

3 0 0 0 0 2 0 0 0 0 0 2 6 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 2 0 0 0 0 0 0 6 29 5 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

4 0 0 0 0 1 0 0 0 0 0 0 1 12 11 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 23 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 11 30 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

3 0 0 0 0 6 0 0 0 0 0 0 0 0 0 0 1 13 13 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23)

3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 23 12 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

3 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 14 32 5 2 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25)

7 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 3 15 33 34 4 0 0 0 0 0 0 0 0 0 0 | u = [25;26)

2 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22 101 6 2 0 0 0 0 0 0 0 0 0 | v = [26;27)

6 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 42 16 3 3 1 0 0 0 0 0 0 0 | w = [27;28)

3 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 9 3 34 10 5 0 0 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 3 13 1 0 0 | y = [29;30)

1 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 36 2 0 0 | z = [30;31)

1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 15 0 0 | aa = [31;32)

0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 1 1 | ab = [32;33)

2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 | ac = [33;33.70]

<u>Método 6</u>: REPTree

Size of the tree : 411

Correctly Classified Instances 965 55.942 %

Incorrectly Classified Instances 760 44.058 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

2 36 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 16 36 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 8 5 100 28 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 36 85 65 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 12 41 171 10 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 3 6 39 42 15 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 20 28 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 5 19 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 1 0 8 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 3 12 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 5 33 4 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 17 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 26 11 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 28 2 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 11 14 9 2 1 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 21 15 1 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 13 32 8 3 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 2 15 33 46 2 0 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17 108 10 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 39 22 7 0 2 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 8 8 43 2 7 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 8 9 1 0 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 4 5 28 5 0 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 4 15 1 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 0 | ac = [33;33.70]

Método 7: J48

Number of Leaves : 1387

Size of the tree : 1541

Correctly Classified Instances 1058 61.3333 %

Incorrectly Classified Instances 667 38.6667 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

3 38 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 8 51 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 8 104 30 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 0 21 122 41 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 9 47 159 18 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 0 2 29 59 15 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 2 11 40 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 7 17 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 0 7 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 1 0 0 5 9 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 2 37 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 22 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 29 8 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 16 19 10 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 10 20 7 0 1 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 23 12 2 0 0 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 13 24 16 3 0 0 0 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 13 45 31 5 1 0 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 22 98 13 0 0 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 32 35 6 1 0 0 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 10 46 5 2 0 0 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 12 9 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 5 26 6 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 5 10 4 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 6 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 0 | ac = [33;33.70]

Método 8: Hoeffding Tree

Correctly Classified Instances 919 53.2754 %

Incorrectly Classified Instances 806 46.7246 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 47 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 15 37 12 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 12 112 19 0 0 1 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 7 44 84 52 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 11 66 131 24 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 2 2 28 51 19 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 4 26 19 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 2 19 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 1 0 0 8 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 2 0 0 3 7 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 1 0 0 0 3 18 19 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 22 3 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 29 9 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 16 19 7 1 0 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7 8 19 7 0 1 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 2 0 20 7 9 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 14 21 15 1 0 5 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 15 41 33 3 4 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 18 79 17 10 0 1 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 9 26 30 8 1 2 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 4 3 9 38 2 6 1 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 3 14 11 1 0 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 43 1 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 11 0 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 0 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 0 | ac = [33;33.70]

Método 9: Random Tree

Size of the tree : 6081

Correctly Classified Instances 939 54.4348 %

Incorrectly Classified Instances 786 45.5652 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

1 40 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 10 40 13 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 7 11 94 31 9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 2 36 108 40 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 6 35 167 26 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 5 7 26 51 18 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 1 0 3 20 27 12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 3 6 12 2 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 7 5 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 1 0 0 5 9 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 1 10 20 10 2 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 2 12 12 4 1 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 3 6 23 6 2 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 16 20 5 1 0 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 11 20 5 3 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 3 6 22 7 3 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 13 26 9 4 2 1 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 1 10 48 32 3 2 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 36 70 24 3 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 8 24 29 10 1 3 1 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 5 6 15 32 4 4 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 8 17 2 1 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 8 28 5 1 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 11 3 1 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 5 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 0 | ac = [33;33.70]

Método 10: Random Forest

Correctly Classified Instances 1157 67.0725 %

Incorrectly Classified Instances 568 32.9275 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5.83;6)

0 46 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7)

0 9 50 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8)

0 5 3 121 22 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9)

0 0 1 21 129 36 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10)

0 0 0 3 24 189 17 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11)

0 0 0 1 0 28 71 6 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12)

0 0 0 0 0 3 16 31 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13)

0 0 0 0 0 0 0 10 14 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14)

0 0 0 0 0 0 0 0 1 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15)

0 0 0 0 0 0 0 0 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 0 0 0 0 0 9 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17)

0 0 0 0 0 0 0 0 0 0 0 5 10 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 3 32 7 0 1 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 8 19 4 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 26 10 1 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 9 27 7 0 1 0 0 0 0 0 0 0 0 | q = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 24 3 4 0 0 0 0 0 0 0 0 0 | r = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 27 8 2 0 0 0 0 0 0 0 0 | s = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 13 28 14 1 0 1 0 0 0 0 0 | t = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 11 56 29 2 1 0 0 0 0 0 | u = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 18 103 12 2 0 0 0 0 0 | v = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 27 36 9 1 2 0 0 0 | w = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 11 45 3 6 0 0 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 14 10 0 1 0 | y = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 37 4 0 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 13 3 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 8 0 1 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 0 | ac = [33;33.70]

<u>Método 11</u>: Rede Neural

Correctly Classified Instances 622 36.058 %

Incorrectly Classified Instances 1103 63.942 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as

0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 | a = [5.83;6)

0 35 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 0 5 0 | b = [6;7)

0 11 39 9 0 2 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 2 0 | c = [7;8)

0 5 6 112 8 2 6 1 0 0 0 2 0 0 0 0 1 0 1 0 0 0 3 1 0 0 0 5 0 | d = [8;9)

0 0 3 42 34 62 6 3 0 0 0 3 0 0 0 0 3 1 1 0 0 0 4 1 0 0 0 24 0 | e = [9;10)

0 0 1 27 25 132 4 6 0 0 0 8 1 0 0 0 8 1 0 0 1 0 4 0 3 0 0 15 0 | f = [10;11)

0 1 1 4 5 34 26 12 0 0 0 9 0 0 0 0 0 1 2 0 0 0 1 0 2 0 0 10 0 | g = [11;12)

0 2 0 4 0 6 12 20 1 0 0 1 1 0 0 0 0 0 0 0 4 0 0 0 2 1 0 10 0 | h = [12;13)

0 0 0 2 0 0 3 1 2 0 0 2 2 0 0 0 0 2 3 0 0 0 2 0 1 0 0 5 0 | i = [13;14)

0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 | j = [14;15)

0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 | k = [15;16)

0 0 0 0 0 0 1 1 0 0 0 3 2 0 0 0 0 1 0 0 0 0 0 1 0 0 0 4 0 | l = [16;17)

0 0 0 0 0 0 1 0 1 0 0 2 5 0 2 0 0 2 1 0 0 0 0 1 1 0 0 4 0 | m = [17;18)

0 1 1 0 0 0 0 1 0 0 0 2 4 4 5 3 0 5 3 1 0 0 1 0 1 0 0 11 0 | n = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 3 1 0 12 2 1 2 2 0 1 0 0 0 1 0 0 6 0 | o = [19;20)

0 1 0 1 0 0 1 1 0 0 0 1 0 0 3 19 1 3 0 2 0 0 0 0 1 0 0 6 0 | p = [20;21)

0 1 0 2 0 0 2 0 0 0 0 1 2 0 0 11 5 2 1 1 0 0 2 0 0 0 0 15 0 | q = [21;22)

0 0 0 1 0 0 4 0 0 0 0 1 0 0 0 5 2 10 5 1 1 0 2 0 1 1 0 8 0 | r = [22;23)

0 0 0 2 0 0 0 1 2 0 0 2 0 0 0 0 0 3 6 6 1 1 0 0 1 1 0 16 0 | s = [23;24)

0 0 0 2 0 0 1 2 1 0 0 3 0 0 1 0 0 0 5 14 14 4 0 4 1 0 0 7 0 | t = [24;25)

0 2 0 0 1 1 1 1 0 0 0 2 0 0 2 0 0 4 6 3 27 22 5 3 3 1 0 17 0 | u = [25;26)

0 0 0 1 1 0 0 4 3 0 0 1 0 0 0 1 0 4 12 0 12 54 13 3 5 0 0 21 0 | v = [26;27)

0 0 1 0 2 0 1 1 0 0 0 0 1 0 1 0 0 4 4 1 4 21 13 4 2 2 0 16 0 | w = [27;28)

0 0 1 0 1 0 1 0 0 0 0 1 1 0 0 0 0 1 3 0 3 5 3 28 6 3 0 12 0 | x = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 1 8 9 0 0 10 0 | y = [29;30)

0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 3 0 0 0 1 7 6 10 0 18 0 | z = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 0 2 2 2 0 11 0 | aa = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 0 1 1 2 0 3 0 | ab = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 2 0 | ac = [33;33.70]

CESP6

Entradas:

t-8

44G = PLD, EAR, CE, IBOV = t, ... , t-8 // ELET6 (t-1), ... , (t-8)

Saídas:

Intervalo de 1 em1 – 28 intervalos

[11;12),[12;13),[13;14),[14;15),[15;16),[16;17),[17;18),[18;19),[19;20),[20;21),[21;22),[22;23),[23;24),[24;25),[25;26),[26;27),[27;28),[28;29),[29;30),[30;31),[31;32),[32;33),[33;34),[34;35),[35;36),[36;37),[37;38),[38;39]

Métodos:

Persistente, Zero-R, J48, Random Forest

Modelo Persistente:

Acertos: 1154 Erros: 571 Acerto: 66,90%

Zero-R

Correctly Classified Instances 112 6.4928 %

Incorrectly Classified Instances 1613 93.5072 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab <-- classified as

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 | a = [11;12)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 61 0 0 0 0 0 0 0 0 0 0 0 | b = [12;13)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 74 0 0 0 0 0 0 0 0 0 0 0 | c = [13;14)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 68 0 0 0 0 0 0 0 0 0 0 0 | d = [14;15)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 74 0 0 0 0 0 0 0 0 0 0 0 | e = [15;16)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0 | f = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 26 0 0 0 0 0 0 0 0 0 0 0 | g = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 44 0 0 0 0 0 0 0 0 0 0 0 | h = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 80 0 0 0 0 0 0 0 0 0 0 0 | i = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 95 0 0 0 0 0 0 0 0 0 0 0 | j = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0 0 0 0 0 0 0 0 0 0 | k = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 99 0 0 0 0 0 0 0 0 0 0 0 | l = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 104 0 0 0 0 0 0 0 0 0 0 0 | m = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 94 0 0 0 0 0 0 0 0 0 0 0 | n = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 82 0 0 0 0 0 0 0 0 0 0 0 | o = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 68 0 0 0 0 0 0 0 0 0 0 0 | p = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 112 0 0 0 0 0 0 0 0 0 0 0 | q = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 86 0 0 0 0 0 0 0 0 0 0 0 | r = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 77 0 0 0 0 0 0 0 0 0 0 0 | s = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 77 0 0 0 0 0 0 0 0 0 0 0 | t = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 | u = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 38 0 0 0 0 0 0 0 0 0 0 0 | v = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17 0 0 0 0 0 0 0 0 0 0 0 | w = [33;34)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 0 0 0 0 0 0 0 0 0 0 | x = [34;35)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 23 0 0 0 0 0 0 0 0 0 0 0 | y = [35;36)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 50 0 0 0 0 0 0 0 0 0 0 0 | z = [36;37)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 | aa = [37;38)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 | ab = [38;39]

J48

Number of Leaves : 1549

Size of the tree : 1721

Correctly Classified Instances 943 54.6667 %

Incorrectly Classified Instances 782 45.3333 %

=== Confusion Matrix ===

```
 a  b  c  d  e  f  g  h  i  j  k  l  m  n  o  p  q  r  s  t  u  v  w  x  y  z aa ab  <-- classified as
21  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  a = [11;12)
 9 36 16  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  b = [12;13)
 1 18 43 10  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  c = [13;14)
 0  1 10 48  9  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  d = [14;15)
 0  0  3  8 51 11  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  e = [15;16)
 0  0  2  0 16 20  4  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  f = [16;17)
 0  0  0  0  0  2 16  8  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  g = [17;18)
 0  0  0  0  0  0  5 30  8  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  h = [18;19)
 0  0  0  0  0  0  2 12 45 19  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  i = [19;20)
 0  0  0  0  0  0  1  2 19 54 18  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  j = [20;21)
 0  0  0  0  0  0  0  0  4 23 60  8  4  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0 |  k = [21;22)
 0  0  0  0  0  0  0  0  2  1  9 67 17  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  l = [22;23)
 0  0  0  0  0  0  0  0  0  0  1 23 52 27  1  0  0  0  0  0  0  0  0  0  0  0  0  0 |  m = [23;24)
 0  0  0  0  0  0  0  2  0  0  0  6 36 29 20  1  0  0  0  0  0  0  0  0  0  0  0  0 |  n = [24;25)
 0  0  0  0  0  0  0  0  0  0  0  2  3 18 38 12  9  0  0  0  0  0  0  0  0  0  0  0 |  o = [25;26)
 0  0  0  0  0  0  0  0  0  0  0  0  0  2 21 29 14  2  0  0  0  0  0  0  0  0  0  0 |  p = [26;27)
 0  0  0  0  0  0  0  0  0  0  2  0  1  3  6 16 60 24  0  0  0  0  0  0  0  0  0  0 |  q = [27;28)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 22 50 12  2  0  0  0  0  0  0  0 |  r = [28;29)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  2 14 48  9  3  1  0  0  0  0  0  0 |  s = [29;30)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  2  9 52 13  0  0  0  0  0  0  0 |  t = [30;31)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  4 11 25  6  2  0  0  0  0  0  0 |  u = [31;32)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 16 14  5  1  2  0  0  0  0 |  v = [32;33)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  3  5  3  6  0  0  0  0  0 |  w = [33;34)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  3  6  5  0  0  0  0  0 |  x = [34;35)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  2  0  4  7  9  0  0  0 |  y = [35;36)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  2  5 18 24  0  0  0  0 |  z = [36;37)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1 19 21  1  0  0  0  0  0 | aa = [37;38)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  3  0  0  0  0  0  0  0  0 | ab = [38;39]
```

Random Forest

Correctly Classified Instances 1035 60 %

Incorrectly Classified Instances 690 40 %

=== Confusion Matrix ===

```
 a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab  <-- classified as
21  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  a = [11;12)
 8 41 12  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  b = [12;13)
 0  8 55  8  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  c = [13;14)
 0  1  9 48 10  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  d = [14;15)
 0  0  1  8 55  9  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  e = [15;16)
 0  0  0  0 21 20  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  f = [16;17)
 0  0  0  0  0  0 19  7  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  g = [17;18)
 0  0  0  0  0  0  3 34  6  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  h = [18;19)
 0  0  0  0  0  0  1 10 47 21  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  i = [19;20)
 0  0  0  0  0  0  0  0 21 53 20  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  j = [20;21)
 0  0  0  0  0  0  0  0  0 15 70 11  3  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0 |  k = [21;22)
 0  0  0  0  0  0  0  0  0  0 11 66 17  5  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  l = [22;23)
 0  0  0  0  0  0  0  0  0  0  0 16 58 29  1  0  0  0  0  0  0  0  0  0  0  0  0  0 |  m = [23;24)
 0  0  0  0  0  0  0  0  0  0  0  0 23 52 19  0  0  0  0  0  0  0  0  0  0  0  0  0 |  n = [24;25)
 0  0  0  0  0  0  0  0  0  0  0  0  3 15 48 15  1  0  0  0  0  0  0  0  0  0  0  0 |  o = [25;26)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0 19 28 20  1  0  0  0  0  0  0  0  0  0  0 |  p = [26;27)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  1 11 76 21  2  0  1  0  0  0  0  0  0  0 |  q = [27;28)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 31 44 11  0  0  0  0  0  0  0  0  0 |  r = [28;29)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1 13 48 11  4  0  0  0  0  0  0  0 |  s = [29;30)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1 10 56  9  1  0  0  0  0  0  0 |  t = [30;31)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  2 10 17 16  1  1  0  0  0  0 |  u = [31;32)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  2 12 22  2  0  0  0  0  0 |  v = [32;33)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  2  7  5  3  0  0  0  0 |  w = [33;34)
 0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  2  6  6  0  0  0 |  x = [34;35)
```

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 5 7 6 3 0 | y = [35;36)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 24 20 0 | z = [36;37)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 26 15 0 | aa = [37;38)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 | ab = [38;39]

TRPL4

Entradas: t-8

44G = PLD, EAR, CE, IBOV = t, ... , t-8 // TRPL4 (t-1), ... , (t-8)

Saídas:

Intervalo de 1 em1 – 49 intervalos

[23;24],[24;25],[25;26],[26;27],[27;28],[28;29],[29;30],[30;31],[31;32],[32;33],[33;34],
[34;35],[35;36],[36;37],[37;38],[38;39],[39;40],[40;41],[41;42],[42;43],[43;44],[44;45],
[45;46],[46;47],[47;48],[48;49],[49;50],[50;51],[51;52],[52;53],[53;54],[54;55],[55;56],
[56;57],[57;58],[58;59],[59;60],[60;61],[61;62],[62;63],[63;64],[64;65],[65;66],[66;67],
[67;68],[68;69],[69;70],[70;71],[71;72]

Métodos:

Persistente, Zero-R, J48, Random Forest

Modelo Persistente:

Acertos: 1025 Erros: 700 Acerto: 59,42%

Zero-R

Correctly Classified Instances 112 6.4928 %

Incorrectly Classified Instances 1613 93.5072 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab <-- classified as

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 25 0 0 0 0 0 0 0 0 0 0 0 | a = [11;12)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 61 0 0 0 0 0 0 0 0 0 0 0 | b = [12;13)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 74 0 0 0 0 0 0 0 0 0 0 0
| c = [13;14)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 68 0 0 0 0 0 0 0 0 0 0 0
| d = [14;15)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 74 0 0 0 0 0 0 0 0 0 0 0
| e = [15;16)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 43 0 0 0 0 0 0 0 0 0 0 0
| f = [16;17)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 26 0 0 0 0 0 0 0 0 0 0 0
| g = [17;18)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 44 0 0 0 0 0 0 0 0 0 0 0
| h = [18;19)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 80 0 0 0 0 0 0 0 0 0 0 0
| i = [19;20)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 95 0 0 0 0 0 0 0 0 0 0 0
| j = [20;21)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 100 0 0 0 0 0 0 0 0 0 0
0 | k = [21;22)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 99 0 0 0 0 0 0 0 0 0 0 0
| l = [22;23)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 104 0 0 0 0 0 0 0 0 0 0
0 | m = [23;24)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 94 0 0 0 0 0 0 0 0 0 0 0
| n = [24;25)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 82 0 0 0 0 0 0 0 0 0 0 0
| o = [25;26)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 68 0 0 0 0 0 0 0 0 0 0 0
| p = [26;27)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 112 0 0 0 0 0 0 0 0 0 0
0 | q = [27;28)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 86 0 0 0 0 0 0 0 0 0 0 0
| r = [28;29)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 77 0 0 0 0 0 0 0 0 0 0 0
| s = [29;30)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 77 0 0 0 0 0 0 0 0 0 0 0
| t = [30;31)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 48 0 0 0 0 0 0 0 0 0 0 0 | u = [31;32)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 38 0 0 0 0 0 0 0 0 0 0 0 | v = [32;33)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17 0 0 0 0 0 0 0 0 0 0 0 | w = [33;34)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 0 0 0 0 0 0 0 0 0 0 0 | x = [34;35)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 23 0 0 0 0 0 0 0 0 0 0 0 | y = [35;36)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 50 0 0 0 0 0 0 0 0 0 0 0 | z = [36;37)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 | aa = [37;38)

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 | ab = [38;39]

J48

Number of Leaves : 1855

Size of the tree : 2061

Correctly Classified Instances 780 45.2174 %

Incorrectly Classified Instances 945 54.7826 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac ad ae af ag ah ai aj ak al am an ao ap aq ar as at au av aw <-- classified as

11 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [23;24]

9 28 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [24;25]

0 6 14 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [25;26]

0 0 6 24 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [26;27]

0 0 0 6 15 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [27;28]

0 1 0 0 2 24 4 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [28;29]

0 0 0 0 0 5 8 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [29;30]

0 0 0 0 0 2 5 15 3 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [30;31]

0 0 0 0 0 0 0 3 16 4 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [31;32]

0 0 0 0 0 3 1 3 3 20 12 2 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [32;33]

0 0 0 0 0 0 0 2 2 9 27 28 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [33;34]

0 0 0 0 0 0 0 0 1 0 17 37 11 4 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [34;35]

0 0 0 0 0 0 0 0 0 1 4 17 15 10 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [35;36]

0 0 0 0 0 0 0 0 0 0 2 3 12 14 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [36;37]

0 0 0 0 0 0 0 0 1 0 1 0 2 4 7 8 0 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [37;38]

0 0 0 0 0 0 0 0 0 0 0 0 1 0 8 15 4 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [38;39]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 9 21 19 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [39;40]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 12 36 17 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [40;41]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 33 24 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [41;42]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 2 3 3 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [42;43]

0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 19 2 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [43;44]

0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 2 9 16 4 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [44;45]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 14 25 18 1 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [45;46]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 21 56 2 2 1 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [46;47]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 10 9 15 1 0 4 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [47;48]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 11 42 6 5 5 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [48;49]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 14 45 12 0 2 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [49;50]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 8 11 31 14 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [50;51]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 8 14 5 1 3 1 2 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [51;52]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 5 13 6 0 1 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ad = [52;53]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 8 8 3 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ae = [53;54]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 4 10 9 2 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | af = [54;55]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 1 11 16 9
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ag = [55;56]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 10 8 2
1 2 0 1 0 0 0 0 0 0 0 0 0 0 | ah = [56;57]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 2 10
1 1 0 0 0 0 0 0 0 0 0 0 0 0 | ai = [57;58]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3
6 3 0 3 0 0 0 0 0 0 0 0 0 0 | aj = [58;59]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1
3 6 9 1 0 0 0 0 0 0 0 0 0 0 | ak = [59;60]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2
0 6 11 10 1 0 0 0 0 0 0 0 0 0 | al = [60;61]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1
2 1 9 15 4 5 1 1 0 0 0 0 0 0 | am = [61;62]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 2 2 11 9 2 0 0 0 0 0 0 0 | an = [62;63]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 3 8 21 3 1 0 0 0 0 0 0 | ao = [63;64]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 5 2 3 7 2 0 0 0 0 0 | ap = [64;65]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0 3 8 7 3 0 0 1 0 | aq = [65;66]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 4 4 2 0 2 0 | ar = [66;67]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 4 3 5 0 1 0 | as = [67;68]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 6 0 0 0 0 | at = [68;69]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 | au = [69;70]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 4 0 | av = [70;71]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 | aw = [71;72]

Random Forest

Correctly Classified Instances 903 52.3478 %

Incorrectly Classified Instances 822 47.6522 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac ad ae af ag ah ai aj ak al am an ao ap aq ar as at au av aw <-- classified as

14 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [23;24]

5 31 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [24;25]

0 4 15 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [25;26]

0 1 5 24 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [26;27]

0 0 0 4 17 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [27;28]

0 0 0 0 3 27 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [28;29]

0 0 0 0 0 6 6 5 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [29;30]

0 0 0 0 0 1 2 20 3 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [30;31]

0 0 0 0 0 0 0 7 16 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [31;32]

0 0 0 0 0 1 1 1 3 23 15 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [32;33]

0 0 0 0 0 0 0 1 1 14 33 18 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [33;34]

0 0 0 0 0 0 0 0 1 1 20 35 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [34;35]

0 0 0 0 0 0 0 0 0 0 2 10 27 10 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [35;36]

0 0 0 0 0 0 0 0 0 0 0 1 15 18 3 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [36;37]

0 0 0 0 0 0 0 0 0 0 0 0 1 0 13 9 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [37;38]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 12 5 4 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [38;39]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 5 20 19 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [39;40]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 13 36 16 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [40;41]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 19 36 1 3 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [41;42]

0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 5 1 5 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [42;43]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 16 3 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [43;44]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 5 9 15 3 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [44;45]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 10 26 21 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [45;46]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 18 63 5 0 1 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [46;47]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 17 7 3 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [47;48]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 8 43 9 8 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [48;49]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 12 50 11 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [49;50]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 13 45 8 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [50;51]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 7 18 7 2 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [51;52]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 3 0 6 14 6 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ad = [52;53]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 8 7 7 2 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ae = [53;54]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 5 11 10 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | af = [54;55]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 3 6 18 12
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ag = [55;56]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 12 10
1 2 1 0 0 0 0 0 0 0 0 0 0 0 0 | ah = [56;57]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 2 4 9
0 1 0 0 0 0 0 0 0 0 0 0 0 0 | ai = [57;58]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2
8 3 1 1 0 0 0 0 0 0 0 0 0 0 | aj = [58;59]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
4 8 7 3 0 0 0 0 0 0 0 0 0 0 | ak = [59;60]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 3 11 13 1 2 0 0 0 0 0 0 0 0 | al = [60;61]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 6 29 3 2 0 0 0 0 0 0 0 0 | am = [61;62]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 4 8 10 3 0 0 0 0 0 0 0 | an = [62;63]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 3 6 23 2 1 1 0 0 0 0 0 | ao = [63;64]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 4 3 7 5 1 1 0 0 0 0 | ap = [64;65]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 3 8 9 4 0 0 0 0 | aq = [65;66]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 7 8 3 2 0 0 0 | ar = [66;67]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 5 3 7 2 0 1 0 | as = [67;68]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 2 4 2 0 0 0 | at = [68;69]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 1 0 0 0 | au = [69;70]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 4 0 | av = [70;71]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 | aw = [71;72]

COCE5

Saídas: 1 em 1 real
[52;53],[51;52],[50;51],[49;50],[48;49],[47;48],[46;47],[45;46],[44;45],[43;44],[42;43],[41;42],[40;41],[39;40],[38;39],[37;38],[36;37],[35;36],[34;35],[33;34],[32;33],[31;32],[30;31],[29;30],[28;29],[27;28],[26;27],[25;26],[24;25]

Modelo Persistente:
Acertos: 1193 Erros: 532 Acerto: 69,16%

Zero-R
Correctly Classified Instances 142 8.2319 %
Incorrectly Classified Instances 1583 91.7681 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as
0 0 0 0 0 0 0 0 0 0 0 0 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [24;25]
0 0 0 0 0 0 0 0 0 0 0 0 24 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [25;26]
0 0 0 0 0 0 0 0 0 0 0 0 27 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [26;27]
0 0 0 0 0 0 0 0 0 0 0 0 47 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [27;28]
0 0 0 0 0 0 0 0 0 0 0 0 61 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [28;29]

0 0 0 0 0 0 0 0 0 0 0 0 71 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [29;30]
0 0 0 0 0 0 0 0 0 0 0 0 86 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [30;31]
0 0 0 0 0 0 0 0 0 0 0 0 46 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [31;32]
0 0 0 0 0 0 0 0 0 0 0 0 56 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [32;33]
0 0 0 0 0 0 0 0 0 0 0 0 73 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [33;34]
0 0 0 0 0 0 0 0 0 0 0 0 130 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [34;35]
0 0 0 0 0 0 0 0 0 0 0 0 125 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [35;36]
0 0 0 0 0 0 0 0 0 0 0 0 142 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [36;37]
0 0 0 0 0 0 0 0 0 0 0 0 128 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [37;38]
0 0 0 0 0 0 0 0 0 0 0 0 129 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [38;39]
0 0 0 0 0 0 0 0 0 0 0 0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [39;40]
0 0 0 0 0 0 0 0 0 0 0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [40;41]
0 0 0 0 0 0 0 0 0 0 0 0 103 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [41;42]
0 0 0 0 0 0 0 0 0 0 0 0 73 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [42;43]
0 0 0 0 0 0 0 0 0 0 0 0 28 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [43;44]
0 0 0 0 0 0 0 0 0 0 0 0 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [44;45]
0 0 0 0 0 0 0 0 0 0 0 0 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [45;46]
0 0 0 0 0 0 0 0 0 0 0 0 16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [46;47]
0 0 0 0 0 0 0 0 0 0 0 0 42 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [47;48]
0 0 0 0 0 0 0 0 0 0 0 0 37 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [48;49]
0 0 0 0 0 0 0 0 0 0 0 0 24 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [49;50]
0 0 0 0 0 0 0 0 0 0 0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [50;51]
0 0 0 0 0 0 0 0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [51;52]

0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [52;53]

J48
Number of Leaves : 1540
Size of the tree : 1711
Correctly Classified Instances 961 55.7101 %
Incorrectly Classified Instances 764 44.2899 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac <-- classified as
6 4 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [24;25]
4 16 3 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [25;26]
2 7 15 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [26;27]
0 0 3 30 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [27;28]
0 0 0 16 35 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [28;29]
0 1 0 2 10 45 12 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [29;30]
0 0 0 0 1 8 64 9 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [30;31]
0 0 0 0 0 0 14 24 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [31;32]
0 0 0 0 0 0 6 7 30 8 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [32;33]
0 0 0 0 0 0 0 1 5 47 15 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [33;34]
0 0 0 0 0 1 0 0 2 20 79 25 2 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [34;35]
0 0 0 0 0 0 0 0 0 4 32 61 25 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [35;36]
0 0 0 0 0 0 0 0 0 0 7 23 78 29 3 0 2 0 0 0 0 0 0 0 0 0 0 0 0 | m = [36;37]
0 0 0 0 0 0 0 0 0 0 0 3 38 68 12 5 2 0 0 0 0 0 0 0 0 0 0 0 0 | n = [37;38]
0 0 0 0 0 0 0 0 0 0 0 0 12 21 61 27 5 3 0 0 0 0 0 0 0 0 0 0 0 | o = [38;39]
0 0 0 0 0 0 0 0 0 0 0 0 2 4 20 60 12 2 0 0 0 0 0 0 0 0 0 0 0 | p = [39;40]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 19 36 9 1 0 0 0 0 0 0 0 0 0 0 | q = [40;41]
0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 2 9 66 19 0 1 0 0 0 0 0 0 0 0 | r = [41;42]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 27 40 2 1 0 0 0 1 0 0 0 0 | s = [42;43]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 14 3 7 1 0 0 1 0 0 0 0 | t = [43;44]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 8 10 5 2 0 0 0 0 0 | u = [44;45]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 6 4 0 1 0 0 0 0 | v = [45;46]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 7 4 1 2 0 0 0 | w = [46;47]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 3 26 7 4 0 0 0 | x = [47;48]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 6 22 7 0 0 0 | y = [48;49]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 5 10 5 1 0 | z = [49;50]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 14 3 0 | aa = [50;51]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 5 0 | ab = [51;52]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 | ac = [52;53]

Random Forest

Correctly Classified Instances	1113	64.5217 %
Incorrectly Classified Instances	612	35.4783 %

=== Confusion Matrix ===

```
  a  b  c  d  e  f  g  h  i  j  k  l  m  n  o  p  q  r  s  t  u  v  w  x  y  z aa ab ac   <-- classified as
  4  8  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  a = [24;25]
  4 19  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  b = [25;26]
  1  5 20  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  c = [26;27]
  0  0  3 36  8  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  d = [27;28]
  0  0  0 13 37 10  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  e = [28;29]
  0  0  0  0  4 59  7  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  f = [29;30]
  0  0  0  0  0 12 62  8  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  g = [30;31]
  0  0  0  0  0  0  9 28  9  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  h = [31;32]
  0  0  0  0  0  0  7  4 31 14  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  i = [32;33]
  0  0  0  0  0  0  0  1  7 53 11  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  j = [33;34]
  0  0  0  0  0  0  0  0  2  9 98 18  2  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  k = [34;35]
  0  0  0  0  0  0  0  0  0  1 21 76 23  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  l = [35;36]
  0  0  0  0  0  0  0  0  0  0  6 13 91 28  2  1  1  0  0  0  0  0  0  0  0  0  0  0  0 |  m = [36;37]
  0  0  0  0  0  0  0  0  0  0  0  2 18 84 22  2  0  0  0  0  0  0  0  0  0  0  0  0  0 |  n = [37;38]
  0  0  0  0  0  0  0  0  0  0  0  0  6 18 84 20  0  1  0  0  0  0  0  0  0  0  0  0  0 |  o = [38;39]
  0  0  0  0  0  0  0  0  0  0  0  0  4  1 19 70  4  2  0  0  0  0  0  0  0  0  0  0  0 |  p = [39;40]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  4 20 36  8  1  0  0  0  0  0  0  0  0  0  0 |  q = [40;41]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  2  8 68 23  0  0  0  1  0  0  0  0  0  0 |  r = [41;42]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 28 40  1  3  0  0  0  1  0  0  0  0 |  s = [42;43]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  9  7  9  1  0  0  1  0  0  0  0 |  t = [43;44]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  3  6 19  2  0  0  0  0  0  0  0 |  u = [44;45]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  2  3  8  2  0  0  0  0  0  0 |  v = [45;46]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  3  2  5  4  2  0  0  0  0 |  w = [46;47]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1 32  7  1  0  0  0 |  x = [47;48]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  1  1 10 17  7  0  0  0 |  y = [48;49]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  8  8  7  0  0 |  z = [49;50]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  3 14  2  0 | aa = [50;51]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  3  7  0 | ab = [51;52]
  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0 | ac = [52;53]
```

CMIG4

Saídas:
[5;6],[6;7],[7;8],[8;9],[9;10],[10;11],[11;12],[12;13],[13;14],[14;15],[15;16],[16;17],[17;18],[18;19],[19;20],[20;21],[21;22],[22;23],[23;24],[24;25],[25;26],[26;27],[27;28],[28;29],[29;30],[30;31],[31;32],[32;33],[33;34],[34;35],[35;36],[36;37],[37;38],[38;39],[39;

40],[4;5],[40;41],[41;42],[42;43],[43;44],[44;45],[45;46],[46;47],[47;48],[48;49],[49;50
]

Modelo Persistente
Acertos: 1265 Erros: 460 Acerto: 73,33%

Zero-R
Correctly Classified Instances 113 6.5507 %
Incorrectly Classified Instances 1612 93.4493 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab
ac ad ae af ag ah ai aj ak al am an ao ap aq ar as at <-- classified as
0 0 41 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | a = [5;6]
0 0 62 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | b = [6;7]
0 0 113 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | c = [7;8]
0 0 72 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | d = [8;9]
0 0 57 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | e = [9;10]
0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | f = [10;11]
0 0 43 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | g = [11;12]
0 0 54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13]
0 0 84 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | i = [13;14]
0 0 53 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15]
0 0 39 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | k = [15;16]
0 0 50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | l = [16;17]
0 0 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | m = [17;18]
0 0 47 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19]
0 0 93 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20]
0 0 32 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21]

0 0 29 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | q = [21;22]
0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23]
0 0 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24]
0 0 49 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25]
0 0 81 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26]
0 0 55 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27]
0 0 83 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28]
0 0 68 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29]
0 0 105 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30]
0 0 69 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31]
0 0 41 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32]
0 0 21 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33]
0 0 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;34]
0 0 23 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ad = [34;35]
0 0 16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ae = [35;36]
0 0 19 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | af = [36;37]
0 0 22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ag = [37;38]
0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ah = [38;39]
0 0 24 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ai = [39;40]
0 0 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | aj = [4;5]
0 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ak = [40;41]
0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | al = [41;42]
0 0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | am = [42;43]

```
  0  0  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  an = [43;44]
  0  0  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  ao = [44;45]
  0  0  7  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  ap = [45;46]
  0  0  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  aq = [46;47]
  0  0  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  ar = [47;48]
  0  0  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  as = [48;49]
  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0 |  at = [49;50]
```

J48
Number of Leaves :   1504
Size of the tree :   1671
Correctly Classified Instances   1047   60.6957 %
Incorrectly Classified Instances   678   39.3043 %

=== Confusion Matrix ===

```
  a  b  c  d  e  f  g  h  i  j  k  l  m  n  o  p  q  r  s  t  u  v  w  x  y  z aa ab ac ad ae af ag ah ai
aj ak al am an ao ap aq ar as at   <-- classified as
 27  9  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
2  0  0  0  0  0  0  0  0  0  0 |  a = [5;6]
  8 38 16  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0 |  b = [6;7]
  8  7 94  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0 |  c = [7;8]
  3  1 15 34 19  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0 |  d = [8;9]
  0  0  0 11 45  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0 |  e = [9;10]
  0  0  0  0  0  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0 |  f = [10;11]
  0  0  0  0  0  1 27 10  5  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0 |  g = [11;12]
  0  0  0  0  1  0 12 26 14  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0 |  h = [12;13]
  0  0  0  0  1  0  3 10 61  8  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0 |  i = [13;14]
  0  0  0  0  0  0  0  1 12 32  7  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0 |  j = [14;15]
```

0 0 0 0 0 0 0 0 1 3 27 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | k = [15;16]
0 0 0 0 0 0 0 0 1 0 8 38 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | l = [16;17]
0 0 0 0 0 0 0 0 2 0 0 3 10 4 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | m = [17;18]
0 0 0 0 0 0 0 0 0 1 0 0 6 17 20 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19]
0 0 0 0 0 0 0 0 0 0 0 0 0 14 69 8 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | o = [19;20]
0 0 0 0 0 0 0 0 0 0 0 0 0 1 12 17 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2 19 5 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | q = [21;22]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 4 20 10 2 2 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | r = [22;23]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 21 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | s = [23;24]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 5 27 16 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 2 17 46 10 1 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 11 26 12 0 1 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 7 63 8 0 3 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | w = [27;28]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 18 22 26 2 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 20 66 16 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 4 16 40 6 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 15 19 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 18 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 3 2 3 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | ac = [33;34]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 20 3 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | ad = [34;35]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 4 4 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | ae = [35;36]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 3 13 1 0 0
0 0 0 0 0 0 0 0 0 0 0 | af = [36;37]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 4 11 4 0
0 0 0 0 0 0 0 0 0 1 0 | ag = [37;38]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 4 4
0 0 0 0 0 0 0 0 0 0 0 | ah = [38;39]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 4 18
0 1 0 0 0 0 0 0 0 0 0 | ai = [39;40]
2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
12 0 0 0 0 0 0 0 0 0 0 | aj = [4;5]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 2
0 0 0 1 0 0 0 0 0 0 0 | ak = [40;41]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
0 0 0 2 1 0 0 0 0 0 0 | al = [41;42]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 5 2 0 0 0 0 0 0 | am = [42;43]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 1 0 1 0 0 0 0 0 | an = [43;44]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 2 0 0 0 0 | ao = [44;45]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 2 4 0 0 0 0 | ap = [45;46]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2 0 1 0 0 | aq = [46;47]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 2 0 | ar = [47;48]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 3 1 0 | as = [48;49]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 | at = [49;50]

Random Forest

Correctly Classified Instances	1127	65.3333 %
Incorrectly Classified Instances	598	34.6667 %

=== Confusion Matrix ===

a b c d e f g h i j k l m n o p q r s t u v w x y z aa ab ac ad ae af ag ah ai
aj ak al am an ao ap aq ar as at <-- classified as
30 8 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 | a = [5;6]
6 34 22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 | b = [6;7]
5 6 94 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 | c = [7;8]
3 0 11 46 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 | d = [8;9]
0 0 0 7 50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 | e = [9;10]

0 0 0 0 1 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | f = [10;11]
0 0 0 0 0 1 34 7 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | g = [11;12]
0 0 0 0 0 0 10 31 12 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | h = [12;13]
0 0 0 0 0 0 1 8 71 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | i = [13;14]
0 0 0 0 0 0 0 1 10 32 8 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | j = [14;15]
0 0 0 0 0 0 0 0 0 4 31 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | k = [15;16]
0 0 0 0 0 0 0 0 0 0 5 40 3 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | l = [16;17]
0 0 0 0 0 0 0 0 0 0 0 3 8 7 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | m = [17;18]
0 0 0 0 0 0 0 0 0 0 0 0 5 22 18 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | n = [18;19]
0 0 0 0 0 0 0 0 0 0 0 0 0 8 76 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | o = [19;20]
0 0 0 0 0 0 0 0 0 0 0 0 0 1 15 13 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | p = [20;21]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 19 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | q = [21;22]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 24 9 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | r = [22;23]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 27 6 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | s = [23;24]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 5 28 16 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | t = [24;25]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 18 53 6 0 0 1 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | u = [25;26]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 29 12 1 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | v = [26;27]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 10 63 5 3 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | w = [27;28]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 12 29 24 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | x = [28;29]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 14 79 10 2 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | y = [29;30]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 24 33 11 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | z = [30;31]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 18 16 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 | aa = [31;32]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 16 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 | ab = [32;33]

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 4 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ac = [33;34]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 19 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ad = [34;35]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 7 4 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ae = [35;36]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 13 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | af = [36;37]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 11 5 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ag = [37;38]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 2 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ah = [38;39]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 20 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 | ai = [39;40]
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 13 0 0 0 0 0 0 0 0 0 0 0 0 0 | aj = [4;5]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 0 0 1 0 0 0 0 0 0 0 0 0 0 | ak = [40;41]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 2 1 0 0 0 0 0 0 0 0 | al = [41;42]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 8 0 0 0 0 0 0 0 0 0 | am = [42;43]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 | an = [43;44]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 2 0 0 0 0 0 0 | ao = [44;45]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 3 2 0 0 0 0 | ap = [45;46]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 | aq = [46;47]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 | ar = [47;48]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 | as = [48;49]
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 | at = [49;50]

Resultados para 10 em 10 centavos com atraso de 8 dias

ELET6 – CESP6 – TRPL4 – COCE5 – CMIG4

Persistente – Zero-R – J48 – Random Forest

ELET6

Modelo Persistente:

Acertos: 283 Erros: 1442 Acerto: 16,41%

Zero-R

Correctly Classified Instances: 34 1.971 %

Incorrectly Classified Instances:1691 98.029 %

J48

Number of Leaves : 2881

Size of the tree : 3201

Correctly Classified Instances: 305 17.6812 %

Incorrectly Classified Instances: 1420 82.3188 %

Random Forest

Correctly Classified Instances: 372 21.5652 %

Incorrectly Classified Instances: 1353 78.4348 %

CESP6

Modelo Persistente:

Acertos: 182 Erros: 1543 Acerto: 10,55%

Zero-R

Correctly Classified Instances: 14 0.8116 %

Incorrectly Classified Instances: 17 99.1884 %

J48

Number of Leaves : 2800

Size of the tree : 3111

Correctly Classified Instances: 245 14.2029 %

Incorrectly Classified Instances: 1480 85.7971 %

Random Forest

Correctly Classified Instances: 328 19.0145 %

Incorrectly Classified Instances: 1397 80.9855 %

TRPL4

Modelo Persistente:

Acertos: 165 Erros: 1560 Acerto: 9,57%

Zero-R

Correctly Classified Instances: 10 0.5797 %

Incorrectly Classified Instances: 1715 99.4203 %

J48

Number of Leaves : 2971

Size of the tree : 3301

Correctly Classified Instances: 196 11.3623 %

Incorrectly Classified Instances: 1529 88.6377 %

Random Forest

Correctly Classified Instances: 235 13.6232 %

Incorrectly Classified Instances: 1490 86.3768 %

COCE5

Modelo Persistente:

Acertos: 232 Erros: 1493 Acerto: 13,45%

Zero-R

Correctly Classified Instances: 20 1.1594 %

Incorrectly Classified Instances: 1705 98.8406 %

J48

Number of Leaves : 2827

Size of the tree : 3141

Correctly Classified Instances: 259 15.0145 %

Incorrectly Classified Instances: 1466 84.9855 %

Random Forest

Correctly Classified Instances: 310 17.9710 %

Incorrectly Classified Instances: 1415 82.0290 %

CMIG4

Modelo Persistente:

Acertos: 221 Erros: 1504 Acerto: 12,81%

Zero-R

Correctly Classified Instances: 22 1.2754 %

Incorrectly Classified Instances: 1703 98.7246 %

J48

Number of Leaves : 2800

Size of the tree : 3111

Correctly Classified Instances: 249 14.4348 %

Incorrectly Classified Instances: 1476 85.5652 %

Random Forest

Correctly Classified Instances: 308 17.8550 %

Incorrectly Classified Instances: 1417 82.1450 %