PERFORMANCE ANALYSIS AND OPTIMIZATION OF CELLULAR AUTOMATA BASED FUZZY CLASSIFIER

THESIS

submitted in partial fulfillment of
the requirements for the award of
M.Tech in Computer Science and Engineering
of the University of Kerala

by

PRINCE MATHEW

(University Register No: 72114400012)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COLLEGE OF ENGINEERING TRIVANDRUM

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Certificate

This is to certify that this thesis report entitled **“Performance Analysis and Optimization of Cellular Automata based Fuzzy Classifier”** is a bonafide record of the work done by **Prince Mathew,** under my guidance towards partial fulfillment of the requirements for the award of the degree of **Master of Technology in Computer Science and Engineering** of the University of Kerala during 2014–2016.

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PRINCE MATHEW

Abstract

Cellular automata, a popular computational model, is inherently parallel in nature and hence can process data at very high speeds. Fuzzy logic, when applied to cellular automata, gives us a more flexible and accurate model named continuous cellular automata, which can be used for fuzzy classification.

The use of cellular automata in classification is a promising area but lacks serious research attempts. The existing rudimentary classifier based on cellular automata shows good accuracy, but is capable of processing only a limited number of data sets containing small number of numeric atrributes and has very high computational complexity.

This thesis proposes an enhanced classifier based on continuous cellular automata with reduced running time and better classification accuracy compared to the rudimentary classifier. The new classifier model is capable of processing data sets containing large number of numeric as well as non-numeric attributes. It performs effective preprocessing of numeric and nominal attributes to identify the most relevant ones. It also prunes out unnecessary computations by limiting stabilization of the cellular automata during the training phase.

A number of experiments were conducted to evaluate the perfomance of the proposed classifier by changing various parameters such as number of attributes used for classification, average number of partitions and extent of training, thereby reducing the complexity of the classifier. Evaluations show that the enhanced classifier out-performs the existing rule based classifiers in terms of accuracy. It also reveal that the optimal values for various controlling parameters are distinct for various data sets.

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Chapter 1

Introduction

Classification is a supervised learning method used in machine learning and statistics, which takes a set of input vectors with known class labels and builds a model that can predict the class label of a previously unknown input vector. Classifiers can be broadly divided into two: crisp classifiers and fuzzy classifiers. A crisp classifier classifies each input vector into a discrete class, whereas, a fuzzy classifier predicts the membership degree of the input vector in each of the available classes.

A cellular automata is a dynamic system composed of very simple, uniformly interconnected cells. Each cell has some state which can be represented by an integer value. A continuous cellular automata is one in which the cell values can be real numbers within some range. Being inherently parallel in nature, a cellular automata can be effectively used for classification of large input.

In this thesis, we suggest a number of enhancements and optimizations to improve the performance of an existing rudimentary fuzzy classifier based on continuous cellular automata(CCA). Here, we overcome various limitations of the exiting classifier and make various changes in the model building phase. We also perform a preprocessing of the data set to improve the classification process. We exploit the inherent parallel nature of CCA to parallelize the diffusion process during the model building phase.

Experimental results using the upgraded classifier shows better accuracy with reduced running time for various data sets and it also processes a wide variety of data sets, containing large number of numeric as well as nominal attributes, compared to the earlier classifier, which can only process numeric attributes only.

1.1 Motivation

Fuzzy classification using continuous cellular automata is not an area of rigorous research. The existing classifier using continuous cellular automata shows very high accuracy for some data sets. But the number of attributes this classifier can process and type of data sets and attributes that can be processed are limited. Cellular automata is an efficient computational model that can leverage advantages of parallelism. This classifier does not utilize this inherent parallelism in cellular automata.

The very high running time for the model building phase is also a heavy turn down while trying to use the existing classifier for real-world problems. Static partition values without considering the distribution of values and uncontrolled diffusion phase also make the existing method less favorable for normal use.

This motivated us to propose various enchancements and optimizations to the existing classifier and to study their effect on the performance of the classifier.

1.2 Objectives

The main objectives of this thesis are:

1. To build an enhanced fuzzy classifier using continuous cellular automata that gives reduced running time and improved accuracy by suitably selecting significant attributes and attribute value partitions and pruning out unneccesary computations whenever possible.

2. To experimentally study the performance of the new classifier on a wide variety of real-world data sets.

3. To identify the optimal value for various parameters such as number of significant attributes, average number of partitions per attribute and the extent of diffusion for various data sets so that the classification accuracy is maximized while the time required for model building and preprocessing is minimised.

1.3 Thesis Outline

The rest of the thesis has the following organization. Chapter 2 gives a brief overview of classification and fuzzy classification. This chapter also discusses the concept of cellular automata, continuous automata and the working of the existing cellular automata based fuzzy classifier. Chapter 3 reviews the related literature. Chapter 4 presents our proposal for enhanced fuzzy classifier using continuous automata. Major experimental results are presented in Chapter 5. The thesis is concluded in Chapter 7 by highlighting the important contributions and giving some future directions. Appendix A gives the complete set of results of the experiments conducted.

Chapter 2

Background & Terminology

In this chapter, we present the necessary background information and terminology needed for the rest of the thesis. We also briefly outline the existing rudimentary classifier and highlight its limitations.

2.1 Fuzzy Classification

In machine learning, there are two types of learning, supervised and unsupervised. Classification is a type of supervised learning. In classification, the aim is to classify patterns into one of many possible categories. These categories are also called classes.

Zadeh [16] invented fuzzy logic in order to handle uncertain and imprecise knowledge in real world applications. Fuzzy logic has been used as a powerful tool to handle and manipulate imprecise and noisy data, categorize patterns into classes, make decisions, and so on. Unlike crisp sets, elements of a fuzzy set belong to that set with a membership degree that varies between zero and one. This is called *degree of membership* of an element in the fuzzy set. The value 0.0 represents absolute non-membership and 1.0 represents absolute membership. According to Jain and Abraham [26], a fuzzy system is defined by a set of "if-then" rules, which represents some linguistic statements based on expert knowledge.

Fuzzy classification systems are rule based fuzzy systems that perform classification by granulating the features domain by means of fuzzy partitions. Linguistic variables in the antecedent part of the rules represent features. Consequent part represents the class. A fuzzy classification rule can be expressed as

$$R_k : \textbf{IF } X_1 \ is \ A_{1j_1} \textbf{ AND } \cdots \textbf{ AND } X_m \ is \ A_{mj_m} \textbf{ THEN } Class \ = \ c_i$$

where R_k is the identifier of k^{th} rule, X_1 to X_m are the m features of the example pattern represented by linguistic variables, A_{1j_1} to A_{mj_m} are the fuzzy sets used to represent each of the m feature values, and c_i is the fuzzy or crisp class that the example pattern belongs to.

As explained by Cintra et al. [37], during classification, an inference mechanism compares an unlabeled sample data with each rule in the fuzzy rule base. Finally the class of the sample is determined based on these rules.

2.2 Continuous Automata

Cellular automata (CA) is a discrete dynamical system which consists of a set of identically programmed automata, also called cells. These cells have a definite state and can interact with one another in a neighborhood relationship. Cellular automata can be used to model how the elements of a system interact with each other.

Cellular automata has a complex and varied behavior that can be completely specified in terms of local relations. It is represented as a uniform grid and the time advances in discrete steps. The transition rules can be expressed in a table through which at each step each cell computes its new state based on the current states of its neighbors.

Each cell has a neighbourhood, defined by a finite and fixed set of neighbours. A number of neighbourhood definitions can be used. Two common two-dimensional neighbourhoods are the *Von Neumann neighbourhood* and the *Moore neighbourhood*. In Von Neumann model, each

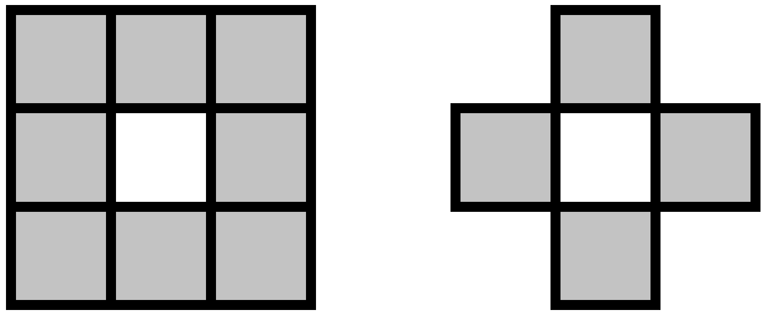


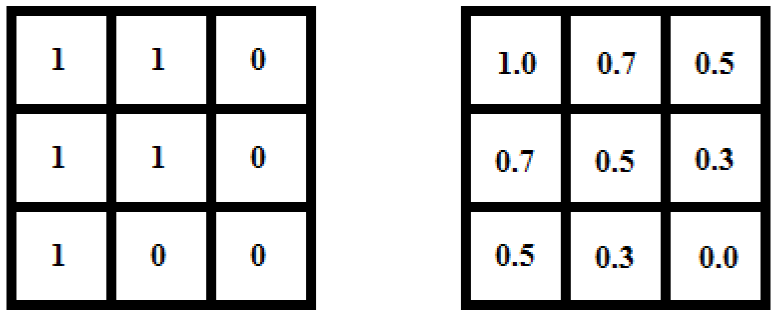
Figure 2.1: Two types of neighbourhood in cellular automata.

cell has neighbours to the north, south, east and west. In Moore model, each cell has four additional neighbours, which are the diagonal cells to the northeast, southeast, southwest and northwest. Figure 2.1 shows these two neighbourhoods in two dimensions. In general, in an n-dimensional space, a cell's Von Neumann neighbourhood will contain $2n$ cells and its Moore neighbourhood will contain $3^n - 1$ cells.

A grid can be seeded with initial values, after which the CA progresses through a series of discrete time steps, called generations. At each time step, each cell computes its new contents by examining the current states of cells in its neighbourhood. To these values it then applies its update rule to compute its new state. Each cell follows the same update rule, and all cells' contents are updated synchronously and simultaneously.

An important feature of cellular automata is that the update rule examines only the neighbouring cells. Hence, its processing is entirely local with no global or macro grid characteristics computed. These generations proceed in lock-step with all the cells updating at once.

According to Wolfram [35], a continuous automaton can be described as a cellular automaton extended so the valid states a cell can take are not just discrete , but continuous, for example, the real number range [0,1] (see Figure 2.2(b)). Its values can spread out from one cell to its neighbours based on some algorithm. The cells remain discretely separated from each other.



(a) Cellular Automata (b) Continuous Automata

Figure 2.2: Two dimensional cellular automata and continuous automata

Such automata can be used to model certain physical reactions such as diffusion more closely and solve the fuzzy classification problem. One such diffusion model could consist of a transition function based on the average values of the cell neighbourhood.

2.3 Existing Classifier

The existing classification process [13] consists of two phases. In the first phase, data samples from the training set is used to build and set up the classification model. This model is used for performing classification in the second phase.

2.3.1 Phase I: Building the Classifier Model

This is also called as 'Training phase'. Whose steps are shown in Figure 2.3. In this phase, first the cell array is created as the underlying data structure for implementing this method. This is an n-dimensional array where n is the dimensionality of the data set. This means that n attributes of the data samples take part in the classification.

For an n-dimensional cell array, each non-boundary cell has 2n neighbours, a left and a right neighbour corresponding to each attribute. Each cell is mapped to a parallel processing resource. Therefore the total number of cells in the model is independent of data set and depends only on the availability of parallel processing units. For the basic implementation of the method, as specified in this paper, each attribute is partitioned into an equal number of divisions. A cell represents one combination of one partition from each attribute. When compared with the classic fuzzy classification model, a cell represents a classification rule.

Each data sample (also called as patterns) in the training set is mapped to a cell based on the attribute values of that sample. This is performed by mapping each attribute to a corresponding partition of that attribute and mapping the combination of all such partitions of all attributes to a single cell.

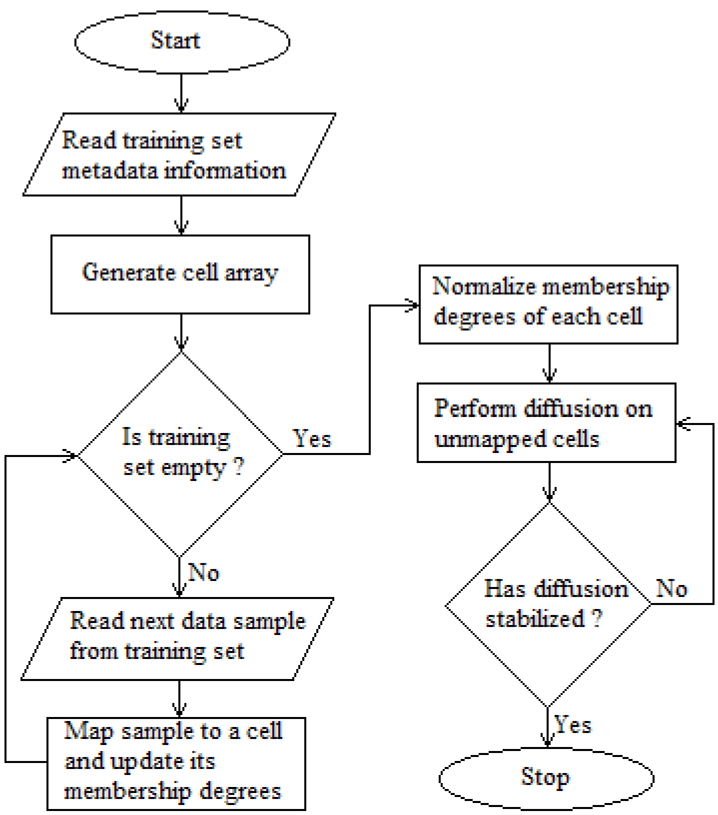


Figure 2.3: Steps in training phase [13]

Once the cell that the sample belongs to has been identified, the membership values of classes in that cell are updated. The updating is done so that membership degree of a class is the percentage of data samples mapped to that cell and belonging to that class with respect to the total number of data samples mapped to that cell (belonging to any class). The values are normalized so that the sum of membership values of all classes within a cell is one.

Once all the training data has been processed, the cells, which had no patterns mapped into them, start acting like a diffusion system, in which each cell independently spreads its membership degree values into its neighbouring cells. The diffusion process stabilizes only when the new membership values of every unmapped cell, is the arithmetic mean of membership values of all its neighbours (mapped or unmapped). Once stabilization occurs the phase I is over and the classifier model is said to be built.

2.3.2 Phase II: Performing Classification

This is also called as 'Testing phase' and its steps are shown in Figure 2.4. Classification is done once the classifier model has been set up in phase I. The data sample that needs to be classified is first mapped to the corresponding cell by the same cell-mapping algorithm used in phase I.

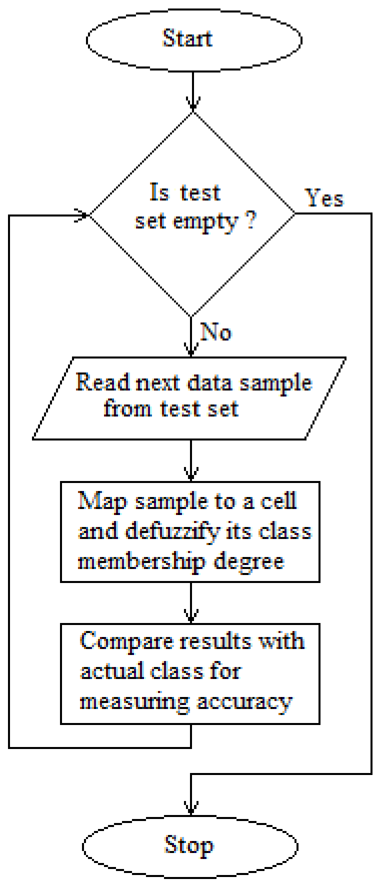


Figure 2.4: Steps in testing phase [13]

The degree of membership of this data sample in various classes is same as the membership degrees of the cell that this sample is mapped to. Now fuzzy classification is said to be completed. If the sample needs to be classified in a crisp fashion, an appropriate defuzzification method can be applied on this list of fuzzy membership degree values.

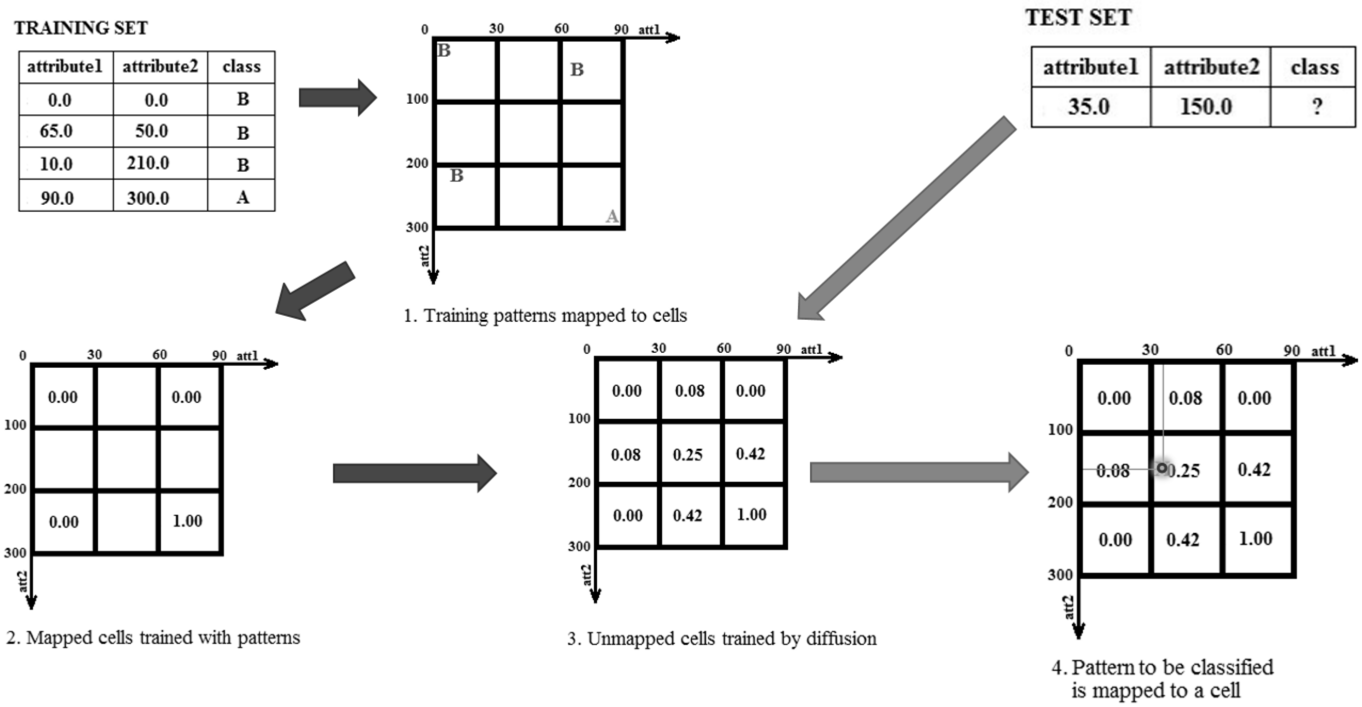


Figure 2.5: Existing Method

Figure 2.5 illustrates the classification process done in the existing rudimentary classifier. We have a training set of size 4 with two attributes, attribute1 and attribute2, and two classes A and B. Both the attribute value ranges are divided into three partitions. The training phase maps the input values into the corresponding cells in the cellular automata as shown in Figure 2.5. The next stage is diffusion where iterative training of cells are done, based on their neighbourhood relations and some predefined rule. Here, the value of untrained cells are updated simulataneously so that, their value is equal to the average value of its neighbours. This process is repeted until the entire cellular automata reaches a stable state.

Classification of an untrained sample is now done directly by mapping its input attribute values to the corresponding cell in the cellular automata. When multiple classes are present, separate celluar automata is constructed for each of the classes. The value in the cellular automata gives us the membership value of a given instance to a particular class. The class having the maximum membership value is choosen as the class of a given input instance.

2.4 Limitations of Existing Model

The existing model is based on continuous cellular automata. This method has an accuracy as good as the existing approaches and even better in some cases.

The main limitation of this method is the computational complexity. It demands a lot of computational resources for training, if used in classical non-parallel environments. Thus, the classifier can process data sets with limited number of attributes only. Also, it can process data sets with limited number of numeric attributes only. Also, each numeric attribute is partitioned into three subsets based on its maximum and minimum values only, without considering the distribution of values of the attribute. Less number of partitions and static fixed partitioning will result in poor classification accuracy and increased running time. Although one can increase the classification accuracy to an extent by increasing the number of partitions, this can lead to exponential increase in the complexity with respect to the number of attributes.

In the existing classifier, only those cells which are not mapped by any training sample take part in the diffusion phase of training. This can lead to less accurate results since a cell with a single training sample mapped to it and a cell with several samples mapped to it can have the same significance. In addition, the diffusion phase stabilizes only when the membership degrees of all unmapped cells are arithmetic means of membership degrees of their neighbourhood. As the number of significant digits in membership values increase, diffusion may take a long time to converge.

2.5 Terminology

The various terminologies used throughout this thesis are listed below:

- **Dimension** : Number of Attributes
- **Partitions** : Number of sections into which the range of a particular attribute is divided.
- **Diffusion Tolerance** : Reflects the extent to which the diffusion process is done.

  For example, a *diffusion tolerance* of x means that the diffusion process is stopped, when the difference between successive iterations of the diffusion phase becomes less than or equal to x and greater than or equal to $-x$, for each and every cell.
- **CCA** : Continuous Cellular Automata.

Chapter 3

Literature Review

In classification, the aim is to learn the relationship between the features(attribute values) and the class for every instance in a given data set. The number of attributes used by the classifier in the learning process must be reduced to the necessary minimum, especially when the model is nonlinear and contains many parameters, as in the case of a fuzzy model. Feature selection is a crucial step with the aim of reducing model complexity and removing (noisy) inputs that do not contribute to the output. Real world databases have a large number of features and the most relevant ones must be chosen.

There are approaches that suggests the method of increasing the number of training samples belonging to a particular class to give it more importance. This will cause the input data to be skewed. When the relations between the features are not well known, automatic procedures can be used to determine which features have a greater influence on the output. This is a form of data reduction that produces a reduced representation of the data set, much smaller in volume but yet produces the same, or almost the same, analytical results.

Since attributes may belong to multiple functional families, analysing these by crisp classification methods has limitations. Unlike crisp classification, fuzzy classification assigns a sample to multiple groups by membership value. This method is more robust to noise and more appropriate in analyzing attribute values than crisp classification method. Partition coefficient and classification entropy were first proposed by Bezdeck [11], to recognize the importance of attributes.

The most widely used fuzzy clustering algorithm is *fuzzy c-means algorithm* proposed by Bezdeck [12]. It generates a fuzzy partition by providing a degree of membership of each data to a given cluster. Bezdeck proposed Partition Coefficient (PC) and Classification Entropy (CE) for fuzzy cluster validation. The optimal partitioning was obtained by maximizing the value of PC and minimizing the value of CE with respect to certain value of c (number of clusters).

3.1 Fuzzy Logic

Fuzzy logic can represent knowledge in terms mathematical model. Because of this it can used in construction of models that can emulate the human decision making process[6].

Fuzzy logic is a precise logic of imprecision and approximate reasoning [20]. More precisely, it can be viewed as an attempt at formalizing of two remarkable human capabilities. First, the capability to converse, reason and make rational decisions in an environment of imprecision, uncertainty, incompleteness of information, conflicting information, partiality of truth and partiality of possibility. And second, the capability to perform a wide variety of physical and mental tasks without any measurements and any computations(Zadeh 1999, 2001). The fuzzy set is characterized as its membership function whose values lies in the unit interval $[0, 1]$.

3.2 Cellular Automata

Cellular Automata is a way to perform computations which involves processing of data at high speed. In cellular machine, a great deal of data should be processed in a short time in order to use the outcome results[2].

Self-reproduction in artificial systems was first studied by John Von Neumann in 1948. J. Von Neumman[10] and S. Ulam introduced the concept of Cellular automata to model natural physical and biological phenomena, in particular, for Von Neumanns pioneering studies of self-reproduction. [4]

Cellular Automata was designed with an aim to create self replication systems that was supposed to be perfect computationally [28]. S. Ulam devised a two-dimensional imaginary finite lattice for one-cellular machine formed of components named cells [36]. These cells are in contact with each other locally. Cellular machine is a ruptured dynamic system in time and space, which contains arrays of cells each of which can be defined in one of the limited states usually changing situation in synchronous or asynchronous paces based on the rules [15]. The next state of a cell is determined by its current state and the current states of its neighbours. The state of each cell in t time is a function of three key aspects [10]:

- The state of cell in t time
- The state of neighbouring cells in t time
- The set of governing rules on each CA cell

If we assume cellular automata to be a graph, then it can be constructed in an N-dimensional Euclidian Space. Consider the following examples. The set of points with integer coordinates, with edges connecting points that differ by at most exactly 1 in exactly one position (the Von Neumman neighbourhood) or, alternatively by at most 1 in each coordinate (the Moore neighbourhood) [4].

In a two-dimensional case the point (2,3) has neighbours (1,3), (3,3), (2,4), and (3,3) if our cellular automaton uses a Von Neumann neighbourhood, and has additional neighbours (1,2), (1,4), (3,2), (3,4) [4]. Instead, if we are using a cellular automaton with Moore neighbourhood.

We can allow wrapped around or a toroidal topology by identifying nodes which differ by a fixed vector[4]. For example, in a 25 x 50 node toroidal topology with Von Neumann neighbourhood, node (1,1) has neighbours (1,2), (2,1), (25,1) and (1,50) since (25,1) is identified with node (0,1) and (1,50) is identified with (1,0).

3.2.1 Pattern Classifiers based on Cellular Automata

Pattern classifiers based on cellular automata (CA) have been explored as a result of the promising structured and spatiotemporal characteristics [30]. There is a less number of technical classifiers based on Cellular Automata reported to date. Elementary Cellular Automata (ECA) [30] consists of a group of cells arranged in one-dimension with two possible states (0 or 1). A next state for the ith cell is considered from local transition function of its nearest neighbours. [28] Now, in the case of continuous cellular automata, these group of cells can have values in the range $[0, 1]$. Also the it can be multidimensional. The transition rules for continuous cellular automata and the neighbourhood relations are similar to that in traditional cellular automata machines.

According to Wolfram [30], a continuous automaton can be described as a cellular automaton extended so the valid states a cell can take are not just discrete, but continuous, for example, the real number range $[0, 1]$. The cells remain discretely separated from each other. Such automata can be used to model certain physical reactions such as diffusion more closely[13].

3.2.2 Synchronous vs. Asynchronous Update Rules

Usually a cellular automata updates the state of all its nodes simultaneously and in discrete steps. Thus, for all discrete times $t \geq 0$, if at discrete time step t each node v is in some state $q_v(t)$ then at the next discrete time step t+1 node v is in its next state $q_v(t+1)$. Thus the new state at a node is given by the local update rule as a function of the current state of that node and the finite list of all current states of all nodes in the neighbourhood of v. In this case of globally simultaneous update, we say that the cellular automaton is synchronous[4].

If the updates of the local component automata are not required to take place synchronously, but each one will be updated to its next state an unbounded number of times as (locally discrete) time goes on, then it is an asynchronous automata network. The updates are otherwise unconstrained, e.g. they may be deterministic, non-deterministic, random, sequential, etc., or even synchronous. Use of synchronous and asynchronous cellular automata to the modelling of biological systems are discussed in (Schonfisch and de Roos, 1999). Prior to this, all published models of self-reproduction in cellular automata have used only synchronous cellular automata update rules[4].

3.3 Defuzzification

Defuzzification process is the last step in generating an output from a fuzzy inference system. The single value thus obtained after defuzzification process can be used by an expert system [21, 23]. There are a variety of defuzzification methods. Each method exhibits different performances under different situation. We cant say that a particular defuzzification method is best in all conditions. This was initially pointed out by Zadeh[17]. The most common defuzzification method is a variation of the max criterion method. These include smallest of maxima(SOM), largest of maxima(MOM), which select the smallest, the largest, or the mean output value whose membership value reaches the maximum[24].

Defuzzification if defined mathematically, is a mapping strategy from a fuzzy set into a particular non fuzzy (crisp) space. I.e., Defuzzification is realized by a decision-making algorithm that selects the best crisp value based on a fuzzy set[31]. Detailed analysis of COG, MOM and Max Criteria(MC) strategies by Kiszka et al. [9], Kickert and Mamdani [34], Braae and Rutherford [22], Larkin[18], as well as Scharf and Mandic [7], concluded that the COA and MOM strategies usually perform better than the MC strategy. Here, neither the COA nor the MOM strategy cannot be claimed to be a better one over the other. The COA strategy yields better steady-state performance and smoother response, but is less transient than the MOM strategy[31].

In Largest of maxima method, the final output is calculated by averaging the set of those output values that have the highest possibility degrees. Two other popular techniques include the Center of Gravity (COG) or Centroid and Center of Area(COA) or Bisector methods[31].

As fuzzy concepts are more understood and accepted, the demand for developing a general and adaptable defuzzification strategy, which can generate the optimal defuzzified result also increases. Filev and Yager [5] were the first to realize that an objective defuzzification strategy cannot be generated without using a learning procedure[31], and they introduced the basic defuzzification distributions (BADD) which included a learning procedure in the defuzzification strategy.

A situation specific switching of different defuzzification methods was studied by Smith [8]. This has a high implementation effort, and the switching effects may be crucial[33]. It is important to select appropriate defuzzification methods depending on the application were standard defuzzification methods fails. Thomas A Runkler proposed a fuzzy rule-based systems with a fixed defuzzification method where selection of appropriate defuzzification methods is done using application specific properties[33].

There are a variety of defuzzification mechanisms [32] discusses two such defuzzification methods namely Center of Area and Centroid Approximation. A large number of defuzzification mechanisms are discussed in [29], which include True Center of Gravity, Mean of Maxima (MOM), Plateau Average (PA), Weighted Plateau Average(WPA) and many other techniques.

3.4 Conclusion

In this chapter, we reviewed the important related literature. In the next chapter we present our proposal for an enhanced fuzzy classifier.

Chapter 4

An Enhanced Fuzzy Classifier

The proposed method of fuzzy classification using continuous cellular automata aims at improving the performance and accuracy of the existing rudimentary classifier. It also proposes effective approaches for processing numeric and nominal attributes.

The classifier building process is divided into two phases. In the first phase the input data is pre-processed, which is subsequently used to construct the classification model in the second phase.

4.1 Pre-processing

In this phase, the input data, which is in the form of an arff file, is processed to perform dimensionality reduction and dynamic partitioning of cells. Initially, the following information are extracted from the header of the arff file.

- Attribute names and their data types.
- Number and names of values of nominal attributes.
- Total number of classes and class names.

Now we process the data section of the arff file and extract the following during the first run through the data.

- Total number of samples - Sample number.
- Total number of mappings to each class .
- Min and max values of numeric attributes.
- Membership degrees for nominal attribute values.

We set a flag to represent numeric and nominal values and store values of numeric attributes and their corresponding classes in a temporary array list.

4.1.1 Dynamic partitioning of attributes

We can calculate entropy for nominal attributes directly with the information in hand as the number of partitions for a nominal attribute is always equal to the number of distinct values it has. Partitioning of numeric attributes takes a different approach as described in Algorithm 1.

Unlike the previous approach, which takes into account the min and max values to define *three* partitions, we consider the distribution and repetition of values of a numerical attribute to decide the number of patitions and size of each partition.

The Algorithm 1 decides partitions based on two factors:(**I**) A threshold(T), which represents the *recommended* maximum size of a partition and (**II**) Number of times each value of the attribute is repeated. The algorithm operates on sorted sequence of values as follows: Let there be n repeating sequences $R_{x_1}, R_{x_2}, \ldots, R_{x_n}$ representing the repeated sequence of values $x_1, x_2, \ldots, x_n$. Here, $|R_{x_i}|$ gives us the number of times x_i is repeated in the repeating sequence R_{x_i}.

The algorithm works as follows: if $|R_{x_i}| \geq T$, then R_{x_i} forms a partition. If $|R_{x_i}| < T$, it is added to the previous partition, provided that the new size of the partition does not exceed T; otherwise R_{x_i} is inserted into a new partition.

Algorithm 1: Numeric Attribute- Partitioning Algorithm

input : Sorted values of a numeric attribute $(x_1, x_2, \ldots, x_n)$, Threshold(T)
output: Partition ranges

Initialize i=1
Add value R_{x_i} into first partition and set count = $|R_{x_i}|$
do
  increment i
  if $(count + |R_{x_i}|) < T$ **then**
    $count = count + |R_{x_i}|$
  else
    Insert R_{x_i} into next partition and set $count = |R_{x_i}|$
  end
while $i \leq n$;

Now based on these partitions, calculate the partition membership like in the case of nominal attributes. The entire processing of the data set is done in a single run through the data set. The data structures created in the intermediate stages are discarded.

4.1.2 Dimensionality Reduction/ Feature Reduction

In this step, we reduce the number of attributes required for the classification process. Important attributes can be identified by calculating *entropy* values of attributes, motivated by the method used in decision trees. Here, the decision tree is not built; instead we use only the entropy values [3], which show the measure of uncertainty. Attributes with lesser entropy are preferred over those with higher value. While this may lead to an increased pre-processing time, it is compensated by the drastic reduction in model building time, particularly for large data sets.

RID	age	income	student	credit_rating	Class: buys_computer
1	youth	high	no	fair	no
2	youth	high	no	excellent	no
3	middle_aged	high	no	fair	yes
4	senior	medium	no	fair	yes
5	senior	low	yes	fair	yes
6	senior	low	yes	excellent	no
7	middle_aged	low	yes	excellent	yes
8	youth	medium	no	fair	no
9	youth	low	yes	fair	yes
10	senior	medium	yes	fair	yes
11	youth	medium	yes	excellent	yes
12	middle_aged	medium	no	excellent	yes
13	middle_aged	high	yes	fair	yes
14	senior	medium	no	excellent	no

Figure 4.1: Entropy Calculation- Example [14]

Calculating Entropy

Entropy measures the amount of randomness or surprise or uncertainty. Given probabilities p1, p2,..., ps where,

$$\sum_{i=1}^{s} P_i = 1 \tag{4.1}$$

Entropy is defined as:

$$H(p_1, p_2, ..., p_s) = \sum_{i=1}^{s} (p_i * (log(1/p_i)) \tag{4.2}$$

The value of entropy is between 0 and 1 and reaches a maximum, when all probabilities are the same.

Example 1 *: The calculation of entropy for the attribute age based on data given in Figure 4.1 is given below.*

For age = ***"<=30"***

s_{11}=2 ; s_{21}=3 ; $I(s_{11},s_{21})$= 0.971

For age = ***"31...40"***

s_{12}=4 ; s_{22}=0 ; $I(s_{12},s_{22})$=0

For age= ***">40"***

s_{13}=3 ; s_{23}=2 ; $I(s_{13},s_{23})$=0.971

E(age) $= \frac{5}{14} \times I(s_{11}, s_{21}) + 4/14 \times I(s_{12}, s_{22}) + 5/14 \times I(s_{13}, s_{23})$

$=\frac{5}{14} \times (-\frac{2}{5}log_2\frac{2}{5} - \frac{3}{5}log_2\frac{3}{5}) + \frac{4}{14} \times (-\frac{4}{4}log_2\frac{4}{4} - \frac{0}{4}log_2\frac{0}{4}) + \frac{5}{14} \times (-\frac{3}{5}log_2\frac{3}{5} - \frac{2}{5}log_2\frac{2}{5})$

=0.694.

4.2 Constructing the Classifier

We now extract the following information from the temporary arff file created.

- Number of classes
- Number of data points. i.e., total number of instances
- Attribute names

4.2.1 Step 1: Create Cells

For each cell we create the following fields:

1. Fields to store membership values for each class.
2. Set the neighbourhood values. i.e., define the neighbourhood relation between cells. Showing which cells are adjacent to a particular cell when arranged spatially.

The neighbourhood relations are static once the cells are created. The only thing that changes during the diffusion process is the membership values.

Defining Neighbourhood Relations

Figure 4.2 shows neighbourhood relations when only one attribute with 5 partitions is used. Figure 4.3 depicts the neighbourhood relations when two attributes are used with 5 and 4 partitions respectively and Figure 4.4 shows neighbourhood relations when three attributes are used for building the classifier with 5, 4 and 4 partitions repectively. In each figure the grey cells represents neighbours of the black cells.

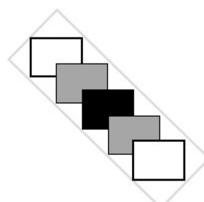


Figure 4.2: Neighbourhood Relations- 1 Attribute with 5 partitions

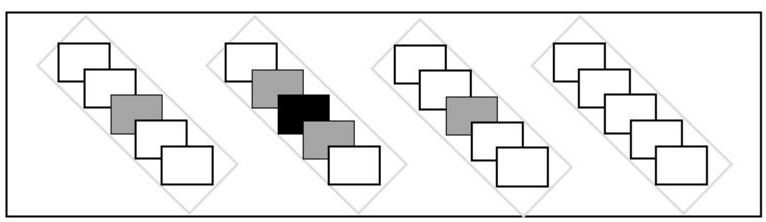


Figure 4.3: Neibourhood Relations- 2 Attributes with 5 and 4 partitions

4.2.2 Step 2: Populate and Normalize Cells

The cells are now populated with information from the training data. Mapping is done for each training sample to corresponding cells, incrementing membership value of the corresponding class. We now normalize the membership values of each cell, considering the membership values

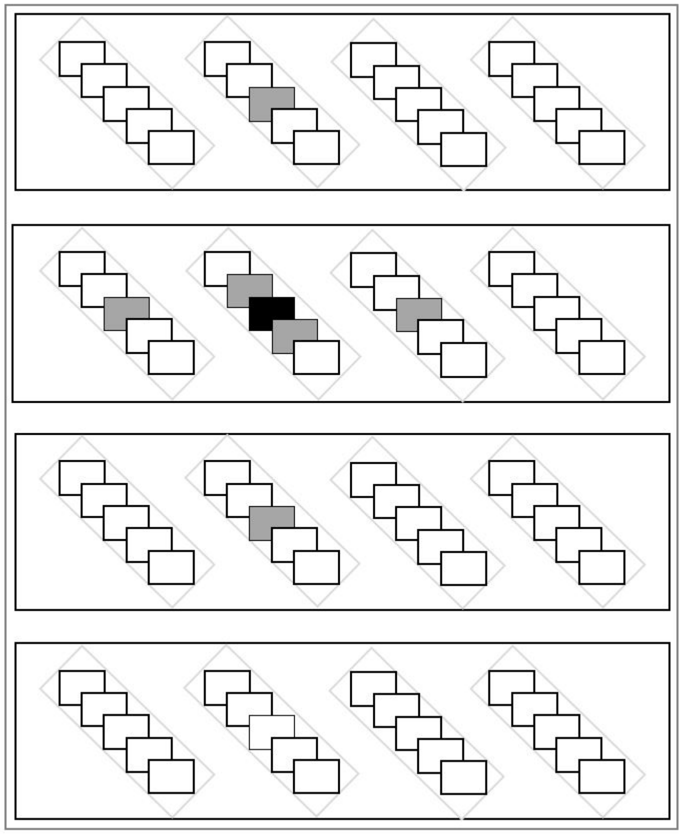


Figure 4.4: Neibourhood Relations- 3 Attributes with 5, 4 and 4 partitions

for each class for a particular cell. The aim is to make the sum of membership values (degree of membership to various classes) of a particular cell to be one.

4.2.3 Step 3: Train Cells

Here training is done using multithreading. Each thread handles the membership values of a particular class, i.e., each cellular automata is handled by different threads as each of them performs independent operations. Each step of diffusion is performed by multiple threads, each thread working on the membership values of a particular class.

The extent to which the diffusion process is limited and the classification accuracy is analysed. 100% diffusion implies that the diffusion process is performed until the average value of the neighbouring cells of every cell becomes equal to the membership value in that cell. The cells marked as fixed do not participate in this process, i.e., their values will remain unchanged during the diffusion process.

The diffusion process may take a very long time to reach an equilibrium state, but may reach a near equilibrium state long before complete diffusion is done. So, the diffusion process may not be doing useful work most of the time. This problem is avoided by limiting the diffusion phase using various tolerance values for diffusion. The idea of diffusion tolerance is made clear in the following example:

Example 2 *Assume that our diffusion tolerance value is 'x'. This means that the diffusion process will come to a halt, when the difference between successive iteration of the diffusion process doesn't change the value of at least a single cell by x. This means that, if a particular iteration of the diffusion process does not increase or decrease the membership value of a cell by x. It will not change the membership values of the any cell by a value greater than or equal to x in its future iterations. So, we can say that the diffusion process is done here with an diffusion tolerance of x.*

Analysis where done using values 0.1, 0.01, 0.001, 0.0001, 0.00001, 0.000001 and 0 for x. Where 0 means complete diffusion or 100% diffusion.

Multithreading of the diffusion process improves the overall speed, when the number of classes are more.

4.3 Conclusion

In this chapter, we presented the proposal for an enhanced fuzzy classifier based on continuous cellular automata.In the next chapter, we present the results of various experiments conducted to assess the performance of the enhanced version of classifier.

Chapter 5

Experiments and Results

In this chapter, we present the experiments carried out to assess the accuracy and running time of the proposed classifier and analyse the results obtained. The detailed results of experiments performed on various data sets are given in Appendix A.

5.1 Platform

The new classification method was implemented in Java 1.8 and integrated with the machine learning tool Weka 3.6 [38]. The evaluations and analysis on data sets were conducted using an Intel Xeon Processor with 2 processors (12 CPUs) running @ 1.90GHz with a 64-bit Windows Server 2012 R2 operating system and 64 GB RAM. Eclipse IDE was used for coding and experimentation.

5.2 Data Sets

Several standard and customized data sets, whose details are given in Table 5.1, were used in the experiments. These data sets were fetched from the UCI machine learning repository [19].

Data set	Attributes	Class Distribution	No:Instance
IRIS	4 numeric attributes and the class	2 Classes - 33.33%, 33.33% & 33.33%	150
IRIS2D	2 numeric attributes and the class	3 Classes - 33.33%, 33.33% & 33.33%	150
HABERMAN	3 numeric attributes and the class	2 Classes - 73.53% & 26.47%	306
DIABETES	8 numeric attributes and the class	2 Classes - 65.1% & 34.9%	768
DIABETES4D	4 numeric attributes and the class	2 Classes - 65.1% & 34.9%	768
IONOSPHERE	34 numeric attributes and the class	2 Classes - 35.9% & 64.1%	351
CAR	6 nominal attributes and the class	4 Classes - 70.02%, 22.22%, 3.99% & 3.76%	1728

Table 5.1: Data sets Used

The following rule based classifiers were used for comparing the accuracy: ZeroR, OneR, Jrip, Decision Table, PART, CA and CAP.

IRIS [1] is a four dimensional data set with 150 data samples. This is one of the best known databases found in machine learning literature. This data set contains three classes with 50 data samples belonging to each of these classes. Each class refers to a type of Iris plant. While one class is linearly separable from the other two, the latter are not linearly separable from each other.

IRIS2D is a modification on the IRIS database, where two most relevant features are chosen for classification. Hence IRIS2D is a two dimensional data set that contains all 150 data samples from the original data set.

DIABETES [25] is a 20 dimensional data Set. It contains diabetes patient records obtained from two sources: an automatic electronic recording device and paper records. It contains 768 instances.

DIABETES4D is a modification of the Pima Indians Diabetes data Set. This data set uses four of the most relevant attributes among the eight attributes in original data set for classification. Several constraints were placed on the selection of these instances from a larger database. The modified data set contains 768 data samples.

HABERMAN [27] is a data set with 3 Attributes. The data set contains cases from a study that was conducted between 1958 and 1970 at the University of Chicago's Billings Hospital on the survival of patients who had undergone surgery for breast cancer. There are 308 instances in this particular data Set.

IONOSPHERE [19] is a data set with 34 Attributes. This radar data was collected by a system in Goose Bay, Labrador. The targets were free electrons in the ionosphere. "Good" radar returns are those showing evidence of some type of structure in the ionosphere. "Bad" returns are those that do not; their signals pass through the ionosphere. There are 351 Instances in this data set.

CAR [19] is a data set with 6 dimensions. This was derived from a simple hierarchical decision model. There are a total of 1728 instances in this data set.

5.3 Experiments

A number of experiments were performed to assess the accuracy and running time of the proposed approach and the results obtained were analysed. Various parameters such as number of attributes used for classification, average number of partitions used and the tolerance value in diffusion are changed and analysis of pre-processing time, model building time and accuracy of the classier is done.

5.4 Results

Accuracy of the proposed model was compared against the popular rule based classifiers for various data sets. The results for 10-fold and 5-fold cross validations with diffusion tolerance 0(i.e., 100% diffusion) are shown in Table 5.2 and Table 5.3 respectively. Detailed results for different values of various parametes are given in Appendix A.

Classifier	IRIS	IRIS2D	HABERMAN	DIABETES4D	DIABETES	IONOSPHERE	CAR
ZeroR	33.33	33.33	73.52	65.1	65.1	64.1	70.02
OneR	92	92	72.87	71.48	71.48	80.91	70.02
Jrip	95.33	94.67	72.87	75.52	76.04	89.74	86.45
PART	94	95.33	69.6	72.27	75.26	91.73	95.77
Decision Table	92.67	92.67	71.24	73.57	71.22	89.46	91.03
CA[1]	96	98	NA	73.56	NA	NA	NA
CAP[2]	96	96	75.16	76.04	76.04	91.45	97.69

Table 5.2: Accuracy of 10-Fold Cross Validation on various data sets with 100% diffusion

Classifier	IRIS	IRIS2D	HABERMAN	DIABETES4D	DIABETES	IONOSPHERE	CAR
ZeroR	33.33	33.33	73.52	65.1	65.1	64.1	70.02
OneR	92.67	92.66	73.85	72.65	72.65	78.91	70.02
Jrip	94.66	96	73.85	75.78	74.47	89.17	85.53
PART	94	96	68.3	73.43	74.21	90.03	95.37
Decision Table	92.66	92.66	71.56	71.61	73.43	87.74	89.41
CA	33.33	98	NA	72.65	NA	NA	NA
CAP	96	96.67	75.82	76.04	76.04	90.88	97.33

Table 5.3: Accuracy of 5-Fold Cross Validation on various data sets with 100% diffusion

[1]CA: **C**ellular **A**utomata based classifier(existing model)
[2]CAP: **C**ellular **A**utomata **P**lus classifier(Our enhanced classifier)

5.4.1 Ionosphere data set

The Ionosphere data set contains 34 attributes. We have performed analysis by varying the number attributes used for classification from one to ten, selecting the most significant ones in each case. The number of partitions is varied from two to five in each case and diffusion tolerance values 0, 0.1 and 0.0001 are used.

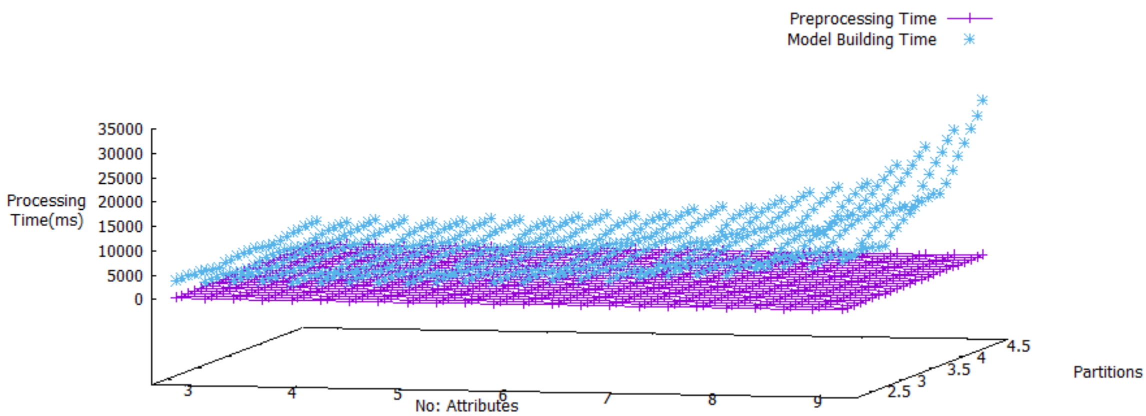


Figure 5.1: Time evaluation: Ionosphere data set with 5-fold cross validation and 100% diffusion

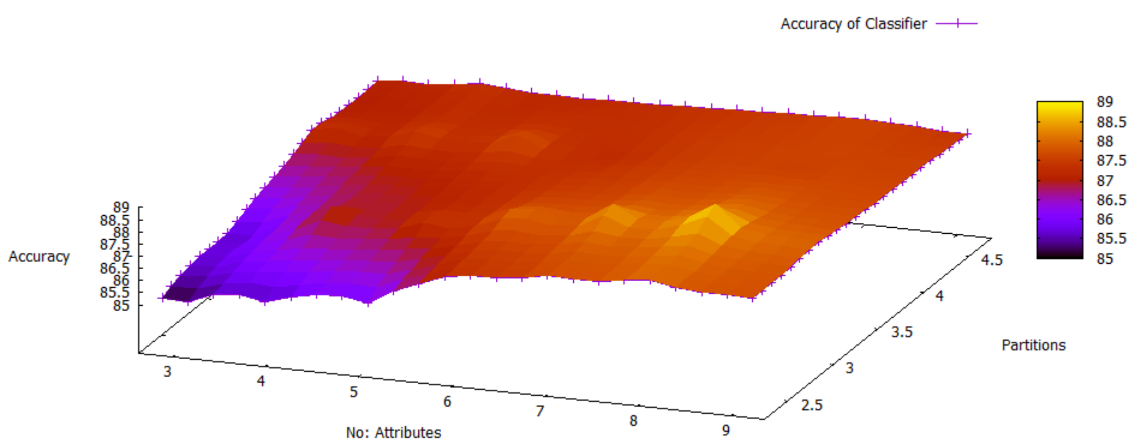


Figure 5.2: Accuracy evaluation: Ionosphere data set with 5-fold cross validation and 100% diffusion

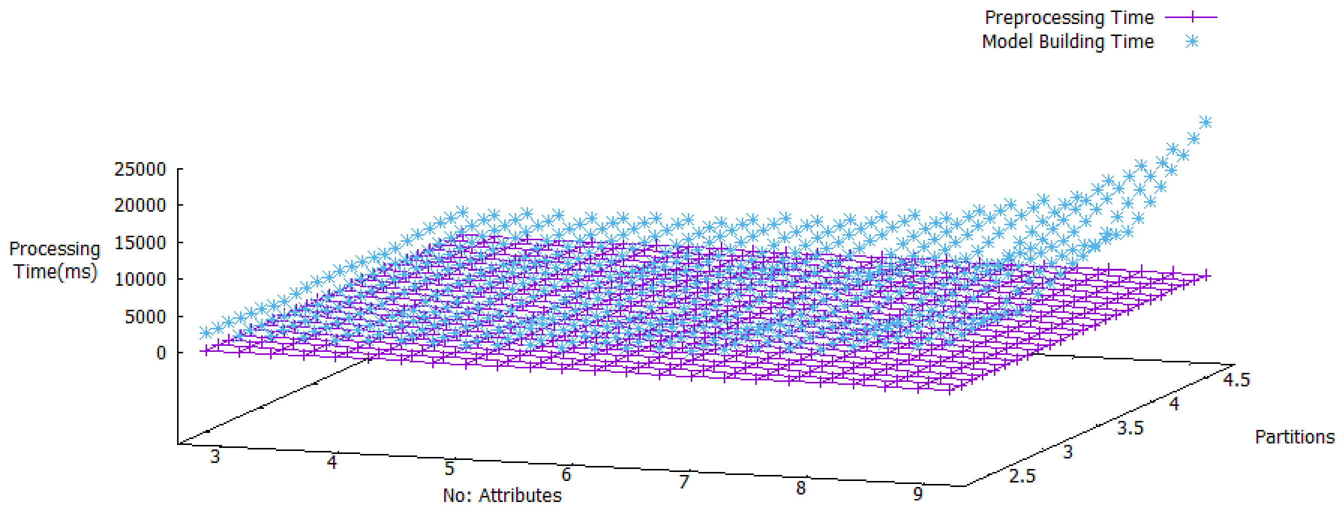


Figure 5.3: Time evaluation: Ionosphere data set with 5-fold cross validation and diffusion tolerance 0.0001

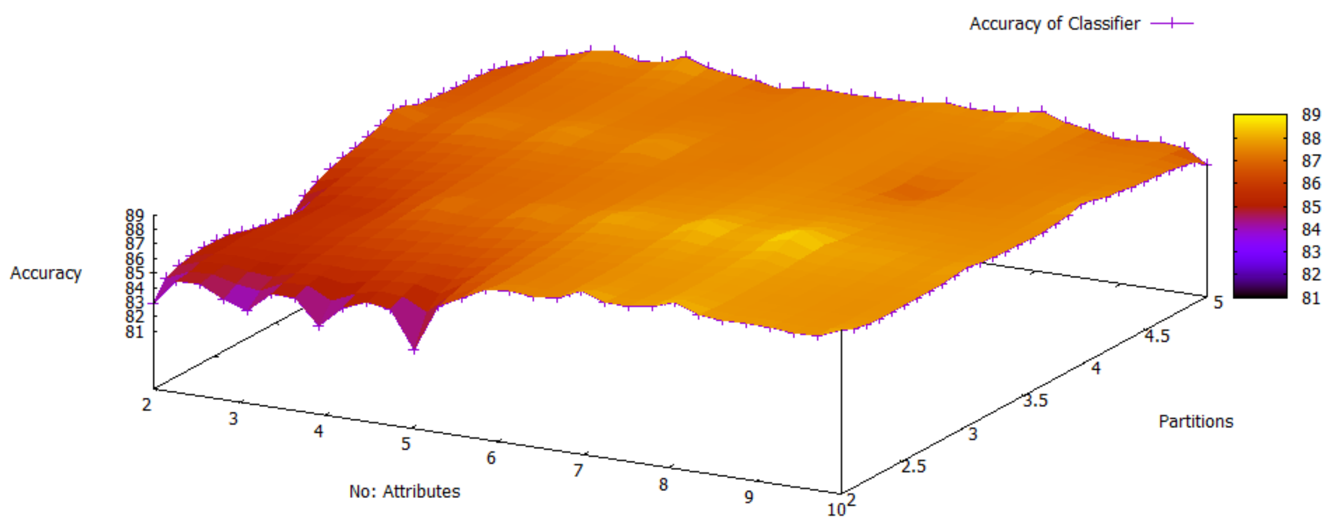


Figure 5.4: Accuracy evaluation: Ionosphere data set with 5-fold cross validation and diffusion tolerance 0.0001

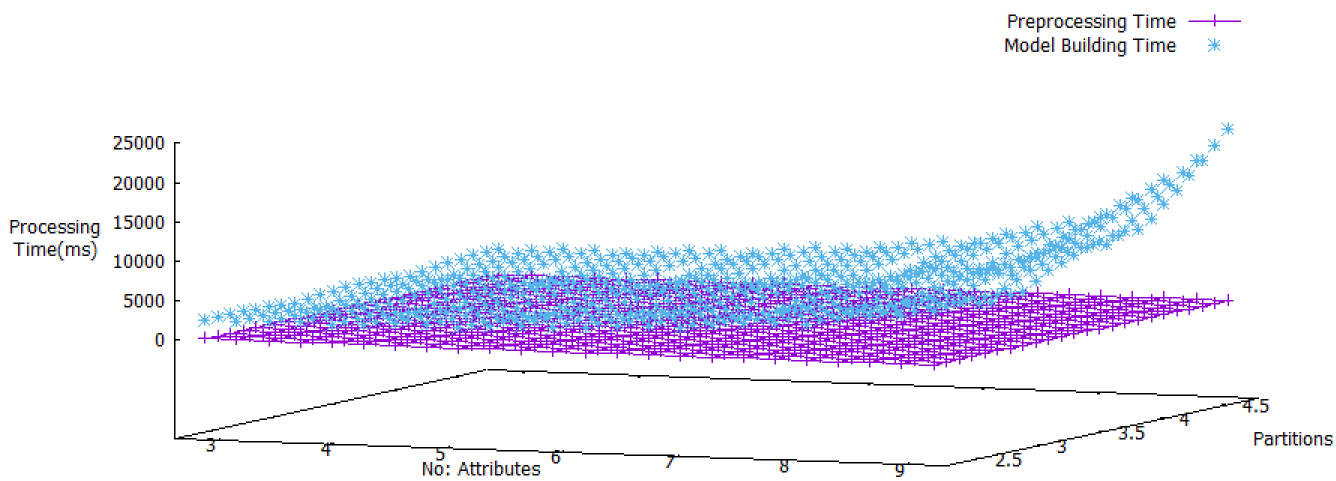


Figure 5.5: Time evaluation: Ionosphere data set with 5-fold cross validation and diffusion tolerance 0.1

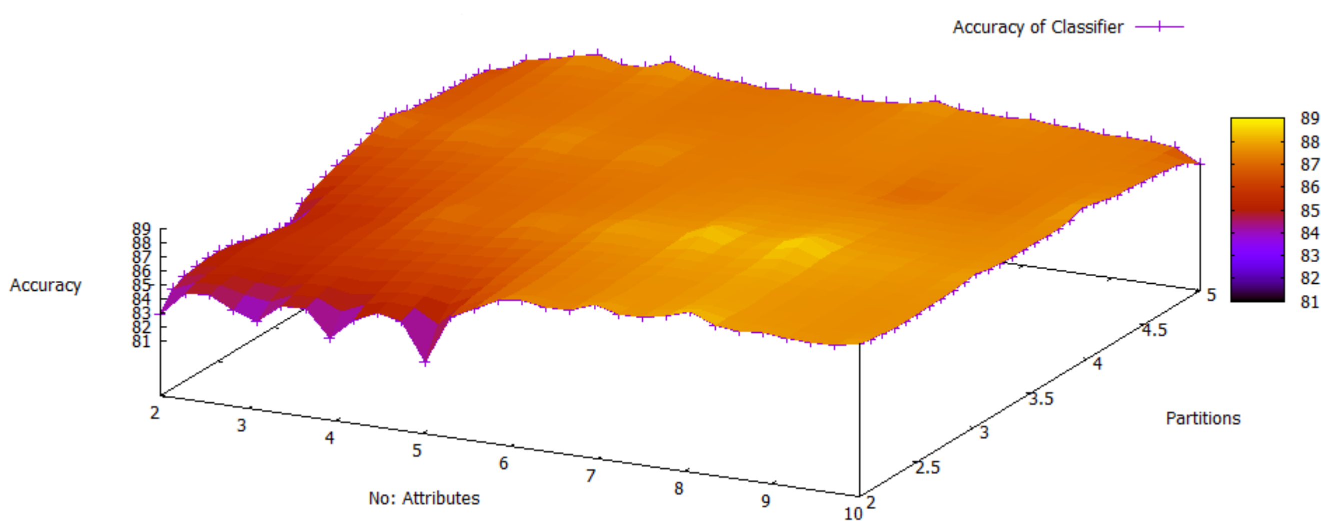


Figure 5.6: Accuracy evaluation: Ionosphere data set with 5-fold cross validation and diffusion tolerance 0.1

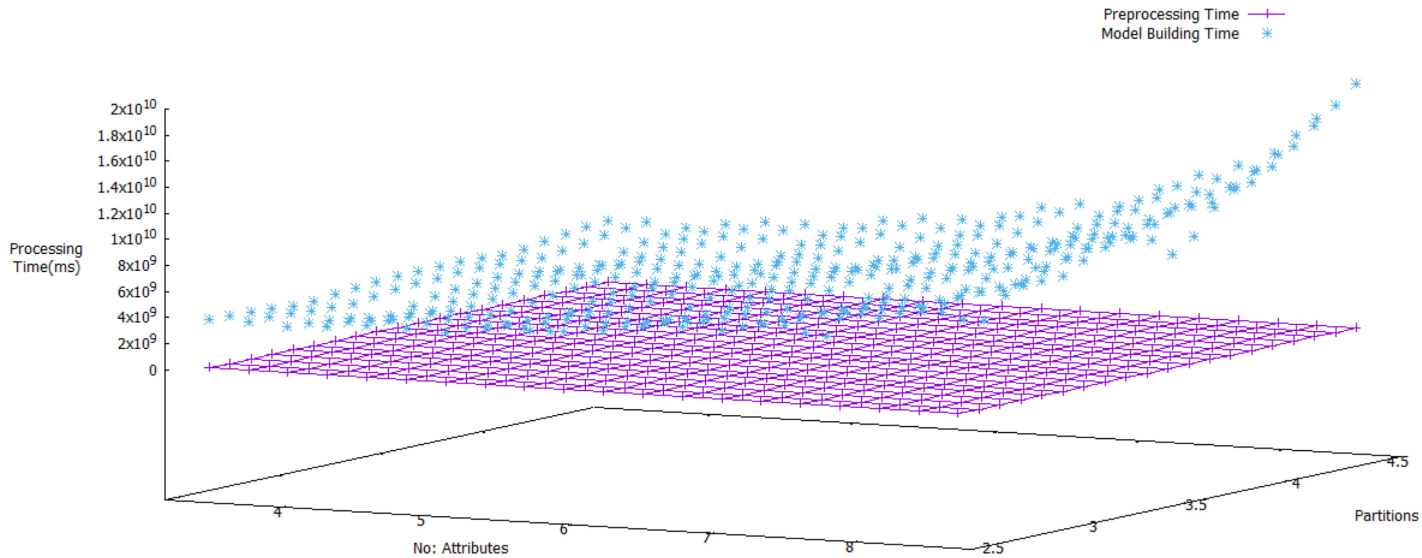


Figure 5.7: Time evaluation: Ionosphere data set with 10-fold cross validation and 100% diffusion

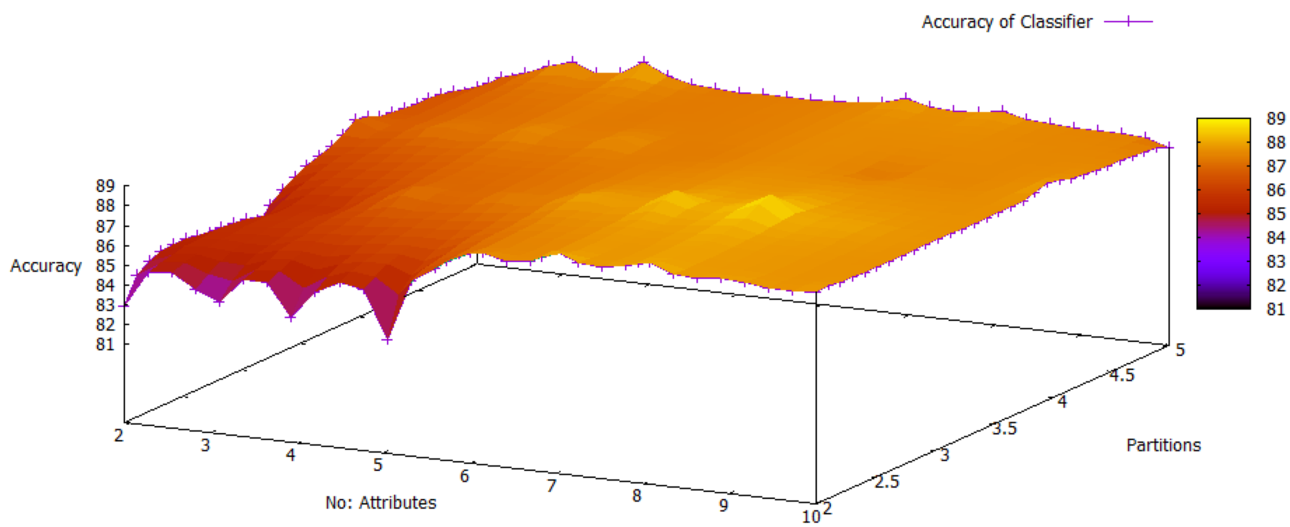


Figure 5.8: Accuracy evaluation: Ionosphere data set with 10-fold cross validation and 100% diffusion

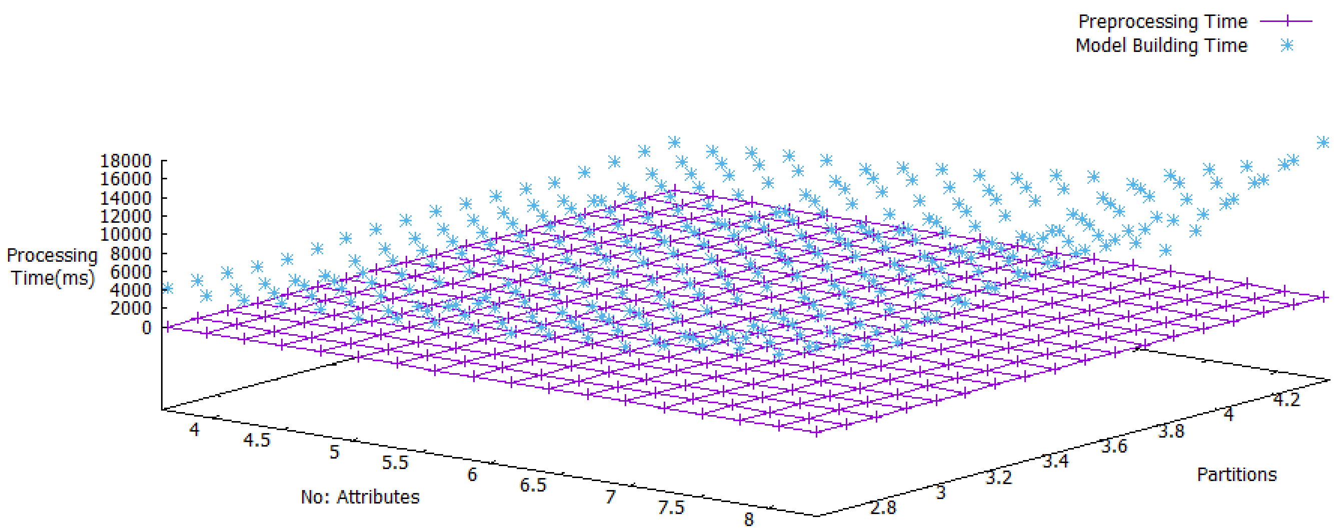


Figure 5.9: Time evaluation: Ionosphere data set with 10-fold cross validation and diffusion tolerance 0.0001

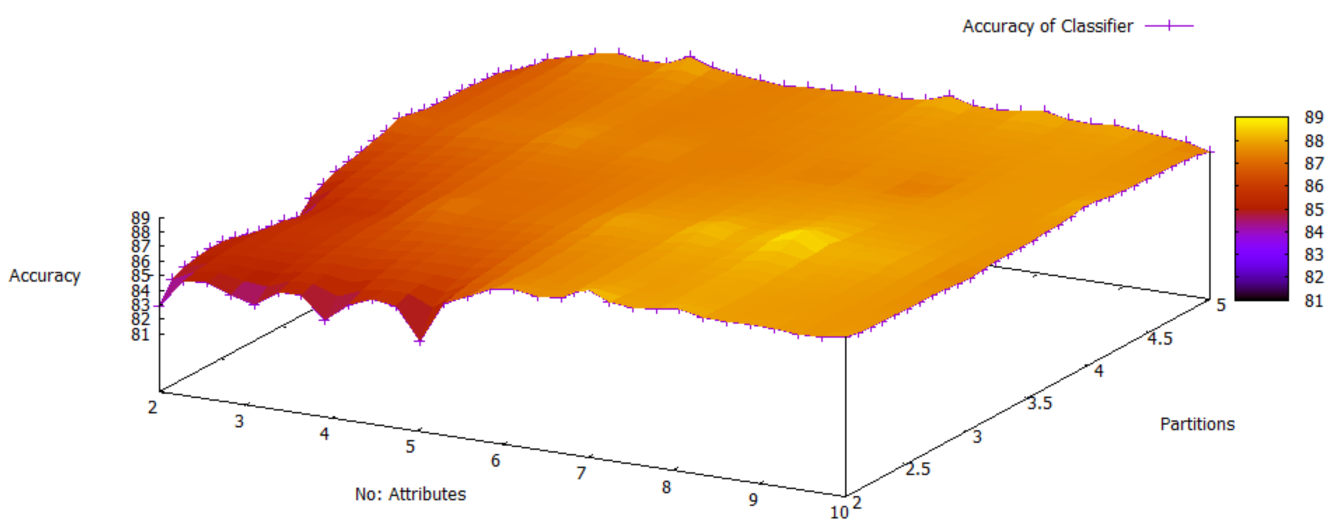


Figure 5.10: Accuracy evaluation: Ionosphere data set with 10-fold cross validation and diffusion tolerance 0.0001

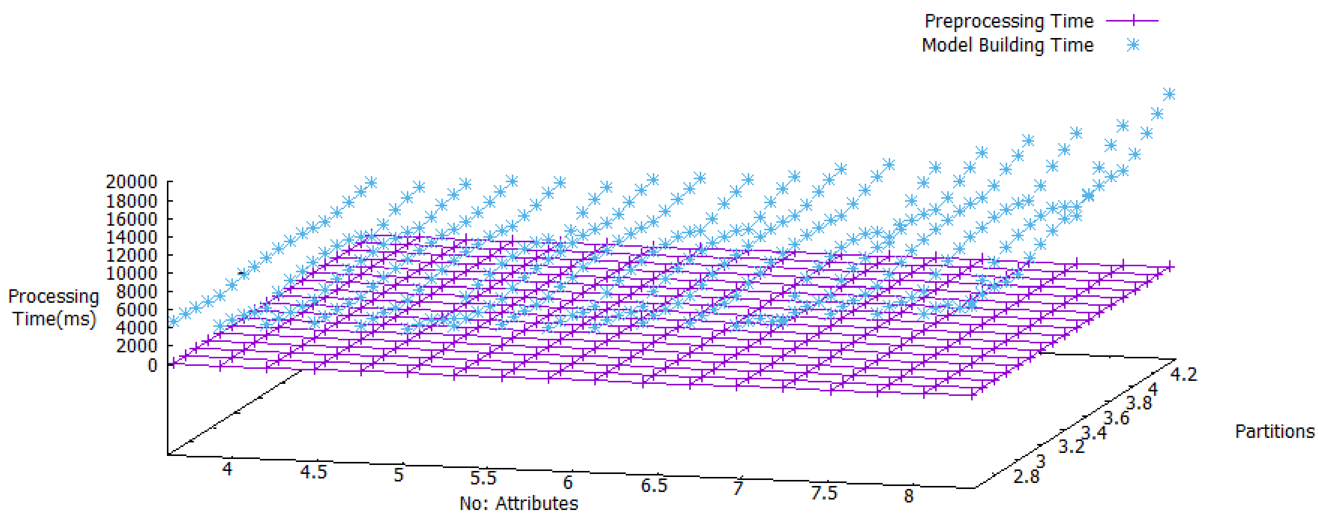


Figure 5.11: Time evaluation: Ionosphere data set with 10-fold cross validation and diffusion tolerance 0.1

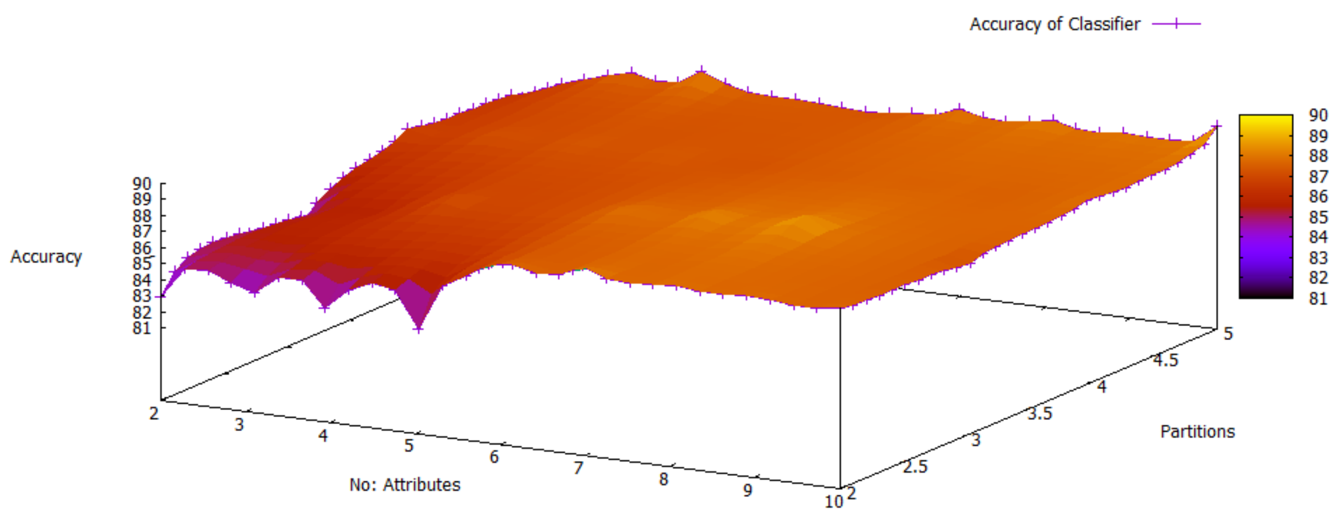


Figure 5.12: Accuracy evaluation: Ionosphere data set with 10-fold cross validation and diffusion tolerance 0.1

Figures 5.1, 5.3 and 5.5 show the variation in preprocessing and model building time with respect to change in number of attributes used for classification and average number of partitions for diffusion tolerance 0, 0.0001 and 0.1, repectively when 5-fold cross validation is used. The results for 10-fold cross validation is shown in Figures 5.7, 5.9 and 5.11. It can be seen that the preprocessing takes only negligible amount of time in all the cases, whereas, the model building time increases as the number of attributes increases.

The accuracy of the classifier is shown in Figures 5.2, 5.4 and 5.6 and Figures 5.8, 5.10 and 5.12 for 5-fold cross validation and 10-fold cross validation respectively. In the case of Ionosphere data set,it is observed that model building using 8 attributes and 3 partitions on the average gives classification accuracy above 90% in all the cases. It may be noted that, the limiting of the diffusion phase does not greately affect the classification accuracy. Hence, minimizing the time required in the model building phase by suitably limiting the diffusion phase is a good design choice.

5.4.2 Iris data set

The Iris data set contains 4 attributes. We performed analysis by varying number of attributes used for classification from two four, selecting the most significant ones in each case. The number of partitions is varied from two to twenty in each case and diffusion tolerance values 0, 0.1 and 0.0001 are used.

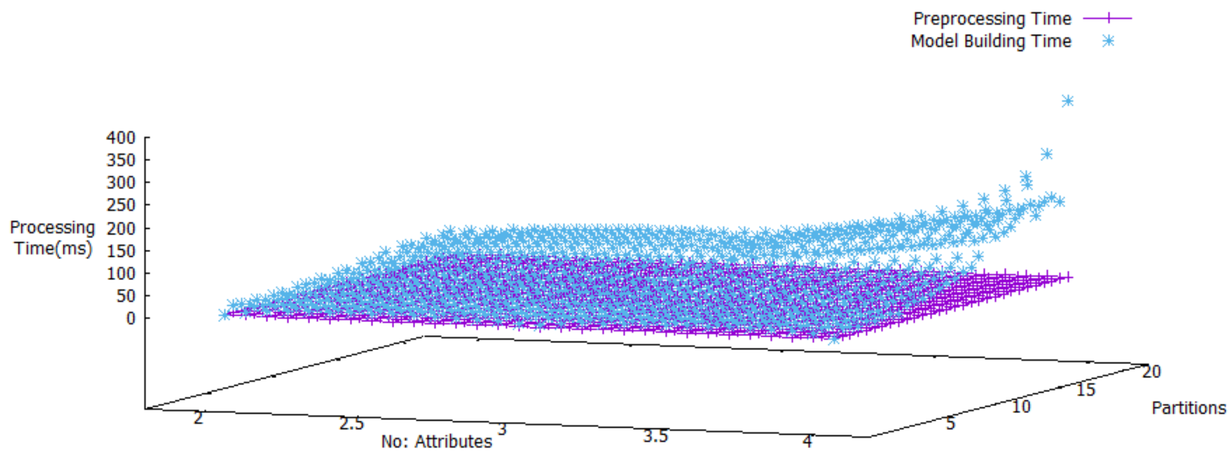


Figure 5.13: Time evaluation: Iris data set with 5-fold cross validation and 100% diffusion

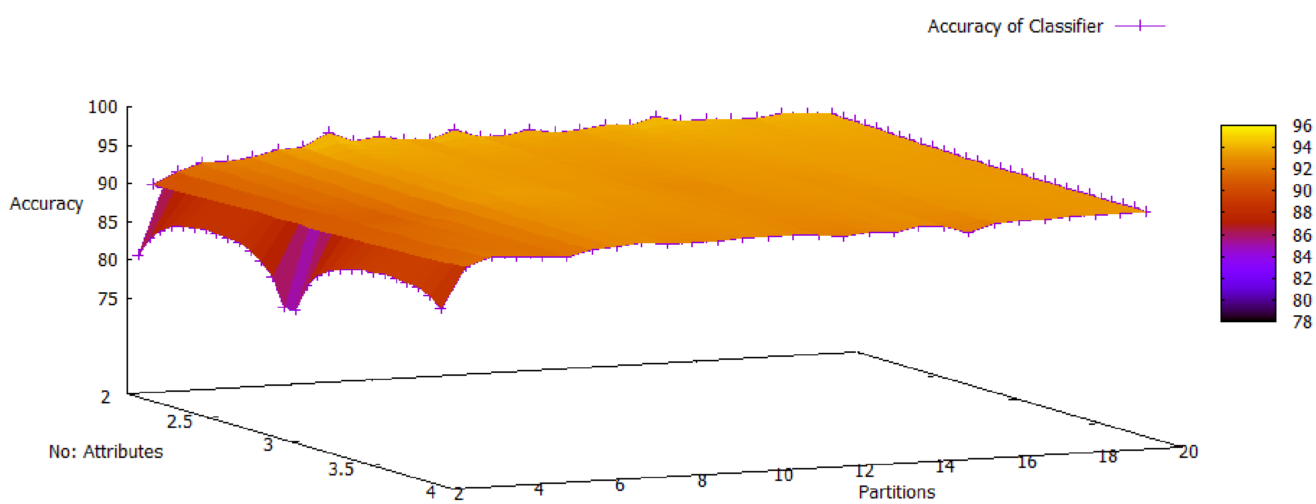


Figure 5.14: Accuracy evaluation: Iris data set with 5-fold cross validation and 100% diffusion

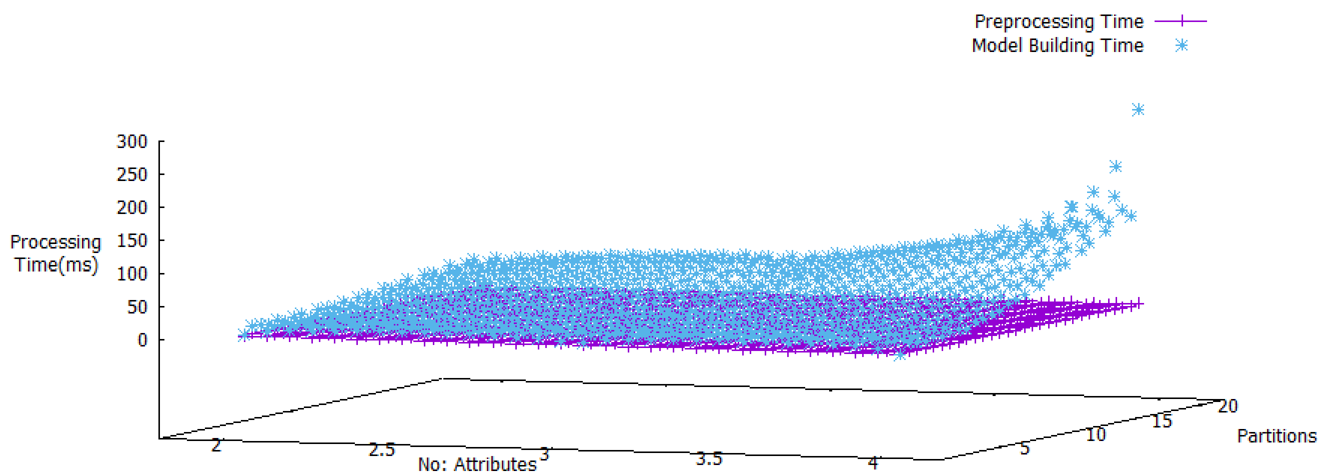


Figure 5.15: Time evaluation: Iris data set with 5-fold cross validation and diffusion tolerance 0.0001

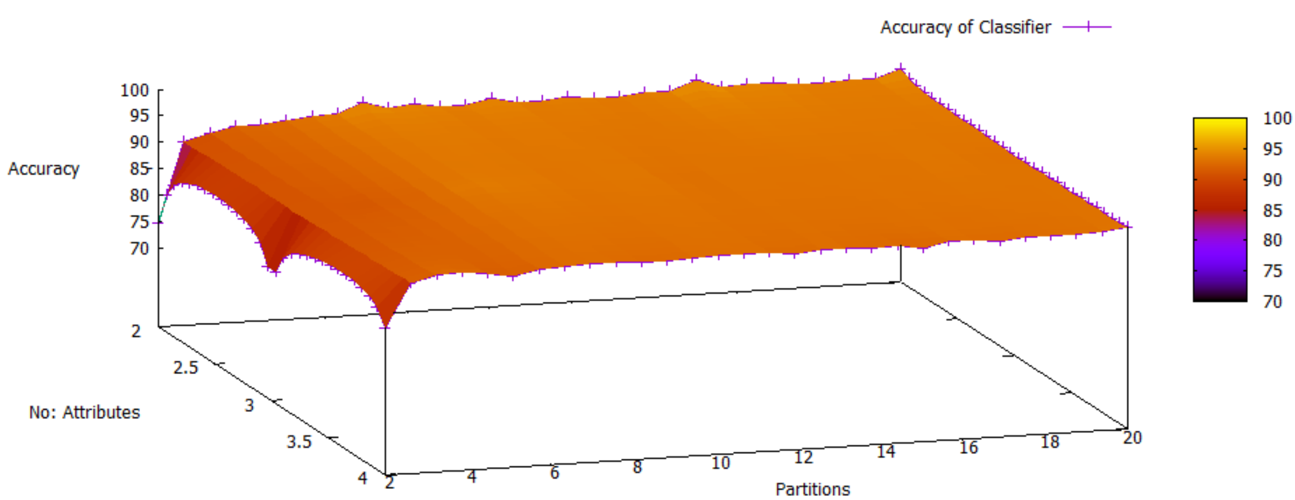


Figure 5.16: Accuracy evaluation: Iris data set with 5-fold cross validation and diffusion tolerance 0.0001

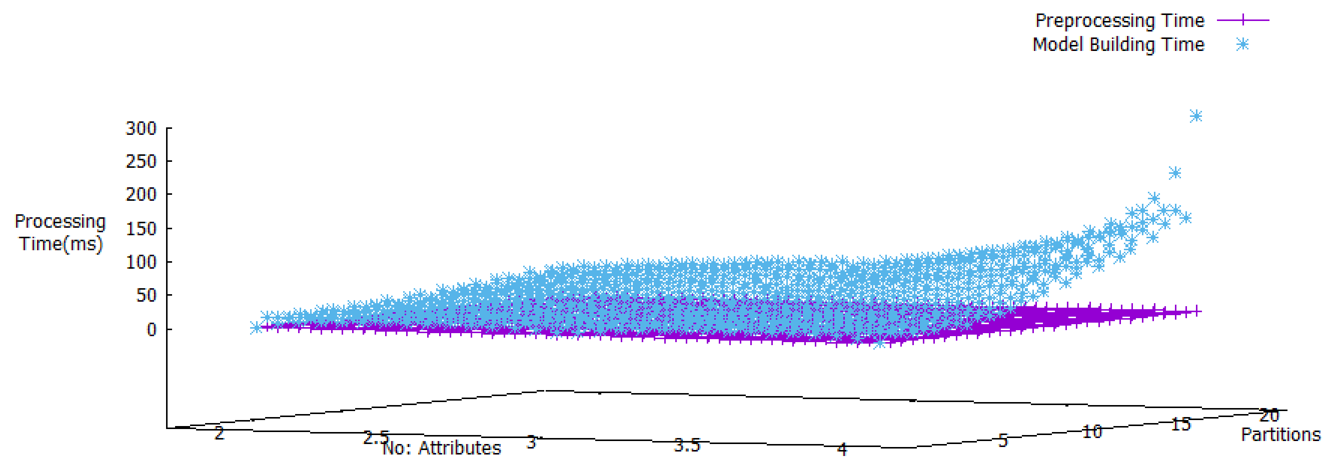


Figure 5.17: Time evaluation: Iris data set with 5-fold cross validation and diffusion tolerance 0.1

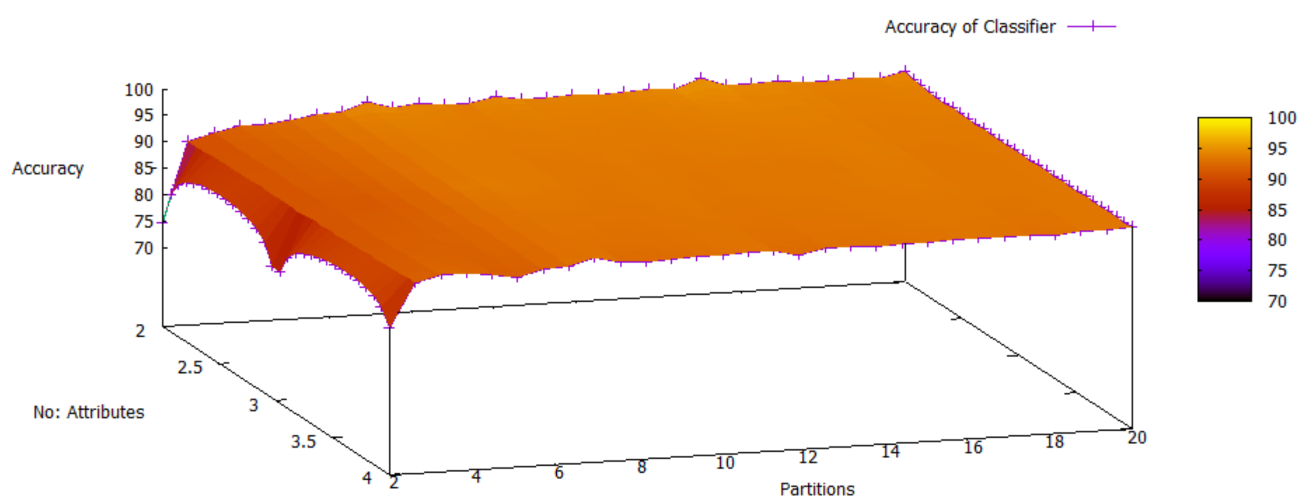


Figure 5.18: Accuracy evaluation: Iris data set with 5-fold cross validation and diffusion tolerance 0.1

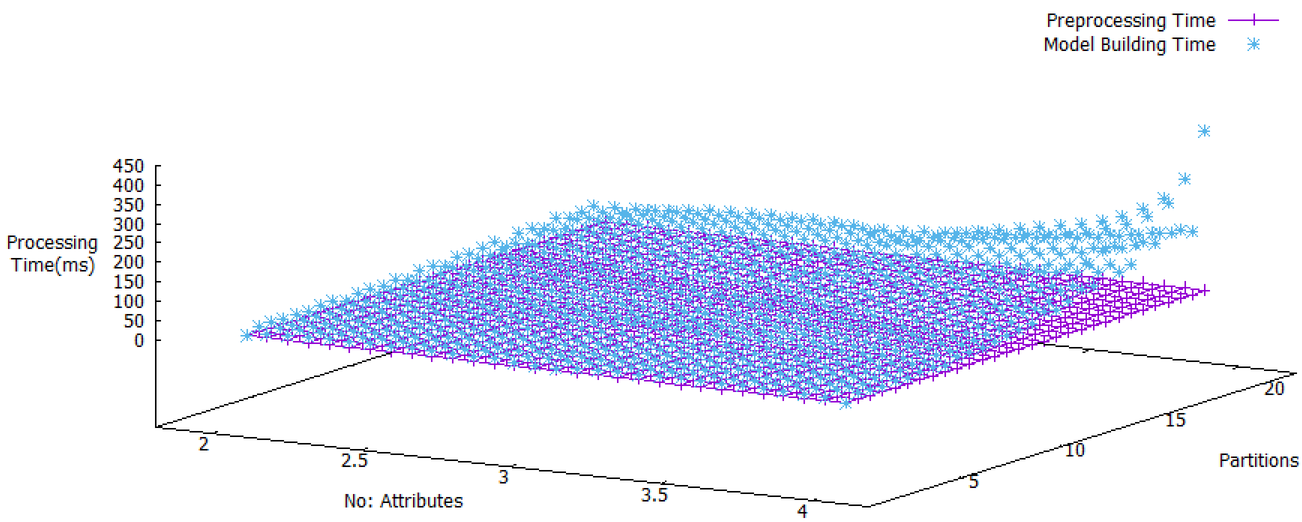


Figure 5.19: Time evaluation: Iris data set with 10-fold cross validation and 100% diffusion

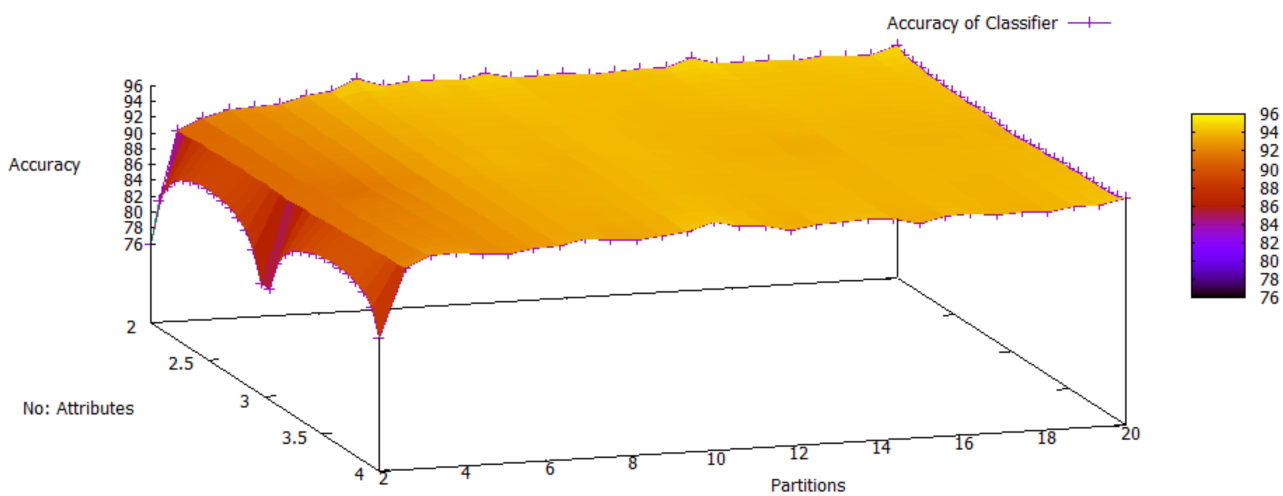


Figure 5.20: Accuracy evaluation: Iris data set with 10-fold cross validation and 100% diffusion

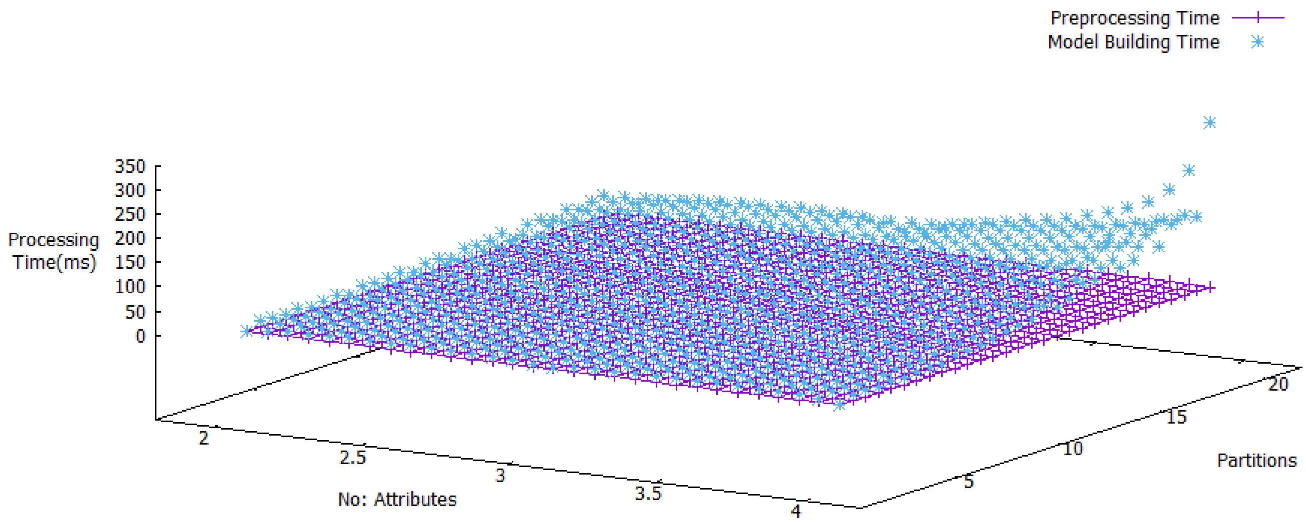


Figure 5.21: Time evaluation: Iris data set with 10-fold cross validation and diffusion tolerance 0.0001

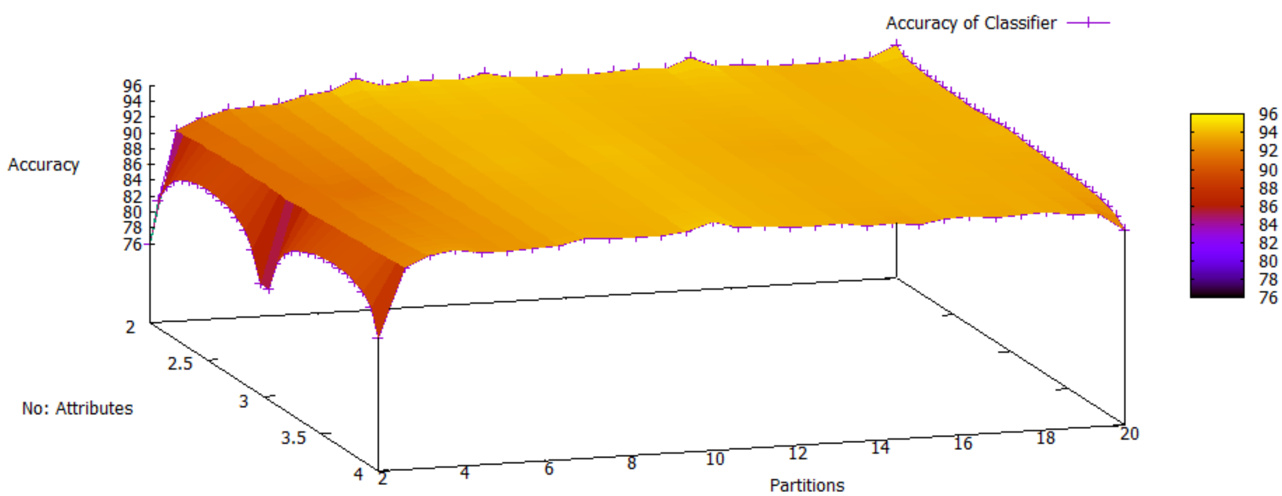


Figure 5.22: Accuracy evaluation: Iris data set with 10-fold cross validation and diffusion tolerance 0.0001

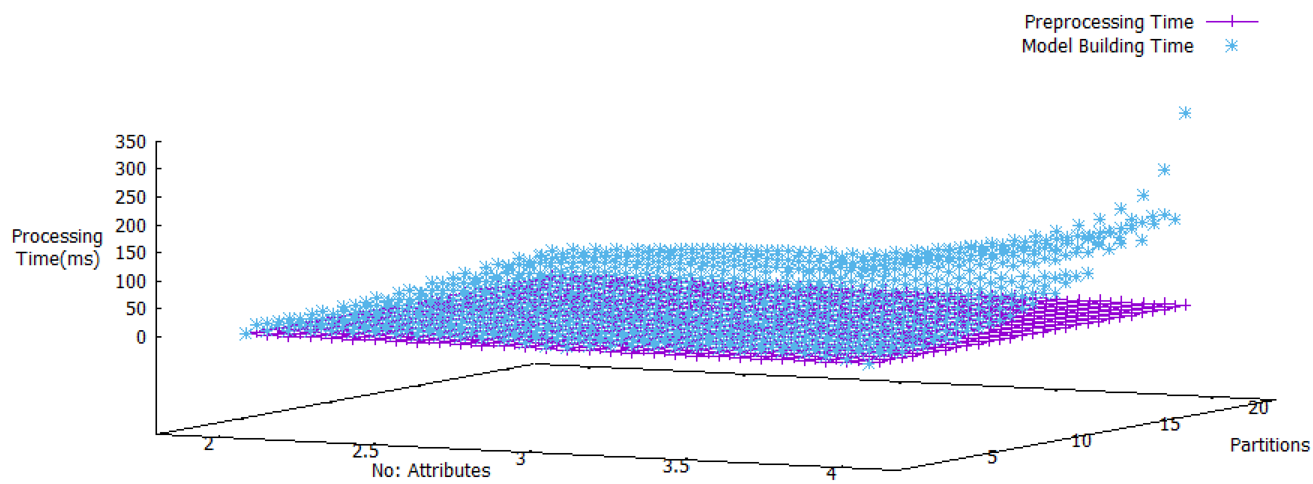


Figure 5.23: Time evaluation: Iris data set with 10-fold cross validation and diffusion tolerance 0.1

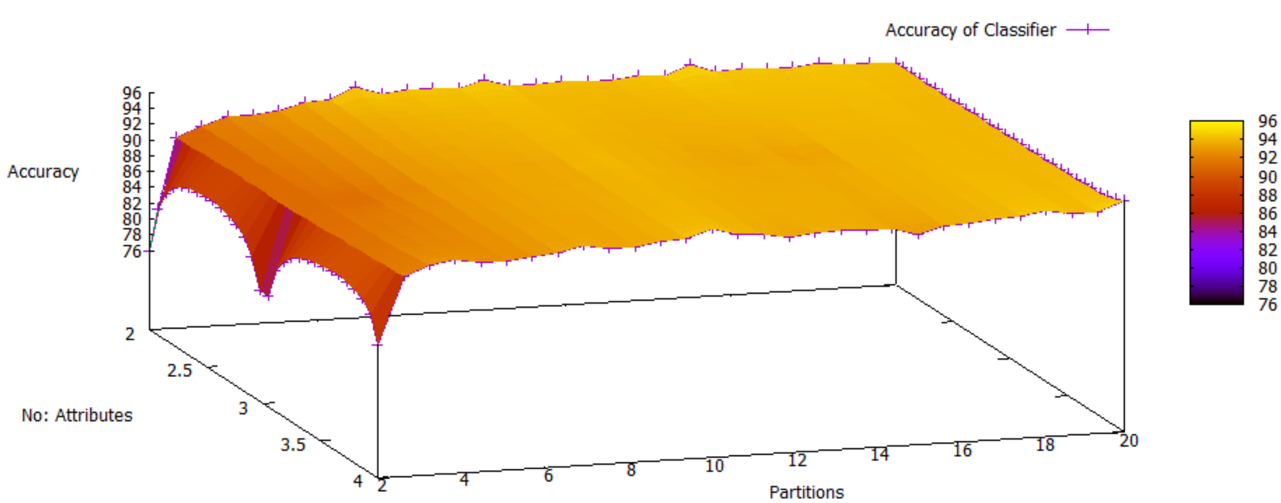


Figure 5.24: Accuracy evaluation: Iris data set with 10-fold cross validation and diffusion tolerance 0.1

Figure 5.13, 5.15 and 5.17 show the variation in preprocessing and model building time withrespect to change in number of attributes used for classification and average number of partitions for diffusion tolerance 0, 0.001 and 0.1 repectively in the case of 5-fold cross validations. The same results for 10-fold cross validation is shown in Figure 5.7, 5.9 and 5.11. In this case also, the preprocessing takes only negligible amount of time, whereas, the model building time increases as the number of attributes increases.

The accuracy of the classifier is shown in Figures 5.14, 5.16 and 5.18 and Figures 5.20, 5.22 and 5.24 for 5-fold cross validation and 10-fold cross validation respectively. Here also we can see that model building with average number of partitions greater than 5 shows a classification accuracy above 95% in all the cases. It can be understood that the number of attributes used for classification does not have much affect in the classification accuracy for this data set. Also we can see that limiting of the diffusion phase doesnot greately affect the classification accuracy. In effect introduction of diffusion tolerance and preprocessing of data reduced the model building time, while maintaining very high classification accuracy.

Chapter 6

Conclusion

In this chapter we presented the main results of experiments conducted on various data sets. Detailed results are appearing in Appendix A. The experiments were conducted by varying parameters such as number of attributes, average number of partitions and diffusion tolerance. It is observed that these parameters can be fine tuned experimentally to arrive at optimum values for accuracy and performance for each data set. Our experiments show that the proposed system has accuracy as good as the existing approaches and even better in some cases.

Chapter 7

Conclusions and Future Work

In this thesis, we proposed an enhanced fuzzy classification system based on continuous cellular automata. The new model identifies the prominant attributes that are needed to construct the cellular automata, identifies the best partitioning for attributes and prune out unnecessary computations by limiting the diffusion phase. A number of experiments were conducted to evaluate the perfomance of the proposed classifier by changing various parametes such as number of attributes used for classification, average number of partitions, diffusion tolerance and number of cross validations. Evaluations show that the optimal values for these parameters are distinct for various data sets. The only way to find this out is by performing some analysis on the data set to find out the optimal values and then use these values for constructing the classifier model.

Our experiments show that the proposed system has accuracy as good as the existing approaches and even better in some cases. The proposed model gives better accuracy in certain cases without performance issues exibited by the existing classifier model. Limiting the diffusion state prior to complete diffusion is also a choice between accuracy and time complexity. In some cases the limited diffusion phase may result in better accuracy than the model built after performing complete diffusion.

The scalability of the proposed approach can be enhanced further by applying one or more of the techniques below, which also opens up some future research directions:

- Processing using GPU can be done to speed up the diffusion phase.
- Using other effective data structures to create cells, instead of using one dimensional list of structures. This will remove the limitation in creating models with larger dimensions (i.e., increased number of attributes).
- Processing data sets containing missing values and string values as attributes.
- Introducing weightage to cells based on number of training patterns mapped to it. Cells with more weightage will have more influence in the diffusion process.
- Introducing new mechanisms and rules so as to ensure that the classifier accuracy increases with the progress in diffusion.

These enhancements can lead to a better fuzzy classification system that has very high level of accuracy and scalability.

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Appendix A

The detailed results of evaluations on various data sets are given in the tables below. Parameters such as diffusion tolerance, number of attributes used for classification, average number of partitions used and number of cross validations are varied for each data set and classification accuracy, preprocessing time and model building time were recorded.

A.1 Ionosphere data set

The table given below shows the results of analysis of 5-fold cross validations on Ionosphere data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	2156	18588292	82.906
0	2	3	4850	1502585	80.057
0	2	4	5390	1184606	87.7493
0	2	5	2156	1172749	85.4701
0	3	2	2156	1576959	80.6268
0	3	3	2694	1084362	84.6154
0	3	4	2156	1014838	88.604
0	3	5	2156	884412	88.3191
0	4	2	2695	833212	80.3419
0	4	3	1617	722189	88.3191
0	4	4	2156	1283234	88.3191
0	4	5	2156	1597978	88.8889
0	5	2	1617	904892	80.6268
0	5	3	2695	889802	88.0342
0	5	4	2156	4903881	88.604
0	5	5	2156	7447713	86.6097
0	6	2	2156	2451132	89.1738
0	6	3	2694	2363823	89.4587
0	6	4	2156	21864553	86.6097
0	6	5	2156	47458082	87.1795
0	7	2	1617	2905465	88.604

0	7	3	2156	3465431	89.4587
0	7	4	2156	151632283	87.4644
0	7	5	2155	417618403	87.1795
0	8	2	2156	6769178	89.4587
0	8	3	2156	70491612	90.8832
0	8	4	2156	799368246	87.1795
0	8	5	2156	2524937361	88.0342
0	9	2	2156	40389249	88.0342
0	9	3	2156	46340305	88.3191
0	9	4	2156	4907973133	87.4644
0	9	5	2156	22282533419	86.6097
0	10	2	2695	105842782	87.7493
0	10	3	1617	165455742	88.0342
0	10	4	2695	10646488839	88.8889
0	10	5	2156	3.86957E+11	87.1795
0.000001	2	2	2156	133416008	82.906
0.000001	2	3	2156	1672355	80.057
0.000001	2	4	1617	1139874	87.7493
0.000001	2	5	2156	1284312	85.4701
0.000001	3	2	2156	1266527	80.6268
0.000001	3	3	2156	1209399	84.6154
0.000001	3	4	2156	944237	88.3191
0.000001	3	5	1617	986274	88.8889
0.000001	4	2	2155	736741	80.3419
0.000001	4	3	1616	670452	88.3191
0.000001	4	4	2156	1193230	88.8889
0.000001	4	5	1617	7627729	88.8889
0.000001	5	2	2156	992743	80.6268
0.000001	5	3	1617	1032625	88.8889
0.000001	5	4	1617	4167684	88.3191
0.000001	5	5	2156	6900149	86.6097
0.000001	6	2	2156	1417972	89.1738
0.000001	6	3	1617	1189458	88.8889
0.000001	6	4	2156	19295412	86.8946
0.000001	6	5	1617	65871287	86.8946
0.000001	7	2	1617	2961518	88.604
0.000001	7	3	1617	1728945	89.1738
0.000001	7	4	2156	134935302	88.0342
0.000001	7	5	1616	539603776	88.3191
0.000001	8	2	1617	7570600	89.4587
0.000001	8	3	1078	4769149	90.8832
0.000001	8	4	1617	585980241	86.3248
0.000001	8	5	2155	2440767204	87.4644
0.000001	9	2	1617	16295089	87.7493
0.000001	9	3	1617	22989360	88.0342
0.000001	9	4	1617	3422276979	87.7493
0.000001	9	5	1617	13877237914	86.8946

0.000001	10	2	1617	79829498	88.3191
0.000001	10	3	1617	162508953	88.3191
0.000001	10	4	2155	7342832289	88.0342
0.000001	10	5	1617	2.65854E+11	84.0456
0.00001	2	2	2155	46723009	82.906
0.00001	2	3	1617	1310721	80.057
0.00001	2	4	1617	1165744	87.7493
0.00001	2	5	1617	975496	85.4701
0.00001	3	2	2694	1559715	80.6268
0.00001	3	3	2156	1027774	84.6154
0.00001	3	4	2156	1411504	88.604
0.00001	3	5	1617	990047	88.604
0.00001	4	2	1617	812733	80.6268
0.00001	4	3	1616	647276	88.3191
0.00001	4	4	1617	1368389	88.604
0.00001	4	5	1617	8568193	88.8889
0.00001	5	2	1617	855850	80.6268
0.00001	5	3	1617	688775	88.3191
0.00001	5	4	1077	4273318	88.3191
0.00001	5	5	1617	6334254	86.6097
0.00001	6	2	4312	1377012	89.1738
0.00001	6	3	2694	1492886	89.4587
0.00001	6	4	1617	20085509	87.1795
0.00001	6	5	1617	46449223	87.4644
0.00001	7	2	1616	2565931	88.604
0.00001	7	3	2695	4743820	90.0285
0.00001	7	4	1617	130649050	87.1795
0.00001	7	5	2695	407560469	87.7493
0.00001	8	2	1078	8250753	89.1738
0.00001	8	3	1617	6492705	90.8832
0.00001	8	4	1617	805882293	85.755
0.00001	8	5	1617	3188867278	88.604
0.00001	9	2	1617	16576420	88.3191
0.00001	9	3	11857	31187297	88.8889
0.00001	9	4	1617	5095712831	86.3248
0.00001	9	5	2695	24261100305	85.755
0.00001	10	2	1617	105728100	88.0342
0.00001	10	3	1077	164672829	88.3191
0.00001	10	4	1617	7468983280	88.3191
0.00001	10	5	1617	2.44308E+11	88.0342
0.0001	2	2	2156	453990290	82.906
0.0001	2	3	2156	1627083	80.057
0.0001	2	4	1617	1028851	87.7493
0.0001	2	5	1616	908128	85.4701
0.0001	3	2	2156	1090292	80.6268
0.0001	3	3	2156	1092448	84.6154
0.0001	3	4	1617	1014300	88.604

0.0001	3	5	2156	1477256	88.604
0.0001	4	2	1617	993281	80.6268
0.0001	4	3	2156	749676	88.3191
0.0001	4	4	2695	1215866	88.604
0.0001	4	5	2156	1657265	88.8889
0.0001	5	2	1616	1567260	80.6268
0.0001	5	3	1617	907588	88.3191
0.0001	5	4	2156	3669696	88.604
0.0001	5	5	2156	6795594	86.6097
0.0001	6	2	2156	2099741	88.604
0.0001	6	3	1616	1435757	89.4587
0.0001	6	4	2156	17511495	86.8946
0.0001	6	5	4312	41073756	87.1795
0.0001	7	2	1617	3757006	88.604
0.0001	7	3	1617	1651875	89.4587
0.0001	7	4	1617	134860927	87.4644
0.0001	7	5	1617	345827762	87.7493
0.0001	8	2	2156	10081020	89.1738
0.0001	8	3	1617	6194128	90.5983
0.0001	8	4	2156	804406653	85.1852
0.0001	8	5	1617	2477229182	88.604
0.0001	9	2	1617	19218881	88.0342
0.0001	9	3	2156	22790488	88.3191
0.0001	9	4	1617	3458907110	87.1795
0.0001	9	5	1078	14195967376	86.3248
0.0001	10	2	1617	83660879	88.3191
0.0001	10	3	1617	163082933	88.0342
0.0001	10	4	1617	7861610581	88.3191
0.0001	10	5	1617	2.53984E+11	86.0399
0.001	2	2	2155	49830042	82.906
0.001	2	3	1617	1557021	80.057
0.001	2	4	1617	1527378	87.7493
0.001	2	5	2156	1112928	85.4701
0.001	3	2	2156	1466477	80.6268
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0.001	3	4	2156	869323	88.3191
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0.001	4	4	1617	939386	88.8889
0.001	4	5	2156	1568338	88.8889
0.001	5	2	2155	1098915	80.3419
0.001	5	3	1617	949087	88.3191
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0.001	6	4	1617	21925477	87.4644
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0.001	7	2	1617	2702284	88.604
0.001	7	3	1078	2595034	89.4587
0.001	7	4	2156	127023547	86.8946
0.001	7	5	1617	295818250	87.7493
0.001	8	2	2156	8599992	88.8889
0.001	8	3	2156	6982609	90.3134
0.001	8	4	2156	616166172	86.6097
0.001	8	5	1617	2776835158	86.6097
0.001	9	2	1617	29389366	88.3191
0.001	9	3	1617	29167320	88.604
0.001	9	4	1617	3552399477	87.1795
0.001	9	5	1617	19475550899	86.8946
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0.001	10	4	1617	10960897715	88.0342
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0.01	5	5	1617	6553607	87.1795
0.01	6	2	2695	1374856	88.8889
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0.01	6	4	1617	11797569	86.6097
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0.01	8	2	2155	6746550	89.1738
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0.01	8	4	2156	580633339	85.4701
0.01	8	5	2156	3295181752	87.1795
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0.01	9	3	1617	29105880	88.3191
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0.1	2	3	2155	1729484	80.057
0.1	2	4	2155	1159277	87.7493
0.1	2	5	2156	4240441	85.4701
0.1	3	2	1617	1275690	80.6268
0.1	3	3	2695	1077895	84.6154
0.1	3	4	1617	2152558	88.604
0.1	3	5	2156	1017534	88.604
0.1	4	2	2156	1013222	80.3419
0.1	4	3	2694	762611	88.3191
0.1	4	4	1617	1386174	88.604
0.1	4	5	2156	1888474	88.604
0.1	5	2	2156	991125	80.3419
0.1	5	3	1616	1083824	88.3191
0.1	5	4	1617	4828973	88.3191
0.1	5	5	2156	4918978	86.8946
0.1	6	2	1617	1403960	88.8889
0.1	6	3	1617	1388869	89.1738
0.1	6	4	1617	18742990	87.1795
0.1	6	5	2155	68032468	86.8946
0.1	7	2	1617	3629275	88.3191
0.1	7	3	1617	4371407	89.7436
0.1	7	4	2156	155191119	86.8946
0.1	7	5	1616	366578872	88.0342
0.1	8	2	1617	7625573	89.4587
0.1	8	3	2156	9895083	90.5983
0.1	8	4	1617	647457486	85.755
0.1	8	5	2155	1970520629	87.7493
0.1	9	2	1617	16360302	88.0342
0.1	9	3	2156	31625462	88.3191
0.1	9	4	1617	4979584116	86.6097
0.1	9	5	1617	15929892044	87.1795
0.1	10	2	1617	106240639	88.0342
0.1	10	3	1616	162139234	88.0342
0.1	10	4	1617	7988035357	88.3191
0.1	10	5	2156	2.61131E+11	86.0399

Table A.1: Results of 5-fold Cross Validation on Ionosphere data set

The table below shows the results of analysis of 10-fold cross validations on Ionosphere data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	1617	1617381	82.906
0	2	3	2156	1655646	80.057
0	2	4	2694	1302635	87.1795
0	2	5	1617	1097835	85.1852
0	3	2	2156	1363536	81.7664
0	3	3	1617	753449	84.6154
0	3	4	2156	960943	88.0342
0	3	5	2695	938846	88.604
0	4	2	4851	616556	81.4815
0	4	3	1616	593381	88.3191
0	4	4	2156	1196463	88.3191
0	4	5	1617	11998044	89.4587
0	5	2	2156	987890	81.4815
0	5	3	2156	1338206	87.4644
0	5	4	1617	5579182	88.3191
0	5	5	2156	11451552	88.0342
0	6	2	1617	1357069	88.8889
0	6	3	2155	1825953	89.4587
0	6	4	2156	50190545	86.8946
0	6	5	1617	45232229	87.1795
0	7	2	2156	3654062	88.8889
0	7	3	2156	3233684	89.4587
0	7	4	2156	123960572	88.0342
0	7	5	1616	330422659	87.7493
0	8	2	2156	11459098	88.0342
0	8	3	2156	6682947	91.453
0	8	4	1617	691189128	86.0399
0	8	5	1617	2552506132	88.604
0	9	2	2156	20007880	88.3191
0	9	3	2156	28781942	88.3191
0	9	4	2155	5520569732	86.6097
0	9	5	1617	22604958099	87.4644
0	10	2	2156	118840034	87.7493
0	10	3	2156	199034314	86.8946
0	10	4	1617	15806964169	87.4644
0	10	5	4311	4.42676E+11	88.0342
0.000001	2	2	2695	1646486	82.906
0.000001	2	3	1617	1620616	80.057
0.000001	2	4	4311	1021845	87.1795
0.000001	2	5	2156	1237424	85.1852
0.000001	3	2	1617	970645	81.7664
0.000001	3	3	1617	799260	84.6154
0.000001	3	4	2156	806266	88.0342

0.000001	3	5	2156	801955	89.4587
0.000001	4	2	1616	703866	81.4815
0.000001	4	3	2156	643504	88.3191
0.000001	4	4	1617	4553031	88.0342
0.000001	4	5	2155	1605526	89.4587
0.000001	5	2	2155	782552	81.7664
0.000001	5	3	2156	904354	87.4644
0.000001	5	4	2156	4675912	88.0342
0.000001	5	5	2156	6522886	87.1795
0.000001	6	2	1617	876869	89.1738
0.000001	6	3	2156	2279750	89.1738
0.000001	6	4	1617	17045305	87.1795
0.000001	6	5	1078	45693618	87.1795
0.000001	7	2	2156	4550337	88.8889
0.000001	7	3	1616	1675050	89.4587
0.000001	7	4	1617	110648694	87.4644
0.000001	7	5	1618	344307390	88.8889
0.000001	8	2	1617	4763760	88.604
0.000001	8	3	1617	4813343	91.1681
0.000001	8	4	1616	698527110	87.1795
0.000001	8	5	1617	1959975575	89.1738
0.000001	9	2	1617	16318264	88.0342
0.000001	9	3	1617	22381967	88.3191
0.000001	9	4	1617	3437812152	87.7493
0.000001	9	5	1617	21540941984	88.3191
0.000001	10	2	1617	78297808	88.3191
0.000001	10	3	1617	163051134	87.1795
0.000001	10	4	1617	18929087933	88.0342
0.000001	10	5	5929	4.55729E+11	86.8946
0.00001	2	2	2155	1465939	82.906
0.00001	2	3	1077	1220717	80.057
0.00001	2	4	2156	1002981	87.1795
0.00001	2	5	2156	908666	85.1852
0.00001	3	2	2156	1489113	81.7664
0.00001	3	3	1616	915672	84.6154
0.00001	3	4	1616	679074	87.7493
0.00001	3	5	2156	1496120	88.8889
0.00001	4	2	2156	676919	81.4815
0.00001	4	3	1617	683925	88.3191
0.00001	4	4	1617	1289702	88.0342
0.00001	4	5	1617	2588567	89.4587
0.00001	5	2	1617	1043403	81.7664
0.00001	5	3	1617	679613	87.1795
0.00001	5	4	2155	2597190	88.0342
0.00001	5	5	1617	6464680	87.4644
0.00001	6	2	1078	1298864	89.1738
0.00001	6	3	2694	1451387	88.604

0.00001	6	4	1617	20181442	86.8946
0.00001	6	5	1617	26652589	87.1795
0.00001	7	2	1617	2743783	88.8889
0.00001	7	3	2156	3364112	89.4587
0.00001	7	4	2156	136769880	87.4644
0.00001	7	5	1617	337355501	88.3191
0.00001	8	2	1617	12747195	88.3191
0.00001	8	3	2156	8939528	90.5983
0.00001	8	4	1617	807576205	87.1795
0.00001	8	5	1616	2409074373	87.4644
0.00001	9	2	2156	21112744	87.7493
0.00001	9	3	2156	51546053	88.0342
0.00001	9	4	1078	4692414363	88.3191
0.00001	9	5	2156	21552546071	88.0342
0.00001	10	2	1617	83659262	87.7493
0.00001	10	3	1078	163191800	87.4644
0.00001	10	4	1616	8756656411	88.0342
0.00001	10	5	1617	4.3847E+11	88.604
0.0001	2	2	2695	1662115	82.906
0.0001	2	3	2156	1448692	80.057
0.0001	2	4	2156	1057955	87.1795
0.0001	2	5	1617	931841	85.1852
0.0001	3	2	1617	959327	81.7664
0.0001	3	3	1616	1104304	84.6154
0.0001	3	4	2156	924834	88.0342
0.0001	3	5	1616	1159816	88.604
0.0001	4	2	2156	845609	81.4815
0.0001	4	3	2156	722729	88.3191
0.0001	4	4	1617	1283774	88.604
0.0001	4	5	1617	5373850	89.1738
0.0001	5	2	2156	979269	81.7664
0.0001	5	3	2155	805188	87.4644
0.0001	5	4	2155	4277629	88.0342
0.0001	5	5	1617	9594351	87.1795
0.0001	6	2	2156	1545164	88.8889
0.0001	6	3	2156	1353837	89.1738
0.0001	6	4	2156	20783986	86.8946
0.0001	6	5	4312	37467117	87.7493
0.0001	7	2	1078	2746478	89.1738
0.0001	7	3	1617	4226968	89.1738
0.0001	7	4	1617	88800285	86.8946
0.0001	7	5	3773	361359701	88.604
0.0001	8	2	2156	8781616	88.604
0.0001	8	3	1617	6558457	90.8832
0.0001	8	4	1078	618302023	86.3248
0.0001	8	5	1617	2295431824	88.604
0.0001	9	2	1617	19448473	88.0342

0.0001	9	3	1617	42580116	88.604
0.0001	9	4	2694	3643940852	87.7493
0.0001	9	5	3773	14137405300	88.3191
0.0001	10	2	1617	81352027	88.0342
0.0001	10	3	1617	162451825	87.1795
0.0001	10	4	1617	7518032926	88.3191
0.0001	10	5	2695	4.50561E+11	87.1795
0.001	2	2	2155	1675590	82.906
0.001	2	3	2695	1593130	80.057
0.001	2	4	1616	1180835	87.1795
0.001	2	5	2155	1087058	85.1852
0.001	3	2	2695	1371083	81.7664
0.001	3	3	2695	1036396	84.6154
0.001	3	4	2156	850999	87.7493
0.001	3	5	2156	894115	88.8889
0.001	4	2	1617	583680	81.4815
0.001	4	3	1617	551882	88.3191
0.001	4	4	1617	1095681	87.7493
0.001	4	5	2156	1176523	89.7436
0.001	5	2	1616	748599	81.7664
0.001	5	3	1617	950704	87.4644
0.001	5	4	2156	3769940	88.3191
0.001	5	5	1617	7304899	87.4644
0.001	6	2	1617	1288624	88.3191
0.001	6	3	2156	1156582	88.8889
0.001	6	4	1617	17882830	86.6097
0.001	6	5	2156	63011091	87.4644
0.001	7	2	1617	2549224	88.604
0.001	7	3	1617	2364365	89.4587
0.001	7	4	1617	142378172	88.0342
0.001	7	5	3234	374521886	88.3191
0.001	8	2	2156	13093738	88.0342
0.001	8	3	2155	8856530	91.1681
0.001	8	4	1616	705938181	86.3248
0.001	8	5	2156	3245525790	88.604
0.001	9	2	2156	26156757	88.604
0.001	9	3	1617	22775399	88.3191
0.001	9	4	2156	4113369842	87.1795
0.001	9	5	2155	26570441296	87.4644
0.001	10	2	1616	85953563	88.3191
0.001	10	3	1616	215137752	87.7493
0.001	10	4	1617	10612841403	88.3191
0.001	10	5	4312	5.08731E+11	87.7493
0.01	2	2	2156	1620617	82.906
0.01	2	3	2156	1366772	80.057
0.01	2	4	2155	1031546	87.1795
0.01	2	5	2156	1035858	85.1852

0.01	3	2	2156	2673181	81.7664
0.01	3	3	1617	972262	84.6154
0.01	3	4	1617	1294014	88.0342
0.01	3	5	1617	887109	88.604
0.01	4	2	2156	848843	81.4815
0.01	4	3	1616	673146	88.3191
0.01	4	4	1616	1240119	88.0342
0.01	4	5	2155	1406654	88.8889
0.01	5	2	1617	616018	81.4815
0.01	5	3	2156	789559	87.4644
0.01	5	4	2156	3663229	88.0342
0.01	5	5	1617	6903922	88.0342
0.01	6	2	1617	1462166	89.1738
0.01	6	3	1617	1386713	88.8889
0.01	6	4	1617	17645693	86.6097
0.01	6	5	1617	53283621	87.7493
0.01	7	2	2156	2929720	89.1738
0.01	7	3	1617	2893611	89.7436
0.01	7	4	1617	108431462	87.4644
0.01	7	5	3234	331216885	88.0342
0.01	8	2	2156	9171276	88.3191
0.01	8	3	2156	5890701	90.3134
0.01	8	4	2155	680700869	87.4644
0.01	8	5	1078	2184107828	88.3191
0.01	9	2	2155	29323076	88.604
0.01	9	3	1616	25707275	88.0342
0.01	9	4	1617	4558347306	86.8946
0.01	9	5	1616	14617439706	88.604
0.01	10	2	1617	90301794	88.0342
0.01	10	3	1078	189531800	87.1795
0.01	10	4	1617	9262714992	88.604
0.01	10	5	4850	4.92704E+11	86.8946
0.1	2	2	2155	1618460	82.906
0.1	2	3	2695	1549475	80.057
0.1	2	4	2156	1193769	87.1795
0.1	2	5	2156	1029929	85.1852
0.1	3	2	1617	972262	81.7664
0.1	3	3	2155	889803	84.6154
0.1	3	4	2156	919984	88.0342
0.1	3	5	2156	916212	88.604
0.1	4	2	2156	732431	81.4815
0.1	4	3	2155	653743	88.3191
0.1	4	4	2156	1415277	87.7493
0.1	4	5	1617	1553787	89.4587
0.1	5	2	2156	941542	81.4815
0.1	5	3	2156	708177	87.1795
0.1	5	4	2156	4106782	87.7493

0.1	5	5	2155	10863572	87.4644
0.1	6	2	2155	1753737	89.1738
0.1	6	3	2156	1502048	89.1738
0.1	6	4	1617	18970426	86.6097
0.1	6	5	1617	41433235	86.8946
0.1	7	2	2156	4482429	88.604
0.1	7	3	4850	3638976	89.1738
0.1	7	4	2155	134906199	87.1795
0.1	7	5	1617	358681130	88.3191
0.1	8	2	1617	10670090	88.0342
0.1	8	3	1617	7274719	90.5983
0.1	8	4	2156	589902704	87.1795
0.1	8	5	1617	1915096307	88.604
0.1	9	2	1617	16498812	88.0342
0.1	9	3	1617	26050585	87.7493
0.1	9	4	2155	3716059084	87.1795
0.1	9	5	1617	43730370845	88.3191
0.1	10	2	1617	82199791	87.7493
0.1	10	3	1617	164573663	86.8946
0.1	10	4	1617	7470718692	88.0342
0.1	10	5	2155	4.68481E+11	89.1738

Table A.2: Results of 10-fold Cross Validation on Ionosphere data set

A.2 Iris data set

The table below shows the results of analysis of 5-fold cross validations on Iris data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	4311	1004598	74.6667
0	2	3	2156	1114004	91.3334
0	2	4	2156	948547	93.3334
0	2	5	2695	990585	92.6667
0	2	6	1617	1082206	96
0	2	7	2155	1565103	96
0	2	8	1617	1227722	97.3334
0	2	9	1078	948547	94
0	2	10	1617	814888	96
0	2	11	1617	841836	94.6667
0	2	12	2156	794947	94.6667
0	2	13	1617	778240	94
0	2	14	2156	1003520	96
0	2	15	1617	942080	95.3334
0	2	16	2156	1398029	96.6667
0	2	17	2156	1310181	94
0	2	18	2156	1074122	95.3334
0	2	19	1617	829440	95.3334
0	2	20	2694	1279461	95.3334
0	3	2	1617	498526	76
0	3	3	1078	520623	94.6667
0	3	4	1616	603082	88
0	3	5	1617	904893	90
0	3	6	1617	1053103	93.3334
0	3	7	2156	1055259	94
0	3	8	2156	17523871	95.3334
0	3	9	2695	3052058	93.3334
0	3	10	2155	3463814	93.3334
0	3	11	2155	6904454	92
0	3	12	2156	7003621	92
0	3	13	2156	7747367	93.3334
0	3	14	2156	11977026	92.6667
0	3	15	2155	9277977	92.6667
0	3	16	2156	12910482	93.3334
0	3	17	2156	16853960	93.3334
0	3	18	2156	16939114	93.3334
0	3	19	2156	18704705	92.6667
0	3	20	2156	19363298	92
0	4	2	2156	395587	82.6667
0	4	3	1078	527629	96
0	4	4	1617	1691216	93.3334
0	4	5	2156	3963419	90

0	4	6	2156	3707418	92.6667
0	4	7	2155	11625094	93.3334
0	4	8	2156	33216939	90.6667
0	4	9	2156	35056366	91.3334
0	4	10	2155	52211058	92.6667
0	4	11	2156	91315996	92
0	4	12	2156	82402347	90.6667
0	4	13	2156	124674139	90.6667
0	4	14	1617	423602335	93.3334
0	4	15	1617	150552772	90
0	4	16	1617	382887561	92
0	4	17	1617	391283821	92.6667
0	4	18	2156	282298977	92.6667
0	4	19	1617	383800537	93.3334
0	4	20	2156	389073598	92.6667
0.000001	2	2	2695	1140412	74.6667
0.000001	2	3	2156	1042863	91.3334
0.000001	2	4	2695	787402	93.3334
0.000001	2	5	2694	2299150	92.6667
0.000001	2	6	1617	843452	96
0.000001	2	7	4312	2017819	96
0.000001	2	8	1078	2360050	97.3334
0.000001	2	9	2156	838602	94
0.000001	2	10	1617	764227	96
0.000001	2	11	2156	2381070	94.6667
0.000001	2	12	2156	813271	94.6667
0.000001	2	13	2155	687697	94.6667
0.000001	2	14	1616	746980	95.3334
0.000001	2	15	2156	1096219	95.3334
0.000001	2	16	2156	1123166	96.6667
0.000001	2	17	1616	850998	94
0.000001	2	18	2155	1054720	94.6667
0.000001	2	19	1617	702248	94.6667
0.000001	2	20	1617	1077895	95.3334
0.000001	3	2	2695	450560	76
0.000001	3	3	4311	557272	94.6667
0.000001	3	4	2156	666678	88
0.000001	3	5	2156	873633	90
0.000001	3	6	1617	970105	93.3334
0.000001	3	7	2155	1136101	94
0.000001	3	8	1617	21415071	94.6667
0.000001	3	9	2155	2681802	92.6667
0.000001	3	10	1617	3482139	92.6667
0.000001	3	11	2156	6046449	94
0.000001	3	12	2156	6218374	92
0.000001	3	13	2155	8047562	93.3334
0.000001	3	14	2156	10555283	92.6667

0.000001	3	15	2156	10867872	92.6667
0.000001	3	16	2156	11432689	93.3334
0.000001	3	17	2156	12431897	93.3334
0.000001	3	18	2156	14404444	93.3334
0.000001	3	19	2156	21748141	93.3334
0.000001	3	20	2156	14448099	92.6667
0.000001	4	2	2155	427924	82.6667
0.000001	4	3	1078	464572	96
0.000001	4	4	1617	1290240	93.3334
0.000001	4	5	1617	3361415	90
0.000001	4	6	2156	5337734	92.6667
0.000001	4	7	2155	13403080	94
0.000001	4	8	2155	25817193	90.6667
0.000001	4	9	2156	34254412	90.6667
0.000001	4	10	2155	43177763	92
0.000001	4	11	2155	90778127	92
0.000001	4	12	2156	135878314	90.6667
0.000001	4	13	2694	118797997	91.3334
0.000001	4	14	1617	168003346	92.6667
0.000001	4	15	1617	175060321	90.6667
0.000001	4	16	1617	183974510	92.6667
0.000001	4	17	2156	292779346	92
0.000001	4	18	1616	572871333	92.6667
0.000001	4	19	2156	309085735	92
0.000001	4	20	2156	451308537	92
0.00001	2	2	1617	1166282	74.6667
0.00001	2	3	2156	1324194	91.3334
0.00001	2	4	1617	914054	93.3334
0.00001	2	5	2156	2055006	92.6667
0.00001	2	6	2156	869861	96
0.00001	2	7	2155	897347	96
0.00001	2	8	1617	2190282	97.3334
0.00001	2	9	1617	805726	94
0.00001	2	10	1617	765305	96
0.00001	2	11	2155	919445	94.6667
0.00001	2	12	2155	676917	95.3334
0.00001	2	13	2156	995436	93.3334
0.00001	2	14	2155	952320	95.3334
0.00001	2	15	2156	995975	96.6667
0.00001	2	16	2156	1012143	95.3334
0.00001	2	17	2155	1009449	94
0.00001	2	18	2156	4916277	94
0.00001	2	19	1617	638114	94.6667
0.00001	2	20	2155	2605811	95.3334
0.00001	3	2	2156	618711	76
0.00001	3	3	1617	555655	94.6667
0.00001	3	4	1078	579368	88

0.00001	3	5	2155	958788	90
0.00001	3	6	2156	1171671	93.3334
0.00001	3	7	2156	1721397	94.6667
0.00001	3	8	1617	2223157	94
0.00001	3	9	1617	2584252	92
0.00001	3	10	2155	5798534	92.6667
0.00001	3	11	2155	8573573	94.6667
0.00001	3	12	2156	6885051	92.6667
0.00001	3	13	2155	7144825	92.6667
0.00001	3	14	1617	10872722	92.6667
0.00001	3	15	2156	11696235	92.6667
0.00001	3	16	2155	12845269	93.3334
0.00001	3	17	1617	15853135	91.3334
0.00001	3	18	2156	22339365	93.3334
0.00001	3	19	2695	24473058	93.3334
0.00001	3	20	1617	18933218	92.6667
0.00001	4	2	2156	596615	82.6667
0.00001	4	3	2156	606855	96
0.00001	4	4	1617	1663191	92.6667
0.00001	4	5	2156	2525507	91.3334
0.00001	4	6	1617	5430972	91.3334
0.00001	4	7	2156	15392335	93.3334
0.00001	4	8	2156	20424486	90.6667
0.00001	4	9	1616	32572897	90.6667
0.00001	4	10	2156	47556171	92.6667
0.00001	4	11	1617	76541295	92
0.00001	4	12	2156	94946884	92
0.00001	4	13	1617	113417147	91.3334
0.00001	4	14	2156	207288292	92
0.00001	4	15	1617	169687556	92.6667
0.00001	4	16	2155	193593641	92.6667
0.00001	4	17	2156	385772007	90.6667
0.00001	4	18	1617	264288436	91.3334
0.00001	4	19	1617	295456297	93.3334
0.00001	4	20	2156	382002610	92.6667
0.0001	2	2	2694	1117777	74.6667
0.0001	2	3	2156	1207242	91.3334
0.0001	2	4	1617	1178139	93.3334
0.0001	2	5	2156	844530	92.6667
0.0001	2	6	1078	825668	96
0.0001	2	7	3234	914594	96
0.0001	2	8	2156	2708750	97.3334
0.0001	2	9	3772	780935	94
0.0001	2	10	1617	769078	96
0.0001	2	11	2156	866089	94
0.0001	2	12	2156	1062265	94.6667
0.0001	2	13	1617	730813	93.3334

0.0001	2	14	1617	635958	95.3334
0.0001	2	15	1617	1180833	96.6667
0.0001	2	16	1617	928606	96.6667
0.0001	2	17	1617	952319	95.3334
0.0001	2	18	2156	909743	94
0.0001	2	19	1617	1288623	94.6667
0.0001	2	20	2156	2748092	95.3334
0.0001	3	2	1616	1580732	76
0.0001	3	3	2695	1697684	94.6667
0.0001	3	4	1617	483436	88
0.0001	3	5	2695	759376	90
0.0001	3	6	1616	839141	93.3334
0.0001	3	7	2156	11705935	94.6667
0.0001	3	8	2156	2254416	95.3334
0.0001	3	9	4312	3277877	93.3334
0.0001	3	10	2155	5024606	93.3334
0.0001	3	11	2156	7051047	94.6667
0.0001	3	12	2156	15960924	92
0.0001	3	13	1617	7946239	93.3334
0.0001	3	14	2156	11181540	92.6667
0.0001	3	15	2156	12302011	92.6667
0.0001	3	16	2155	13190196	92.6667
0.0001	3	17	1617	18189471	92.6667
0.0001	3	18	1617	15938289	94
0.0001	3	19	2156	19017833	92.6667
0.0001	3	20	2155	15380478	92.6667
0.0001	4	2	2156	423613	82.6667
0.0001	4	3	2155	674223	96
0.0001	4	4	2156	1758046	94
0.0001	4	5	2156	3333928	90
0.0001	4	6	2156	9117372	92
0.0001	4	7	2156	13866036	92.6667
0.0001	4	8	2156	23418877	91.3334
0.0001	4	9	2156	36582665	90.6667
0.0001	4	10	2156	50194857	92.6667
0.0001	4	11	2156	79520596	92
0.0001	4	12	2156	92857925	91.3334
0.0001	4	13	1616	112510638	92.6667
0.0001	4	14	1617	151407542	90.6667
0.0001	4	15	2156	213404266	91.3334
0.0001	4	16	1617	199039704	92
0.0001	4	17	1617	238397408	91.3334
0.0001	4	18	1617	312717162	92
0.0001	4	19	1617	304013163	92
0.0001	4	20	1617	294547093	93.3334
0.001	2	2	2695	985196	74.6667
0.001	2	3	2695	1231494	91.3334

0.001	2	4	2156	1027234	93.3334
0.001	2	5	2155	1226105	92.6667
0.001	2	6	1617	905431	96
0.001	2	7	2156	889263	96
0.001	2	8	2694	1311798	97.3334
0.001	2	9	1617	812733	94
0.001	2	10	2155	731890	96
0.001	2	11	2156	724884	94.6667
0.001	2	12	2695	811116	94.6667
0.001	2	13	2156	3055292	94
0.001	2	14	2156	1091369	96.6667
0.001	2	15	1078	1343596	95.3334
0.001	2	16	2156	883874	95.3334
0.001	2	17	2156	926990	94
0.001	2	18	2156	965255	95.3334
0.001	2	19	2155	743209	94.6667
0.001	2	20	2694	1088135	94.6667
0.001	3	2	1617	384269	76
0.001	3	3	1078	533558	94.6667
0.001	3	4	2155	1673971	88
0.001	3	5	1617	5723081	90
0.001	3	6	2155	5976926	93.3334
0.001	3	7	1617	9035991	93.3334
0.001	3	8	1617	1963924	95.3334
0.001	3	9	1617	2536824	92
0.001	3	10	2156	3624421	93.3334
0.001	3	11	2156	6296521	94
0.001	3	12	2156	7224589	92.6667
0.001	3	13	2155	6745464	94
0.001	3	14	2156	14891653	92.6667
0.001	3	15	2156	13432722	92.6667
0.001	3	16	2156	13108815	93.3334
0.001	3	17	2156	11850912	93.3334
0.001	3	18	2156	16372680	92.6667
0.001	3	19	1617	16982768	92.6667
0.001	3	20	2156	16967678	92.6667
0.001	4	2	2155	467267	82.6667
0.001	4	3	4312	585835	95.3334
0.001	4	4	2156	1661575	93.3334
0.001	4	5	2156	4121869	90
0.001	4	6	2156	3232606	90.6667
0.001	4	7	2156	13112588	92.6667
0.001	4	8	4311	21516932	91.3334
0.001	4	9	2156	34685031	90.6667
0.001	4	10	2695	57241593	93.3334
0.001	4	11	2155	97131238	92
0.001	4	12	1617	88394363	90.6667

0.001	4	13	2156	123535343	92.6667
0.001	4	14	6467	202235661	90.6667
0.001	4	15	1617	194258164	93.3334
0.001	4	16	1617	193061161	91.3334
0.001	4	17	2156	286175086	90.6667
0.001	4	18	1617	227287009	92
0.001	4	19	1616	317344563	92.6667
0.001	4	20	1616	395275804	91.3334
0.01	2	2	1617	898964	74.6667
0.01	2	3	2695	1171133	91.3334
0.01	2	4	2156	1068732	93.3334
0.01	2	5	2695	881179	92.6667
0.01	2	6	1617	840219	96
0.01	2	7	1617	961481	96
0.01	2	8	2156	820278	97.3334
0.01	2	9	2156	792252	94
0.01	2	10	1617	628413	96
0.01	2	11	1616	674762	95.3334
0.01	2	12	2156	698476	94.6667
0.01	2	13	1078	726501	94.6667
0.01	2	14	2156	918905	96.6667
0.01	2	15	4311	844530	95.3334
0.01	2	16	2156	1014299	95.3334
0.01	2	17	2156	1068193	94.6667
0.01	2	18	1617	997053	94
0.01	2	19	1616	918905	95.3334
0.01	2	20	1617	1118854	94.6667
0.01	3	2	1617	612783	76
0.01	3	3	1617	977650	94.6667
0.01	3	4	2695	2791208	88
0.01	3	5	1617	3243385	90
0.01	3	6	2155	4452243	93.3334
0.01	3	7	1617	15915652	94.6667
0.01	3	8	2156	2226391	95.3334
0.01	3	9	2695	2911932	93.3334
0.01	3	10	2156	3537650	93.3334
0.01	3	11	2156	7967258	94
0.01	3	12	2156	6197894	92.6667
0.01	3	13	1617	7175544	93.3334
0.01	3	14	1616	16124764	92.6667
0.01	3	15	2156	8385481	92.6667
0.01	3	16	2156	11718331	93.3334
0.01	3	17	1617	13125523	92.6667
0.01	3	18	1617	14067602	93.3334
0.01	3	19	2156	18963938	93.3334
0.01	3	20	2156	20984991	92.6667
0.01	4	2	2695	454872	82.6667

0.01	4	3	1617	559966	96
0.01	4	4	2156	1567797	94
0.01	4	5	2156	3949945	90
0.01	4	6	2156	5646012	92.6667
0.01	4	7	2156	15135257	93.3334
0.01	4	8	2155	22245049	91.3334
0.01	4	9	2156	28937158	91.3334
0.01	4	10	2155	48879286	92.6667
0.01	4	11	1617	65994636	92.6667
0.01	4	12	1616	82988722	94
0.01	4	13	2156	142833968	93.3334
0.01	4	14	1617	193068707	92.6667
0.01	4	15	1616	160728096	90
0.01	4	16	2156	214166877	91.3334
0.01	4	17	2156	285757941	94
0.01	4	18	1617	280578657	92
0.01	4	19	4850	327112444	90.6667
0.01	4	20	2156	419290217	90.6667
0.1	2	2	1617	831057	74.6667
0.1	2	3	1617	2256572	91.3334
0.1	2	4	1617	1048792	93.3334
0.1	2	5	2156	894114	92.6667
0.1	2	6	1078	721111	96
0.1	2	7	1078	1284311	96
0.1	2	8	2156	1258441	97.3334
0.1	2	9	2156	725423	94
0.1	2	10	1617	776085	96
0.1	2	11	1617	901659	95.3334
0.1	2	12	1617	822973	94.6667
0.1	2	13	4311	800337	94.6667
0.1	2	14	2156	736741	96.6667
0.1	2	15	2155	659133	96.6667
0.1	2	16	1617	823512	96.6667
0.1	2	17	1617	797103	95.3334
0.1	2	18	2155	1067115	94
0.1	2	19	2155	1157120	95.3334
0.1	2	20	2156	1015916	94.6667
0.1	3	2	2155	404750	76
0.1	3	3	1617	593920	94.6667
0.1	3	4	1616	682846	88
0.1	3	5	1616	1577499	90
0.1	3	6	1617	13042525	93.3334
0.1	3	7	1616	5176589	94.6667
0.1	3	8	1617	1746189	95.3334
0.1	3	9	2156	2700665	93.3334
0.1	3	10	2695	4674290	92.6667
0.1	3	11	1617	6120285	94

0.1	3	12	2156	6291131	92.6667
0.1	3	13	2156	7223511	93.3334
0.1	3	14	2155	19027535	92.6667
0.1	3	15	2156	13494702	92.6667
0.1	3	16	2156	13273194	93.3334
0.1	3	17	2156	16571552	94
0.1	3	18	2155	15926970	92.6667
0.1	3	19	2156	24345866	92.6667
0.1	3	20	2156	22886935	93.3334
0.1	4	2	2155	444632	82.6667
0.1	4	3	1078	887647	96
0.1	4	4	1078	1005675	93.3334
0.1	4	5	2156	3365187	89.3334
0.1	4	6	1617	4607999	91.3334
0.1	4	7	2156	12041700	94
0.1	4	8	2156	22660578	90.6667
0.1	4	9	1616	23856502	91.3334
0.1	4	10	1617	49577222	92.6667
0.1	4	11	2156	84094103	93.3334
0.1	4	12	2156	112732684	90.6667
0.1	4	13	6467	111373459	92.6667
0.1	4	14	1617	188051107	91.3334
0.1	4	15	2156	158352417	92.6667
0.1	4	16	1617	180502611	92.6667
0.1	4	17	1617	268895896	92.6667
0.1	4	18	1617	261879881	91.3334
0.1	4	19	2156	345668939	93.3334
0.1	4	20	2155	292123985	93.3334

Table A.3: Results of 5-fold Cross Validation on Iris data set

The table below shows the results of analysis of 10-fold cross validations on Iris data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	1616	1146341	76
0	2	3	1078	1239579	91.3334
0	2	4	2156	912977	93.3334
0	2	5	1617	977651	92.6667
0	2	6	1617	918905	96
0	2	7	2156	939924	96
0	2	8	2155	783629	96.6667
0	2	9	4850	4866694	96
0	2	10	1078	717339	96
0	2	11	1617	744286	94.6667
0	2	12	2156	708716	94.6667
0	2	13	2156	993819	94.6667

0	2	14	2156	877407	95.3334
0	2	15	2156	1094602	96
0	2	16	1617	876868	96
0	2	17	2695	1062805	94.6667
0	2	18	1616	805187	95.3334
0	2	19	2156	1319343	95.3334
0	2	20	2156	709793	95.3334
0	3	2	1617	391814	76
0	3	3	1617	493137	94.6667
0	3	4	1617	641347	87.3334
0	3	5	1078	921600	90
0	3	6	1617	956093	93.3334
0	3	7	2155	46486360	94
0	3	8	1617	7697784	95.3334
0	3	9	2156	2719528	92.6667
0	3	10	2156	3991982	94
0	3	11	2156	5469238	94.6667
0	3	12	1617	5470315	94
0	3	13	2156	6770795	93.3334
0	3	14	2156	13861186	92.6667
0	3	15	2156	11338373	92.6667
0	3	16	2695	13705969	94
0	3	17	2155	17810591	93.3334
0	3	18	2156	16422802	93.3334
0	3	19	2156	25934683	93.3334
0	3	20	1616	18954237	93.3334
0	4	2	36109	345466	82.6667
0	4	3	1078	1333355	96
0	4	4	1617	910282	94.6667
0	4	5	2156	4057735	92
0	4	6	4311	5088202	92.6667
0	4	7	2156	10394677	94
0	4	8	2156	21717420	92
0	4	9	2155	32016164	93.3334
0	4	10	2156	47671505	96
0	4	11	2156	77342710	95.3334
0	4	12	2156	98178412	92.6667
0	4	13	2156	120579757	94
0	4	14	2155	204028739	95.3334
0	4	15	1616	238770898	92.6667
0	4	16	2694	228944811	94.6667
0	4	17	1617	272918599	93.3334
0	4	18	1617	524518599	92.6667
0	4	19	2156	301578738	95.3334
0	4	20	2156	411288467	94.6667
0.000001	2	2	1617	1033701	76
0.000001	2	3	1617	1006753	91.3334

0.000001	2	4	1617	718956	93.3334
0.000001	2	5	1616	1027772	92.6667
0.000001	2	6	1617	905971	96
0.000001	2	7	1617	1348446	96
0.000001	2	8	1078	2225314	96.6667
0.000001	2	9	1616	4858610	96
0.000001	2	10	2156	798181	96
0.000001	2	11	1078	826206	94.6667
0.000001	2	12	1617	671528	94.6667
0.000001	2	13	1078	697936	94.6667
0.000001	2	14	2156	872556	96
0.000001	2	15	2156	1089751	96
0.000001	2	16	2156	714644	95.3334
0.000001	2	17	1078	978729	94
0.000001	2	18	2156	688236	94
0.000001	2	19	1617	1033701	94.6667
0.000001	2	20	1617	706560	94.6667
0.000001	3	2	2155	445170	76
0.000001	3	3	1617	606855	94.6667
0.000001	3	4	1617	559427	87.3334
0.000001	3	5	1616	1107536	90
0.000001	3	6	1617	1044480	92.6667
0.000001	3	7	2156	13456975	94.6667
0.000001	3	8	2155	2261962	93.3334
0.000001	3	9	2156	2645693	91.3334
0.000001	3	10	1617	3413153	94
0.000001	3	11	1617	6072859	95.3334
0.000001	3	12	2156	10339704	93.3334
0.000001	3	13	2695	9976454	93.3334
0.000001	3	14	2695	16441665	92.6667
0.000001	3	15	2156	10272335	92.6667
0.000001	3	16	2156	12456150	94
0.000001	3	17	2156	16514423	94
0.000001	3	18	1616	15858524	93.3334
0.000001	3	19	1617	19263055	94
0.000001	3	20	2156	20848637	93.3334
0.000001	4	2	3772	486131	82.6667
0.000001	4	3	1078	790635	95.3334
0.000001	4	4	2156	1396412	95.3334
0.000001	4	5	1616	3303208	92
0.000001	4	6	2156	6086871	92.6667
0.000001	4	7	2155	14205573	94
0.000001	4	8	2156	24018186	92.6667
0.000001	4	9	2156	32980341	93.3334
0.000001	4	10	1617	45527034	96
0.000001	4	11	1617	65813549	94.6667
0.000001	4	12	1617	95935313	93.3334

0.000001	4	13	1617	103910656	93.3334
0.000001	4	14	2155	187777322	92.6667
0.000001	4	15	1617	147168722	94.6667
0.000001	4	16	1617	193724605	94
0.000001	4	17	1077	262820344	94.6667
0.000001	4	18	1616	258114256	94.6667
0.000001	4	19	1617	361033787	92.6667
0.000001	4	20	1617	318230593	93.3334
0.00001	2	2	1616	1133406	76
0.00001	2	3	1617	1103225	92
0.00001	2	4	2156	1927815	93.3334
0.00001	2	5	1617	1012682	92.6667
0.00001	2	6	2155	791713	96
0.00001	2	7	1617	855309	96
0.00001	2	8	2156	845608	96.6667
0.00001	2	9	2156	911360	96
0.00001	2	10	2155	846686	96
0.00001	2	11	1078	757221	94.6667
0.00001	2	12	1617	787941	94.6667
0.00001	2	13	1617	1094063	94
0.00001	2	14	2156	887646	96
0.00001	2	15	1617	929684	96
0.00001	2	16	3773	873633	96
0.00001	2	17	1617	1028851	94
0.00001	2	18	2156	602543	95.3334
0.00001	2	19	2156	2619822	94.6667
0.00001	2	20	2156	715183	95.3334
0.00001	3	2	1617	510383	76
0.00001	3	3	1617	542181	94.6667
0.00001	3	4	1078	712489	87.3334
0.00001	3	5	1617	1084362	90
0.00001	3	6	1617	958787	92.6667
0.00001	3	7	2156	1880387	93.3334
0.00001	3	8	2156	2424724	94.6667
0.00001	3	9	2156	2627368	92.6667
0.00001	3	10	2156	7245608	94.6667
0.00001	3	11	2156	8222719	94
0.00001	3	12	2156	6964816	94.6667
0.00001	3	13	2695	10461506	93.3334
0.00001	3	14	2155	9997472	92.6667
0.00001	3	15	2156	10849009	92.6667
0.00001	3	16	2156	12150567	94.6667
0.00001	3	17	1617	17336318	93.3334
0.00001	3	18	2155	16189977	93.3334
0.00001	3	19	2155	21002237	94
0.00001	3	20	2156	18018086	94
0.00001	4	2	1617	458106	82.6667

0.00001	4	3	1617	935073	94.6667
0.00001	4	4	1616	1471865	95.3334
0.00001	4	5	2156	4027015	92
0.00001	4	6	2155	3617414	92.6667
0.00001	4	7	2156	13114205	92.6667
0.00001	4	8	2156	25577361	92.6667
0.00001	4	9	2156	36581587	93.3334
0.00001	4	10	2155	46168920	96
0.00001	4	11	1617	68464631	94.6667
0.00001	4	12	2156	105163708	92.6667
0.00001	4	13	2695	119997693	93.3334
0.00001	4	14	1617	192421970	92.6667
0.00001	4	15	2156	251958938	92
0.00001	4	16	2694	277554085	94
0.00001	4	17	1617	247615024	94
0.00001	4	18	2156	271532426	92.6667
0.00001	4	19	1617	376757035	92.6667
0.00001	4	20	1617	324363274	94.6667
0.0001	2	2	1617	970105	76
0.0001	2	3	1617	1109692	91.3334
0.0001	2	4	1617	928606	93.3334
0.0001	2	5	1078	974956	92.6667
0.0001	2	6	1617	784169	96
0.0001	2	7	2156	1425516	96
0.0001	2	8	2156	830518	96.6667
0.0001	2	9	1617	792252	96
0.0001	2	10	1616	961482	96
0.0001	2	11	1078	810576	94.6667
0.0001	2	12	2155	731351	94.6667
0.0001	2	13	1078	609010	94.6667
0.0001	2	14	1616	815966	96
0.0001	2	15	1617	985196	96
0.0001	2	16	2156	1015916	95.3334
0.0001	2	17	2156	1013760	93.3334
0.0001	2	18	1617	1161970	93.3334
0.0001	2	19	2156	1095680	94.6667
0.0001	2	20	2156	693086	95.3334
0.0001	3	2	1617	369179	76
0.0001	3	3	1616	398821	94.6667
0.0001	3	4	1617	622484	87.3334
0.0001	3	5	1617	905971	90
0.0001	3	6	2156	5168504	93.3334
0.0001	3	7	2156	12184521	94
0.0001	3	8	2156	2322324	96
0.0001	3	9	1617	3518248	92.6667
0.0001	3	10	2156	3559208	94.6667
0.0001	3	11	1616	5588883	95.3334

0.0001	3	12	2156	7309203	93.3334
0.0001	3	13	2155	7095780	93.3334
0.0001	3	14	2156	11885405	92
0.0001	3	15	2695	18164141	92.6667
0.0001	3	16	2156	14186709	94.6667
0.0001	3	17	1617	16415257	94
0.0001	3	18	1617	16845337	93.3334
0.0001	3	19	2156	17504470	94
0.0001	3	20	1617	18584520	94
0.0001	4	2	1617	452177	82.6667
0.0001	4	3	2156	3971503	96
0.0001	4	4	1617	1899789	95.3334
0.0001	4	5	2156	3863174	92.6667
0.0001	4	6	2694	5415881	92.6667
0.0001	4	7	2156	13180495	94
0.0001	4	8	2156	31316611	93.3334
0.0001	4	9	2156	34225309	93.3334
0.0001	4	10	2155	46027177	96
0.0001	4	11	2156	84367888	94.6667
0.0001	4	12	2155	94908619	93.3334
0.0001	4	13	1616	95977891	94
0.0001	4	14	2155	194719502	92
0.0001	4	15	2156	201077464	92.6667
0.0001	4	16	2156	183800429	94
0.0001	4	17	1617	240709492	92.6667
0.0001	4	18	2156	255760672	94
0.0001	4	19	2156	378731199	92
0.0001	4	20	2155	339919449	90.6667
0.001	2	2	1617	948008	76
0.001	2	3	1617	1150113	91.3334
0.001	2	4	1617	728657	93.3334
0.001	2	5	3773	902198	92.6667
0.001	2	6	1078	890341	96
0.001	2	7	2694	2556227	96
0.001	2	8	2156	795486	96.6667
0.001	2	9	2156	4263073	96
0.001	2	10	2156	604160	96
0.001	2	11	1617	699554	94.6667
0.001	2	12	1617	1063882	94.6667
0.001	2	13	1078	819738	94.6667
0.001	2	14	1617	1963385	96
0.001	2	15	2156	1067116	96
0.001	2	16	2156	868244	96
0.001	2	17	2156	1083823	94
0.001	2	18	1617	626796	95.3334
0.001	2	19	2156	1145263	94
0.001	2	20	1617	1173288	94.6667

0.001	3	2	1078	633802	76
0.001	3	3	1617	1222871	94.6667
0.001	3	4	1617	1796850	87.3334
0.001	3	5	2695	3704184	90
0.001	3	6	4312	5810929	93.3334
0.001	3	7	2156	1595284	92.6667
0.001	3	8	2156	3359258	94.6667
0.001	3	9	1616	2488859	92
0.001	3	10	2156	3835688	94.6667
0.001	3	11	2156	6241009	94.6667
0.001	3	12	2695	6401616	93.3334
0.001	3	13	2155	6477607	93.3334
0.001	3	14	2156	12313867	94
0.001	3	15	2156	11634795	92.6667
0.001	3	16	2156	13951729	94.6667
0.001	3	17	2156	17957185	94
0.001	3	18	2155	14879796	94
0.001	3	19	1617	18966634	92.6667
0.001	3	20	2156	17187568	93.3334
0.001	4	2	1617	353011	82.6667
0.001	4	3	2156	910282	95.3334
0.001	4	4	2156	1651874	94.6667
0.001	4	5	2695	4353077	92.6667
0.001	4	6	2156	5709069	92.6667
0.001	4	7	2156	11585211	94
0.001	4	8	2156	21721193	92.6667
0.001	4	9	2156	26843887	92
0.001	4	10	2156	50153896	96
0.001	4	11	2156	79305017	94
0.001	4	12	1617	82609842	92
0.001	4	13	2156	110739117	92.6667
0.001	4	14	2156	220524837	93.3334
0.001	4	15	2156	231274680	92.6667
0.001	4	16	1616	200378449	94.6667
0.001	4	17	1617	266626928	94
0.001	4	18	2156	216554952	92
0.001	4	19	1617	288169729	92
0.001	4	20	1078	298182831	92
0.01	2	2	1078	901120	76
0.01	2	3	1617	1075739	91.3334
0.01	2	4	2156	1998416	93.3334
0.01	2	5	1617	1207242	92.6667
0.01	2	6	2694	870400	96
0.01	2	7	1617	1259520	96
0.01	2	8	1617	859082	96.6667
0.01	2	9	1078	4049111	96
0.01	2	10	1078	661827	96

0.01	2	11	1617	710333	94.6667
0.01	2	12	1078	2016740	94.6667
0.01	2	13	1077	945313	94.6667
0.01	2	14	1617	1000286	95.3334
0.01	2	15	2156	924834	96
0.01	2	16	2155	985195	96
0.01	2	17	1617	950703	95.3334
0.01	2	18	1617	826207	94
0.01	2	19	2155	1074661	94.6667
0.01	2	20	1617	1025616	94.6667
0.01	3	2	1078	350315	76
0.01	3	3	1078	512000	94.6667
0.01	3	4	1617	1578038	87.3334
0.01	3	5	1617	4162290	90
0.01	3	6	2156	4950770	92.6667
0.01	3	7	2156	1682594	93.3334
0.01	3	8	2156	2152016	94.6667
0.01	3	9	2156	2741625	91.3334
0.01	3	10	1617	3602324	94.6667
0.01	3	11	2155	6654921	94.6667
0.01	3	12	2694	11112555	93.3334
0.01	3	13	2155	6883435	93.3334
0.01	3	14	3773	10457194	92.6667
0.01	3	15	1617	12372613	92.6667
0.01	3	16	1617	11275316	94.6667
0.01	3	17	2156	13332478	94
0.01	3	18	2156	13386373	94
0.01	3	19	2155	18532781	93.3334
0.01	3	20	2156	18500983	93.3334
0.01	4	2	1617	341692	82.6667
0.01	4	3	1617	633263	95.3334
0.01	4	4	2156	1684749	94.6667
0.01	4	5	2155	3772092	92
0.01	4	6	2155	4804715	92
0.01	4	7	2156	21815508	94
0.01	4	8	1617	22118936	93.3334
0.01	4	9	2155	36664585	93.3334
0.01	4	10	1617	47655876	95.3334
0.01	4	11	2156	85957782	95.3334
0.01	4	12	2695	102767548	93.3334
0.01	4	13	2156	100702302	94.6667
0.01	4	14	1617	140864654	91.3334
0.01	4	15	2695	196353590	93.3334
0.01	4	16	2155	284269907	94
0.01	4	17	1617	259809245	94.6667
0.01	4	18	1617	329188470	92
0.01	4	19	1617	425716625	92.6667

0.01	4	20	2156	386218795	92.6667
0.1	2	2	1078	824590	76
0.1	2	3	2156	1231494	91.3334
0.1	2	4	2156	827823	93.3334
0.1	2	5	1617	919983	92.6667
0.1	2	6	1078	880101	96
0.1	2	7	1617	1414198	96
0.1	2	8	1617	1319343	96.6667
0.1	2	9	1617	782012	96
0.1	2	10	1616	792253	96
0.1	2	11	1617	865010	94.6667
0.1	2	12	1617	740513	94.6667
0.1	2	13	1617	694703	94.6667
0.1	2	14	2694	707099	96
0.1	2	15	1078	673145	96
0.1	2	16	1617	673145	96
0.1	2	17	1617	755604	94.6667
0.1	2	18	1617	991663	95.3334
0.1	2	19	1616	1334973	94.6667
0.1	2	20	1617	1029929	94
0.1	3	2	2156	410139	76
0.1	3	3	1617	569129	94.6667
0.1	3	4	1617	565895	87.3334
0.1	3	5	2156	1022922	90
0.1	3	6	1616	599849	93.3334
0.1	3	7	2155	17102953	92.6667
0.1	3	8	2156	2079258	93.3334
0.1	3	9	2156	2630602	92
0.1	3	10	2156	3561364	94.6667
0.1	3	11	2695	7021944	94
0.1	3	12	2156	6251250	93.3334
0.1	3	13	2695	10073464	92
0.1	3	14	2156	11193396	92.6667
0.1	3	15	2695	18423914	92
0.1	3	16	2695	12630769	94
0.1	3	17	2156	17123434	93.3334
0.1	3	18	2156	18755905	94
0.1	3	19	1616	19198920	93.3334
0.1	3	20	2156	19147180	94
0.1	4	2	1078	503377	82.6667
0.1	4	3	1078	819739	95.3334
0.1	4	4	1616	1512286	94.6667
0.1	4	5	2156	6887207	92
0.1	4	6	2695	3077928	92.6667
0.1	4	7	2156	14646432	94
0.1	4	8	2156	20132916	92.6667
0.1	4	9	2156	35925149	94

0.1	4	10	1617	40947060	96
0.1	4	11	2155	86228872	94.6667
0.1	4	12	1617	88483828	92.6667
0.1	4	13	1617	125507890	94
0.1	4	14	1616	150060173	93.3334
0.1	4	15	2156	183634973	92
0.1	4	16	2156	350655818	93.3334
0.1	4	17	2155	275752383	94
0.1	4	18	2156	282009562	96
0.1	4	19	2155	369399866	94
0.1	4	20	2156	344104914	95.3334

Table A.4: Results of 10-fold Cross Validation on Iris data set

A.3 Iris2D data set

The Iris2D data set is a modification of Iris data set, containing only 2 attributes. The table below shows the results of analysis of 5-fold cross validations on Iris2D data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	4851	2134769	74.6667
0	2	3	2695	2085725	91.3334
0	2	4	2156	1671275	93.3334
0	2	5	2156	1447073	92.6667
0	2	10	2156	3575914	96
0	2	15	2155	4825192	95.3334
0	2	20	2155	2221540	95.3334
0	2	25	2156	2461910	94.6667
0	2	30	2156	2789590	94.6667
0.000001	2	2	2155	2338491	74.6667
0.000001	2	3	2155	2270584	91.3334
0.000001	2	4	2695	1874997	93.3334
0.000001	2	5	2694	1811401	92.6667
0.000001	2	10	2695	3146911	96
0.000001	2	15	2155	7192248	96.6667
0.000001	2	20	2695	2486701	94.6667
0.000001	2	25	4312	3098945	94.6667
0.000001	2	30	2156	6844088	94.6667
0.00001	2	2	2156	2183275	74.6667
0.00001	2	3	2156	1985481	91.3334
0.00001	2	4	2695	1861523	93.3334
0.00001	2	5	2695	1862601	92.6667
0.00001	2	10	4311	3276797	96
0.00001	2	15	2156	2424723	96.6667
0.00001	2	20	2694	2655931	95.3334
0.00001	2	25	2156	2341725	95.3334
0.00001	2	30	2156	2250643	94.6667
0.0001	2	2	2695	2155250	74.6667
0.0001	2	3	2155	1959611	91.3334
0.0001	2	4	2156	2293759	93.3334
0.0001	2	5	2695	1837809	92.6667
0.0001	2	10	3234	3059602	96
0.0001	2	15	2156	6987987	96.6667
0.0001	2	20	2156	3157691	94.6667
0.0001	2	25	3234	2868276	94.6667
0.0001	2	30	2156	2793901	94.6667
0.001	2	2	2695	2138003	74.6667
0.001	2	3	2155	2079796	91.3334
0.001	2	4	1617	1624386	93.3334
0.001	2	5	2694	1706306	92.6667
0.001	2	10	2695	7233747	96

0.001	2	15	2155	2369750	96.6667
0.001	2	20	2156	2978760	94.6667
0.001	2	25	2156	2805758	94.6667
0.001	2	30	2695	2756714	94.6667
0.01	2	2	2156	2219384	74.6667
0.01	2	3	2695	2025902	91.3334
0.01	2	4	2695	1855056	93.3334
0.01	2	5	2695	1741877	92.6667
0.01	2	10	2156	4735188	96
0.01	2	15	2694	5820089	95.3334
0.01	2	20	3234	2824082	94.6667
0.01	2	25	2156	2335257	94.6667
0.01	2	30	2694	2617127	95.3334
0.1	2	2	2155	2428495	74.6667
0.1	2	3	5390	2419332	92
0.1	2	4	2156	1548933	93.3334
0.1	2	5	2156	1648639	92.6667
0.1	2	10	2155	3325842	96
0.1	2	15	2156	5273057	95.3334
0.1	2	20	2695	2838634	94.6667
0.1	2	25	2695	1823796	95.3334
0.1	2	30	2155	1744033	94.6667

Table A.5: Results of 5-fold Cross Validation on Iris2D data set

The table below shows the results of analysis of 10-fold cross validations on Iris2D data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	1617	2115906	76
0	2	3	4851	1966618	92
0	2	4	2695	1900327	93.3334
0	2	5	1616	1768285	92.6667
0	2	10	2156	2873127	96
0	2	15	2156	7265006	96
0	2	20	2695	1817869	94.6667
0	2	25	2156	2353582	94
0	2	30	2156	4383795	94.6667
0.000001	2	2	2155	2060395	76
0.000001	2	3	2694	1922963	91.3334
0.000001	2	4	2156	1413119	93.3334
0.000001	2	5	2156	2023207	92.6667
0.000001	2	10	2695	6892054	96
0.000001	2	15	2156	4765908	96
0.000001	2	20	2156	2442507	94.6667
0.000001	2	25	2156	2547602	94.6667
0.000001	2	30	2156	2427956	94.6667
0.00001	2	2	2156	1930508	76
0.00001	2	3	2156	2022130	91.3334
0.00001	2	4	2156	1606601	93.3334
0.00001	2	5	1616	1768285	92.6667
0.00001	2	10	2155	3350095	96
0.00001	2	15	2156	2224773	96
0.00001	2	20	2694	9045148	94.6667
0.00001	2	25	1617	1448150	95.3334
0.00001	2	30	2155	2173573	94.6667
0.0001	2	2	2695	2386997	76
0.0001	2	3	2155	1992488	91.3334
0.0001	2	4	2155	1411502	93.3334
0.0001	2	5	2156	1873919	92.6667
0.0001	2	10	2695	7985578	96
0.0001	2	15	2156	2196748	96
0.0001	2	20	2694	2611738	94.6667
0.0001	2	25	1617	2161177	94.6667
0.0001	2	30	2156	2676949	94.6667
0.001	2	2	2156	2133153	76
0.001	2	3	2156	1795233	91.3334
0.001	2	4	2695	1524142	93.3334
0.001	2	5	2156	1815713	92.6667
0.001	2	10	2156	8069115	96
0.001	2	15	2156	2255493	96
0.001	2	20	2695	2539519	94.6667
0.001	2	25	2695	2187586	94.6667

0.001	2	30	1617	4285168	94.6667
0.01	2	2	5389	2687728	76
0.01	2	3	1617	1926736	91.3334
0.01	2	4	2156	1453540	93.3334
0.01	2	5	2695	1818407	92.6667
0.01	2	10	2695	3091400	96
0.01	2	15	2156	2871509	96
0.01	2	20	2156	2418794	94.6667
0.01	2	25	2156	2320167	94
0.01	2	30	2695	1748344	94.6667
0.1	2	2	1617	1914879	76
0.1	2	3	2695	1902483	91.3334
0.1	2	4	2695	1485338	93.3334
0.1	2	5	2155	1921346	92.6667
0.1	2	10	2155	3628730	96
0.1	2	15	2155	2833784	95.3334
0.1	2	20	2156	7741974	94.6667
0.1	2	25	2156	1822180	95.3334
0.1	2	30	2156	2638146	94.6667

Table A.6: Results of 10-fold Cross Validation on Iris2D data set

A.4 Car data set

The Car data set is a data set containing 6 attributes. The table below shows the results of analysis of 5-fold cross validations on Car data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	2156	6886850	76.5047
0	2	3	2156	3068227	76.5047
0	2	4	2155	2335798	76.5047
0	2	5	1617	1523604	76.5047
0	2	6	2156	1636783	76.5047
0	2	7	1617	1492345	76.5047
0	2	8	1617	1972008	76.5047
0	2	9	2156	1430366	76.5047
0	2	10	2155	1324732	76.5047
0	2	11	1617	1748884	76.5047
0	2	12	2156	1506357	76.5047
0	2	13	3234	1548395	76.5047
0	2	14	1616	1220176	76.5047
0	2	15	2156	1378627	76.5047
0	2	16	2156	1545701	76.5047
0	2	17	2155	1519292	76.5047
0	2	18	2156	1455158	76.5047
0	2	19	2156	1518753	76.5047
0	2	20	2156	1476177	76.5047
0	3	2	2156	2010274	81.1343
0	3	3	4851	1919731	81.1343
0	3	4	2155	1931587	81.1343
0	3	5	2156	1867452	81.1343
0	3	6	2695	2128841	81.1343
0	3	7	2695	2004884	81.1343
0	3	8	2156	2066324	81.1343
0	3	9	2156	1913262	81.1343
0	3	10	2156	1907334	81.1343
0	3	11	2156	1863141	81.1343
0	3	12	2155	1845894	81.1343
0	3	13	2156	1904101	81.1343
0	3	14	2156	2007579	81.1343
0	3	15	2156	2036682	81.1343
0	3	16	1617	1877154	81.1343
0	3	17	2156	2204294	81.1343
0	3	18	2156	2214534	81.1343
0	3	19	1616	2425263	81.1343
0	3	20	2155	1772059	81.1343
0	4	2	2155	2543831	85.1852
0	4	3	2695	2453827	85.1852
0	4	4	2156	2620901	85.1852

0	4	5	2156	2379991	85.1852
0	4	6	2156	22231576	85.1852
0	4	7	1617	2456522	85.1852
0	4	8	1617	2527663	85.1852
0	4	9	2695	2265196	85.1852
0	4	10	2156	2665633	85.1852
0	4	11	4851	2413945	85.1852
0	4	12	2156	2130998	85.1852
0	4	13	2156	2024825	85.1852
0	4	14	2695	2506105	85.1852
0	4	15	1617	2184353	85.1852
0	4	16	2156	2498560	85.1852
0	4	17	2156	2330408	85.1852
0	4	18	2695	2314779	85.1852
0	4	19	1617	2368135	85.1852
0	4	20	2156	2603116	85.1852
0	5	2	2155	3211586	93.4607
0	5	3	2155	4128337	93.4607
0	5	4	2694	3336623	93.4607
0	5	5	2156	3256319	93.4607
0	5	6	2156	3362492	93.4607
0	5	7	4850	3003014	93.4607
0	5	8	3234	3328539	93.4607
0	5	9	2156	2570239	93.4607
0	5	10	2155	2969060	93.4607
0	5	11	2155	2984691	93.4607
0	5	12	2156	3870181	93.4607
0	5	13	2156	3015410	93.4607
0	5	14	2156	3214282	93.4607
0	5	15	2156	3074156	93.4607
0	5	16	2156	3028345	93.4607
0	5	17	2156	3119427	93.4607
0	5	18	2155	8492193	93.4607
0	5	19	2695	3143141	93.4607
0	5	20	2156	3198113	93.4607
0	6	2	2695	4980412	97.2801
0	6	3	2156	5246113	97.2801
0	6	4	2156	4987418	97.2801
0	6	5	2695	4977718	97.2801
0	6	6	2155	4966399	97.2223
0	6	7	2155	4561650	97.338
0	6	8	2155	4570273	97.2223
0	6	9	2156	4886635	97.2801
0	6	10	2156	4539014	97.2801
0	6	11	2156	3913835	97.1644
0	6	12	2694	4072286	97.2223
0	6	13	1616	4577279	97.2801

0	6	14	2695	4817111	97.2223
0	6	15	2695	3925153	97.2801
0	6	16	2155	3952640	97.2801
0	6	17	2156	3904674	97.338
0	6	18	2155	4882324	97.1644
0	6	19	2156	5481633	97.2223
0	6	20	2156	4925439	97.2801
0.000001	2	2	2695	6066930	76.5047
0.000001	2	3	2156	2616051	76.5047
0.000001	2	4	2695	2250104	76.5047
0.000001	2	5	1616	1506358	76.5047
0.000001	2	6	2156	1712236	76.5047
0.000001	2	7	2695	1425516	76.5047
0.000001	2	8	1617	1413120	76.5047
0.000001	2	9	2156	1652413	76.5047
0.000001	2	10	1617	1639478	76.5047
0.000001	2	11	2156	1585583	76.5047
0.000001	2	12	2695	1500968	76.5047
0.000001	2	13	4850	1607141	76.5047
0.000001	2	14	2156	1540311	76.5047
0.000001	2	15	1617	1424976	76.5047
0.000001	2	16	2155	1463242	76.5047
0.000001	2	17	2156	1469709	76.5047
0.000001	2	18	2155	1314492	76.5047
0.000001	2	19	2156	1337129	76.5047
0.000001	2	20	2695	1493423	76.5047
0.000001	3	2	1617	1989255	81.1343
0.000001	3	3	1616	1714391	81.1343
0.000001	3	4	2155	2009195	81.1343
0.000001	3	5	2156	1990333	81.1343
0.000001	3	6	2156	1762896	81.1343
0.000001	3	7	2155	1658341	81.1343
0.000001	3	8	1617	1893861	81.1343
0.000001	3	9	2156	1889549	81.1343
0.000001	3	10	1616	1871764	81.1343
0.000001	3	11	2695	1719781	81.1343
0.000001	3	12	2156	1904640	81.1343
0.000001	3	13	2156	1817330	81.1343
0.000001	3	14	2156	1699301	81.1343
0.000001	3	15	2155	1801162	81.1343
0.000001	3	16	2155	1911107	81.1343
0.000001	3	17	2155	1860446	81.1343
0.000001	3	18	2155	1824336	81.1343
0.000001	3	19	2156	1829187	81.1343
0.000001	3	20	4311	1910568	81.1343
0.000001	4	2	2156	2545987	85.1852
0.000001	4	3	2695	2417179	85.1852

0.000001	4	4	2695	2250644	85.1852
0.000001	4	5	2156	2450055	85.1852
0.000001	4	6	2156	2409633	85.1852
0.000001	4	7	2156	2710904	85.1852
0.000001	4	8	2156	2329330	85.1852
0.000001	4	9	2156	2291064	85.1852
0.000001	4	10	2156	2092733	85.1852
0.000001	4	11	2156	2426341	85.1852
0.000001	4	12	2156	2299688	85.1852
0.000001	4	13	1617	2424185	85.1852
0.000001	4	14	2695	2388614	85.1852
0.000001	4	15	2695	2381608	85.1852
0.000001	4	16	2155	2253878	85.1852
0.000001	4	17	2156	2024286	85.1852
0.000001	4	18	2156	2265735	85.1852
0.000001	4	19	2156	2272202	85.1852
0.000001	4	20	2155	2344421	85.1852
0.000001	5	2	2695	3101642	93.4607
0.000001	5	3	2694	3227755	93.4607
0.000001	5	4	2156	3022417	93.4607
0.000001	5	5	2156	2979301	93.4607
0.000001	5	6	2156	3064454	93.4607
0.000001	5	7	2156	2611739	93.4607
0.000001	5	8	4311	3078467	93.4607
0.000001	5	9	2156	3075233	93.4607
0.000001	5	10	2156	2694198	93.4607
0.000001	5	11	2155	2996008	93.4607
0.000001	5	12	2156	3260092	93.4607
0.000001	5	13	2695	3103258	93.4607
0.000001	5	14	2155	2724379	93.4607
0.000001	5	15	2694	2971756	93.4607
0.000001	5	16	2156	2594493	93.4607
0.000001	5	17	2156	3084396	93.4607
0.000001	5	18	2156	3017027	93.4607
0.000001	5	19	2156	2734618	93.4607
0.000001	5	20	2156	2775040	93.4607
0.000001	6	2	2695	5387317	97.2223
0.000001	6	3	2156	4949692	97.0487
0.000001	6	4	2695	4672673	97.1644
0.000001	6	5	2156	4696925	97.2801
0.000001	6	6	2156	4219419	97.338
0.000001	6	7	2695	4513684	97.2223
0.000001	6	8	2156	4827890	97.2801
0.000001	6	9	2156	4637103	97.1644
0.000001	6	10	2156	3960724	97.1065
0.000001	6	11	2156	4530391	97.338
0.000001	6	12	2156	3502079	97.2801

0.000001	6	13	2156	4968555	97.2801
0.000001	6	14	2695	4506677	97.2801
0.000001	6	15	2155	4432841	97.2223
0.000001	6	16	2695	4904960	97.338
0.000001	6	17	2694	4568656	97.2801
0.000001	6	18	2156	3633583	97.2223
0.000001	6	19	2156	3552201	97.2801
0.000001	6	20	2156	4752437	97.2223
0.00001	2	2	2156	5871236	76.5047
0.00001	2	3	2695	4668900	76.5047
0.00001	2	4	2156	1839966	76.5047
0.00001	2	5	2695	1673432	76.5047
0.00001	2	6	2695	1591512	76.5047
0.00001	2	7	2156	1580733	76.5047
0.00001	2	8	2155	1406653	76.5047
0.00001	2	9	3773	1366770	76.5047
0.00001	2	10	1617	1416353	76.5047
0.00001	2	11	2695	1471865	76.5047
0.00001	2	12	1617	1506897	76.5047
0.00001	2	13	2155	1423360	76.5047
0.00001	2	14	1617	1772059	76.5047
0.00001	2	15	2156	1594745	76.5047
0.00001	2	16	1617	1485339	76.5047
0.00001	2	17	3233	1890627	76.5047
0.00001	2	18	1078	2272202	76.5047
0.00001	2	19	2155	1779604	76.5047
0.00001	2	20	2156	1435217	76.5047
0.00001	3	2	1617	1829726	81.1343
0.00001	3	3	2695	1980631	81.1343
0.00001	3	4	2155	1932665	81.1343
0.00001	3	5	1617	1902484	81.1343
0.00001	3	6	2156	2044227	81.1343
0.00001	3	7	2156	2138004	81.1343
0.00001	3	8	2155	1888471	81.1343
0.00001	3	9	2156	2171958	81.1343
0.00001	3	10	2155	2100277	81.1343
0.00001	3	11	2695	1880926	81.1343
0.00001	3	12	1617	1818947	81.1343
0.00001	3	13	2155	1884699	81.1343
0.00001	3	14	1617	1723014	81.1343
0.00001	3	15	2695	2247411	81.1343
0.00001	3	16	2156	1997338	81.1343
0.00001	3	17	2156	4718484	81.1343
0.00001	3	18	2156	1830265	81.1343
0.00001	3	19	2156	1973086	81.1343
0.00001	3	20	2156	2031831	81.1343
0.00001	4	2	2156	2347655	85.1852

0.00001	4	3	2156	2358972	85.1852
0.00001	4	4	2156	2525507	85.1852
0.00001	4	5	2156	2416640	85.1852
0.00001	4	6	4312	2521195	85.1852
0.00001	4	7	2694	2805221	85.1852
0.00001	4	8	2156	2395081	85.1852
0.00001	4	9	2156	2375680	85.1852
0.00001	4	10	2155	2350350	85.1852
0.00001	4	11	2156	2454366	85.1852
0.00001	4	12	2156	2598265	85.1852
0.00001	4	13	2155	2312623	85.1852
0.00001	4	14	1617	2346577	85.1852
0.00001	4	15	2156	2405861	85.1852
0.00001	4	16	2156	2389154	85.1852
0.00001	4	17	2694	2417178	85.1852
0.00001	4	18	2156	2145010	85.1852
0.00001	4	19	2694	2589103	85.1852
0.00001	4	20	2156	2644614	85.1852
0.00001	5	2	2156	3013793	93.4607
0.00001	5	3	2156	4229120	93.4607
0.00001	5	4	2156	3181406	93.4607
0.00001	5	5	2156	3144757	93.4607
0.00001	5	6	2156	3206737	93.4607
0.00001	5	7	2695	3124816	93.4607
0.00001	5	8	7006	3057448	93.4607
0.00001	5	9	2156	2395621	93.4607
0.00001	5	10	1617	2769111	93.4607
0.00001	5	11	2156	2950737	93.4607
0.00001	5	12	2695	2845642	93.4607
0.00001	5	13	2695	3170627	93.4607
0.00001	5	14	2156	2915166	93.4607
0.00001	5	15	2156	2851031	93.4607
0.00001	5	16	2156	2996547	93.4607
0.00001	5	17	2156	3194341	93.4607
0.00001	5	18	1617	2488320	93.4607
0.00001	5	19	2694	3098408	93.4607
0.00001	5	20	2156	3311292	93.4607
0.00001	6	2	1617	4824117	97.1065
0.00001	6	3	5390	5420193	97.338
0.00001	6	4	2156	4697464	97.1644
0.00001	6	5	2156	3711730	97.2801
0.00001	6	6	2156	4891486	97.2801
0.00001	6	7	3234	5484867	97.2223
0.00001	6	8	1617	4874778	97.338
0.00001	6	9	2156	5146947	97.2223
0.00001	6	10	2155	4886096	97.2223
0.00001	6	11	1617	3946172	97.2223

0.00001	6	12	2156	4126719	97.2223
0.00001	6	13	2156	4570273	97.2801
0.00001	6	14	2694	5024606	97.2223
0.00001	6	15	2155	4070130	97.2223
0.00001	6	16	2156	4302955	97.2801
0.00001	6	17	2156	4067974	97.2801
0.00001	6	18	1617	3956951	97.2801
0.00001	6	19	2155	4647342	97.2801
0.00001	6	20	1617	5090896	97.338
0.0001	2	2	2156	4209680	76.5047
0.0001	2	3	2156	3416387	76.5047
0.0001	2	4	2156	2309389	76.5047
0.0001	2	5	10779	1730021	76.5047
0.0001	2	6	2695	1643250	76.5047
0.0001	2	7	2156	1457313	76.5047
0.0001	2	8	1617	1421743	76.5047
0.0001	2	9	2156	1387250	76.5047
0.0001	2	10	2156	1256286	76.5047
0.0001	2	11	2695	1189457	76.5047
0.0001	2	12	2155	1638400	76.5047
0.0001	2	13	2695	1531688	76.5047
0.0001	2	14	2156	1524681	76.5047
0.0001	2	15	2156	1538695	76.5047
0.0001	2	16	2156	1525759	76.5047
0.0001	2	17	2156	1478333	76.5047
0.0001	2	18	1616	1780682	76.5047
0.0001	2	19	2156	1453002	76.5047
0.0001	2	20	2156	1590972	76.5047
0.0001	3	2	2694	2044766	81.1343
0.0001	3	3	2155	1967158	81.1343
0.0001	3	4	2156	2046383	81.1343
0.0001	3	5	2156	2080875	81.1343
0.0001	3	6	2155	2035604	81.1343
0.0001	3	7	2156	1886316	81.1343
0.0001	3	8	1617	1608758	81.1343
0.0001	3	9	1617	1986021	81.1343
0.0001	3	10	1617	1717086	81.1343
0.0001	3	11	2695	2028059	81.1343
0.0001	3	12	2694	1921347	81.1343
0.0001	3	13	2156	1844278	81.1343
0.0001	3	14	2156	1730560	81.1343
0.0001	3	15	2156	1829726	81.1343
0.0001	3	16	2156	1973625	81.1343
0.0001	3	17	2156	1715469	81.1343
0.0001	3	18	2155	1855596	81.1343
0.0001	3	19	2156	1867452	81.1343
0.0001	3	20	2155	1835116	81.1343

0.0001	4	2	1616	2383224	85.1852
0.0001	4	3	2156	2168185	85.1852
0.0001	4	4	2156	2616050	85.1852
0.0001	4	5	2156	2401010	85.1852
0.0001	4	6	2156	2495865	85.1852
0.0001	4	7	5389	2419334	85.1852
0.0001	4	8	2156	1990871	85.1852
0.0001	4	9	1617	1874459	85.1852
0.0001	4	10	1617	2245793	85.1852
0.0001	4	11	2156	2266812	85.1852
0.0001	4	12	2156	2401011	85.1852
0.0001	4	13	2155	2406399	85.1852
0.0001	4	14	2156	2430652	85.1852
0.0001	4	15	2156	2334181	85.1852
0.0001	4	16	2156	2456522	85.1852
0.0001	4	17	2156	2140160	85.1852
0.0001	4	18	2156	2328252	85.1852
0.0001	4	19	2156	2330947	85.1852
0.0001	4	20	2156	2377836	85.1852
0.0001	5	2	1617	2883907	93.4607
0.0001	5	3	2155	3237456	93.4607
0.0001	5	4	1617	2881752	93.4607
0.0001	5	5	2156	3234761	93.4607
0.0001	5	6	2156	2833785	93.4607
0.0001	5	7	2156	2920016	93.4607
0.0001	5	8	3772	2676413	93.4607
0.0001	5	9	2156	2549220	93.4607
0.0001	5	10	2156	3073077	93.4607
0.0001	5	11	2155	3109187	93.4607
0.0001	5	12	2156	3037507	93.4607
0.0001	5	13	2155	3016488	93.4607
0.0001	5	14	2156	2785280	93.4607
0.0001	5	15	2156	3109726	93.4607
0.0001	5	16	2156	3283806	93.4607
0.0001	5	17	2156	3267638	93.4607
0.0001	5	18	2156	2592337	93.4607
0.0001	5	19	1617	3061760	93.4607
0.0001	5	20	2695	3247157	93.4607
0.0001	6	2	2156	4956159	97.2801
0.0001	6	3	2156	4991730	97.2801
0.0001	6	4	2156	4586441	97.2801
0.0001	6	5	2156	4540631	97.338
0.0001	6	6	2156	4216185	97.2801
0.0001	6	7	2156	4946997	97.2801
0.0001	6	8	2156	4603687	97.2801
0.0001	6	9	2155	3965035	97.2801
0.0001	6	10	2156	4968555	97.2801

0.0001	6	11	2156	4542248	97.2801
0.0001	6	12	2156	4914660	97.2801
0.0001	6	13	2156	4491048	97.2801
0.0001	6	14	1617	3345246	97.2223
0.0001	6	15	2156	4337448	97.2801
0.0001	6	16	2156	4945919	97.2223
0.0001	6	17	2156	3686938	97.338
0.0001	6	18	2156	4029170	97.2801
0.0001	6	19	2155	3913835	97.2801
0.0001	6	20	2156	4028631	97.2223
0.001	2	2	2156	4367204	76.5047
0.001	2	3	2156	2596109	76.5047
0.001	2	4	3234	3140446	76.5047
0.001	2	5	2156	1437373	76.5047
0.001	2	6	2155	1675048	76.5047
0.001	2	7	2695	1571031	76.5047
0.001	2	8	2155	1559713	76.5047
0.001	2	9	2156	1595284	76.5047
0.001	2	10	2156	1604985	76.5047
0.001	2	11	1617	1631394	76.5047
0.001	2	12	2156	1476176	76.5047
0.001	2	13	2156	1443840	76.5047
0.001	2	14	2156	1482644	76.5047
0.001	2	15	2155	1366770	76.5047
0.001	2	16	2156	1486417	76.5047
0.001	2	17	1617	1620075	76.5047
0.001	2	18	1617	1573187	76.5047
0.001	2	19	1617	1490189	76.5047
0.001	2	20	2155	1367848	76.5047
0.001	3	2	2156	1855057	81.1343
0.001	3	3	2156	1931587	81.1343
0.001	3	4	1617	1923503	81.1343
0.001	3	5	2695	1909490	81.1343
0.001	3	6	2156	1991949	81.1343
0.001	3	7	2156	1741878	81.1343
0.001	3	8	2156	2468918	81.1343
0.001	3	9	1617	1706307	81.1343
0.001	3	10	1616	1546778	81.1343
0.001	3	11	2156	2159561	81.1343
0.001	3	12	2695	1888471	81.1343
0.001	3	13	1616	2128842	81.1343
0.001	3	14	2156	1933204	81.1343
0.001	3	15	2156	2120758	81.1343
0.001	3	16	4311	1989255	81.1343
0.001	3	17	2156	1865835	81.1343
0.001	3	18	2155	1968235	81.1343
0.001	3	19	2156	1718164	81.1343

0.001	3	20	2155	1835654	81.1343
0.001	4	2	1617	2570779	85.1852
0.001	4	3	2156	2477541	85.1852
0.001	4	4	2155	2450593	85.1852
0.001	4	5	2155	2727612	85.1852
0.001	4	6	2156	2210223	85.1852
0.001	4	7	2156	2360050	85.1852
0.001	4	8	2155	2356278	85.1852
0.001	4	9	2156	2321785	85.1852
0.001	4	10	2695	2320707	85.1852
0.001	4	11	2155	2160639	85.1852
0.001	4	12	2156	2287831	85.1852
0.001	4	13	1617	2288909	85.1852
0.001	4	14	1617	2288370	85.1852
0.001	4	15	1617	2321785	85.1852
0.001	4	16	2155	28913983	85.1852
0.001	4	17	2155	2375680	85.1852
0.001	4	18	2155	2122913	85.1852
0.001	4	19	2156	2489936	85.1852
0.001	4	20	2156	2435502	85.1852
0.001	5	2	1617	2850492	93.4607
0.001	5	3	2694	3033196	93.4607
0.001	5	4	2156	2839713	93.4607
0.001	5	5	1617	3139368	93.4607
0.001	5	6	2156	3024572	93.4607
0.001	5	7	2156	2823545	93.4607
0.001	5	8	3772	2670484	93.4607
0.001	5	9	2695	3063376	93.4607
0.001	5	10	2155	3234762	93.4607
0.001	5	11	2156	2861271	93.4607
0.001	5	12	2156	3270332	93.4607
0.001	5	13	2156	3137212	93.4607
0.001	5	14	2156	3373811	93.4607
0.001	5	15	2156	3027806	93.4607
0.001	5	16	2156	2906003	93.4607
0.001	5	17	2156	2857498	93.4607
0.001	5	18	2155	3041819	93.4607
0.001	5	19	2156	3173322	93.4607
0.001	5	20	2155	2558383	93.4607
0.001	6	2	2695	4977178	97.2801
0.001	6	3	2155	4923822	97.0487
0.001	6	4	2155	4096538	97.0487
0.001	6	5	2156	4990652	97.2801
0.001	6	6	4312	4818189	97.338
0.001	6	7	2695	4480269	97.338
0.001	6	8	2156	4942686	97.2223
0.001	6	9	2156	3890661	97.1065

0.001	6	10	2156	4809565	97.338
0.001	6	11	2156	4012462	97.338
0.001	6	12	2155	4612311	97.2223
0.001	6	13	2156	3990365	97.2801
0.001	6	14	2156	4982029	97.2801
0.001	6	15	2155	4598299	97.2801
0.001	6	16	2156	3728437	97.2801
0.001	6	17	2155	4870467	97.2223
0.001	6	18	2695	4342837	97.1065
0.001	6	19	2156	4099772	97.2801
0.001	6	20	2156	3930542	97.338
0.01	2	2	2155	4841545	76.5047
0.01	2	3	2156	3523638	76.5047
0.01	2	4	3234	2080876	76.5047
0.01	2	5	2156	1696067	76.5047
0.01	2	6	1617	1410964	76.5047
0.01	2	7	2156	1458930	76.5047
0.01	2	8	1617	1483722	76.5047
0.01	2	9	2156	1486956	76.5047
0.01	2	10	1617	1585044	76.5047
0.01	2	11	2156	1203469	76.5047
0.01	2	12	2156	1599056	76.5047
0.01	2	13	1617	1574265	76.5047
0.01	2	14	1078	1214787	76.5047
0.01	2	15	1617	1109154	76.5047
0.01	2	16	1616	1101069	76.5047
0.01	2	17	2155	1436834	76.5047
0.01	2	18	1616	1437911	76.5047
0.01	2	19	2694	1522526	76.5047
0.01	2	20	2156	1392100	76.5047
0.01	3	2	2156	1924581	81.1343
0.01	3	3	4850	2112673	81.1343
0.01	3	4	2156	1974703	81.1343
0.01	3	5	2156	1914341	81.1343
0.01	3	6	2156	1880387	81.1343
0.01	3	7	2156	2095966	81.1343
0.01	3	8	2155	1970931	81.1343
0.01	3	9	1617	1979553	81.1343
0.01	3	10	1616	1879309	81.1343
0.01	3	11	2156	1639477	81.1343
0.01	3	12	1616	1659419	81.1343
0.01	3	13	2156	1900867	81.1343
0.01	3	14	1617	1870686	81.1343
0.01	3	15	1617	1846972	81.1343
0.01	3	16	2156	1955301	81.1343
0.01	3	17	2156	1922425	81.1343
0.01	3	18	2155	1874998	81.1343

0.01	3	19	2155	1836733	81.1343
0.01	3	20	2156	1861524	81.1343
0.01	4	2	2155	2210762	85.1852
0.01	4	3	2155	1957996	85.1852
0.01	4	4	1616	1986021	85.1852
0.01	4	5	2156	2630601	85.1852
0.01	4	6	1617	2201600	85.1852
0.01	4	7	2156	2458138	85.1852
0.01	4	8	2155	2146088	85.1852
0.01	4	9	2156	2385920	85.1852
0.01	4	10	2156	2394004	85.1852
0.01	4	11	2155	2288370	85.1852
0.01	4	12	1617	2276514	85.1852
0.01	4	13	2156	2493171	85.1852
0.01	4	14	2155	2353583	85.1852
0.01	4	15	2156	2405322	85.1852
0.01	4	16	2156	2390770	85.1852
0.01	4	17	2156	2126686	85.1852
0.01	4	18	2155	2384842	85.1852
0.01	4	19	2156	2139082	85.1852
0.01	4	20	2156	2357894	85.1852
0.01	5	2	2156	3121583	93.4607
0.01	5	3	2156	3139368	93.4607
0.01	5	4	2155	2831629	93.4607
0.01	5	5	2156	3094635	93.4607
0.01	5	6	2695	3208353	93.4607
0.01	5	7	2156	3052598	93.4607
0.01	5	8	3772	2586408	93.4607
0.01	5	9	2156	2954509	93.4607
0.01	5	10	2156	3120505	93.4607
0.01	5	11	2155	3005170	93.4607
0.01	5	12	4850	3109187	93.4607
0.01	5	13	2156	2937263	93.4607
0.01	5	14	2156	2600421	93.4607
0.01	5	15	2156	3046669	93.4607
0.01	5	16	1617	3115654	93.4607
0.01	5	17	1617	3078467	93.4607
0.01	5	18	1617	3102720	93.4607
0.01	5	19	2156	3292968	93.4607
0.01	5	20	2156	2924328	93.4607
0.01	6	2	2156	4722256	97.2801
0.01	6	3	2156	5110298	97.2801
0.01	6	4	2156	4659738	97.2801
0.01	6	5	2156	3983898	97.2801
0.01	6	6	2156	3898745	97.2801
0.01	6	7	2156	4989574	97.2801
0.01	6	8	2156	4482424	97.2801

0.01	6	9	2695	3996294	97.2801
0.01	6	10	2156	4450087	97.2801
0.01	6	11	2156	4872084	97.2801
0.01	6	12	2156	4579435	97.2801
0.01	6	13	2695	3897128	97.338
0.01	6	14	1617	3437406	97.2801
0.01	6	15	2156	3447646	97.2801
0.01	6	16	2156	3777482	97.2801
0.01	6	17	2155	4847292	97.2801
0.01	6	18	2695	3899284	97.2801
0.01	6	19	1617	4592909	97.2223
0.01	6	20	2156	3941860	97.2223
0.1	2	2	2156	4958270	76.5047
0.1	2	3	2156	3121044	76.5047
0.1	2	4	2694	2964749	76.5047
0.1	2	5	1617	1512825	76.5047
0.1	2	6	2156	1657262	76.5047
0.1	2	7	2156	1395874	76.5047
0.1	2	8	2156	1735950	76.5047
0.1	2	9	2156	1586661	76.5047
0.1	2	10	2695	1581271	76.5047
0.1	2	11	2156	1359225	76.5047
0.1	2	12	1616	1164126	76.5047
0.1	2	13	2156	1332278	76.5047
0.1	2	14	2695	1458392	76.5047
0.1	2	15	2156	1355453	76.5047
0.1	2	16	2156	1492345	76.5047
0.1	2	17	1616	1421204	76.5047
0.1	2	18	1617	1351680	76.5047
0.1	2	19	4312	2578324	76.5047
0.1	2	20	2156	1382938	76.5047
0.1	3	2	2694	1677743	81.1343
0.1	3	3	2155	1863679	81.1343
0.1	3	4	1617	1741878	81.1343
0.1	3	5	2156	1870686	81.1343
0.1	3	6	2156	1725170	81.1343
0.1	3	7	2694	2097583	81.1343
0.1	3	8	2156	1896017	81.1343
0.1	3	9	2156	1734333	81.1343
0.1	3	10	2156	1941288	81.1343
0.1	3	11	2156	2491014	81.1343
0.1	3	12	2155	2099200	81.1343
0.1	3	13	1616	1707385	81.1343
0.1	3	14	2156	1883621	81.1343
0.1	3	15	1617	1900328	81.1343
0.1	3	16	1617	1892783	81.1343
0.1	3	17	1617	1786610	81.1343

0.1	3	18	2156	1876614	81.1343
0.1	3	19	1617	1950989	81.1343
0.1	3	20	1617	2355200	81.1343
0.1	4	2	2156	2604193	85.1852
0.1	4	3	1617	2439815	85.1852
0.1	4	4	2156	2507183	85.1852
0.1	4	5	2156	2422029	85.1852
0.1	4	6	2155	2504489	85.1852
0.1	4	7	2156	2536825	85.1852
0.1	4	8	2156	2391309	85.1852
0.1	4	9	2156	2296993	85.1852
0.1	4	10	2155	2314778	85.1852
0.1	4	11	2156	2605810	85.1852
0.1	4	12	1617	2102433	85.1852
0.1	4	13	2694	2205912	85.1852
0.1	4	14	2156	2411251	85.1852
0.1	4	15	1617	2456522	85.1852
0.1	4	16	2156	2743781	85.1852
0.1	4	17	2695	2379991	85.1852
0.1	4	18	2156	2341187	85.1852
0.1	4	19	2155	2084648	85.1852
0.1	4	20	2156	2178964	85.1852
0.1	5	2	2156	2647848	93.4607
0.1	5	3	2156	3939704	93.4607
0.1	5	4	1617	2799292	93.4607
0.1	5	5	2155	2986307	93.4607
0.1	5	6	5390	2969599	93.4607
0.1	5	7	2155	2864505	93.4607
0.1	5	8	3773	2623057	93.4607
0.1	5	9	2156	3067149	93.4607
0.1	5	10	2155	3866408	93.4607
0.1	5	11	2156	3048825	93.4607
0.1	5	12	2156	2767494	93.4607
0.1	5	13	1617	2679107	93.4607
0.1	5	14	2156	2625751	93.4607
0.1	5	15	2156	2883907	93.4607
0.1	5	16	2156	3025650	93.4607
0.1	5	17	1617	2752404	93.4607
0.1	5	18	2156	3021339	93.4607
0.1	5	19	2695	3130745	93.4607
0.1	5	20	2695	2605271	93.4607
0.1	6	2	2156	4408050	97.2223
0.1	6	3	2156	4989574	97.2801
0.1	6	4	2694	4973405	97.1644
0.1	6	5	2156	3645978	97.2801
0.1	6	6	2156	4879090	97.2801
0.1	6	7	2156	5093052	97.1644

0.1	6	8	2156	4648960	97.2801
0.1	6	9	2155	3628732	97.2801
0.1	6	10	2155	3900362	97.2801
0.1	6	11	2156	4903882	97.2801
0.1	6	12	4312	4439309	97.2801
0.1	6	13	2695	4535241	97.2801
0.1	6	14	1617	5381928	97.0487
0.1	6	15	2695	4380564	97.2223
0.1	6	16	2155	4037793	97.2223
0.1	6	17	2155	4375713	97.2223
0.1	6	18	2156	3980126	97.338
0.1	6	19	2156	4824656	97.2801
0.1	6	20	2156	4724951	97.2801

Table A.7: Results of 5-fold Cross Validation on Car data set

The table below shows the results of analysis of 10-fold cross validations on Car data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	2695	4075519	76.5625
0	2	3	2156	2272201	76.5625
0	2	4	2155	1818409	76.5625
0	2	5	2156	1901406	76.5625
0	2	6	5390	1723553	76.5625
0	2	7	2156	1547857	76.5625
0	2	8	1616	1744572	76.5625
0	2	9	2156	1378627	76.5625
0	2	10	1617	1378088	76.5625
0	2	11	3234	1463242	76.5625
0	2	12	2156	1512286	76.5625
0	2	13	2155	1310720	76.5625
0	2	14	1617	1246046	76.5625
0	2	15	3772	1514981	76.5625
0	2	16	2155	1558636	76.5625
0	2	17	2155	1656724	76.5625
0	2	18	2155	1635166	76.5625
0	2	19	2156	1726248	76.5625
0	2	20	2156	1768286	76.5625
0	3	2	1616	2043149	81.0186
0	3	3	2156	1857212	81.0186
0	3	4	1617	1901406	81.0186
0	3	5	2156	1935899	81.0186
0	3	6	1617	1834038	81.0186
0	3	7	2156	2001650	81.0186
0	3	8	2156	1838350	81.0186
0	3	9	2156	1858290	81.0186

0	3	10	1617	2039916	81.0186
0	3	11	1617	2036143	81.0186
0	3	12	2156	2012430	81.0186
0	3	13	4851	1834037	81.0186
0	3	14	2156	1916496	81.0186
0	3	15	4312	2100278	81.0186
0	3	16	2156	1774753	81.0186
0	3	17	1617	2154711	81.0186
0	3	18	2156	1854518	81.0186
0	3	19	2156	2042610	81.0186
0	3	20	4312	1938054	81.0186
0	4	2	2156	2520117	85.0116
0	4	3	2156	2615512	85.0116
0	4	4	2156	2535208	85.0116
0	4	5	2694	2341187	85.0116
0	4	6	2695	2492092	85.0116
0	4	7	2155	2431730	85.0116
0	4	8	1617	2251722	85.0116
0	4	9	1617	2436580	85.0116
0	4	10	1617	2408016	85.0116
0	4	11	2156	2286753	85.0116
0	4	12	1617	2301305	85.0116
0	4	13	1617	2052311	85.0116
0	4	14	2155	2333641	85.0116
0	4	15	2156	2409095	85.0116
0	4	16	1617	2362206	85.0116
0	4	17	2156	2489398	85.0116
0	4	18	2156	2433886	85.0116
0	4	19	2156	2322324	85.0116
0	4	20	2695	2354660	85.0116
0	5	2	2156	3940783	94.213
0	5	3	2694	3228833	94.213
0	5	4	1617	3082778	94.213
0	5	5	2155	3090863	94.213
0	5	6	1077	3142602	94.213
0	5	7	2156	3108109	94.213
0	5	8	2156	2608505	94.213
0	5	9	2156	2588025	94.213
0	5	10	2155	2568622	94.213
0	5	11	2694	3553280	94.213
0	5	12	2155	3043436	94.213
0	5	13	2156	3305364	94.213
0	5	14	2156	3028345	94.213
0	5	15	2156	2714678	94.213
0	5	16	2156	3079545	94.213
0	5	17	2156	3046130	94.213
0	5	18	2156	2590181	94.213

0	5	19	2156	3146374	94.213
0	5	20	2156	3056370	94.213
0	6	2	2694	5355519	97.6274
0	6	3	2156	4947536	97.6274
0	6	4	2156	4694231	97.6852
0	6	5	2695	5668648	97.6274
0	6	6	2155	4719562	97.6274
0	6	7	2695	3980126	97.6274
0	6	8	2695	5138862	97.6274
0	6	9	2695	4999814	97.6274
0	6	10	2155	4911966	97.6274
0	6	11	2156	4892563	97.6274
0	6	12	2155	4508833	97.6274
0	6	13	2156	4545481	97.5695
0	6	14	2155	3958568	97.6274
0	6	15	2695	4895259	97.6274
0	6	16	2156	4883402	97.6274
0	6	17	2155	4938913	97.6274
0	6	18	3234	5426660	97.6274
0	6	19	2695	4859688	97.6274
0	6	20	2156	4971250	97.6852
0.000001	2	2	2694	4261456	76.5625
0.000001	2	3	2695	2091654	76.5625
0.000001	2	4	2694	2590181	76.5625
0.000001	2	5	2156	1765052	76.5625
0.000001	2	6	2156	1836733	76.5625
0.000001	2	7	2156	1474021	76.5625
0.000001	2	8	2156	1460547	76.5625
0.000001	2	9	2156	1416353	76.5625
0.000001	2	10	2695	1687444	76.5625
0.000001	2	11	2156	1670737	76.5625
0.000001	2	12	2156	1727326	76.5625
0.000001	2	13	2156	1641094	76.5625
0.000001	2	14	2156	1516598	76.5625
0.000001	2	15	2694	1537617	76.5625
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0.01	3	9	1078	1784454	81.0186
0.01	3	10	2156	1802778	81.0186
0.01	3	11	1617	1640016	81.0186
0.01	3	12	1617	1557558	81.0186
0.01	3	13	2695	1920269	81.0186
0.01	3	14	2156	1921347	81.0186
0.01	3	15	2156	1692295	81.0186
0.01	3	16	1617	1854517	81.0186
0.01	3	17	2695	2114290	81.0186
0.01	3	18	2156	2055006	81.0186
0.01	3	19	1617	1934282	81.0186
0.01	3	20	1617	1707385	81.0186
0.01	4	2	2156	2088960	85.0116
0.01	4	3	4312	2002728	85.0116
0.01	4	4	1617	2121296	85.0116
0.01	4	5	2156	2389692	85.0116
0.01	4	6	2695	2541676	85.0116
0.01	4	7	2156	2435502	85.0116
0.01	4	8	2156	2420952	85.0116
0.01	4	9	2155	2356277	85.0116
0.01	4	10	2156	2294298	85.0116
0.01	4	11	2156	2336875	85.0116
0.01	4	12	2155	2349810	85.0116
0.01	4	13	2156	2404244	85.0116
0.01	4	14	2156	2286754	85.0116
0.01	4	15	2155	2188665	85.0116
0.01	4	16	1617	2481313	85.0116
0.01	4	17	2155	2105667	85.0116
0.01	4	18	2156	2302921	85.0116
0.01	4	19	2156	2103512	85.0116
0.01	4	20	2155	2269507	85.0116
0.01	5	2	2156	3918686	94.213
0.01	5	3	2156	3074155	94.213
0.01	5	4	2156	3079006	94.213
0.01	5	5	2156	3165776	94.213
0.01	5	6	2155	3071999	94.213
0.01	5	7	2694	2752404	94.213
0.01	5	8	2156	2550299	94.213
0.01	5	9	2156	2840792	94.213
0.01	5	10	2156	3066610	94.213
0.01	5	11	2156	3003553	94.213
0.01	5	12	2156	3005709	94.213
0.01	5	13	2156	2775578	94.213

0.01	5	14	2155	2553533	94.213
0.01	5	15	2156	2980918	94.213
0.01	5	16	1617	3064454	94.213
0.01	5	17	2156	3056909	94.213
0.01	5	18	2155	3344707	94.213
0.01	5	19	2156	3255242	94.213
0.01	5	20	2156	2470534	94.213
0.01	6	2	2155	4800942	97.6274
0.01	6	3	2156	4034021	97.6274
0.01	6	4	2156	4319662	97.6274
0.01	6	5	2695	5392706	97.6274
0.01	6	6	2156	4659199	97.6274
0.01	6	7	2156	4704471	97.5695
0.01	6	8	2695	4836513	97.6274
0.01	6	9	2156	5028917	97.6274
0.01	6	10	4311	4383797	97.6274
0.01	6	11	2156	3935932	97.6274
0.01	6	12	1617	4410744	97.6274
0.01	6	13	2156	3732749	97.6274
0.01	6	14	1617	4304572	97.6274
0.01	6	15	1617	3856168	97.6274
0.01	6	16	2156	4944303	97.6274
0.01	6	17	2694	4006534	97.6274
0.01	6	18	2156	3889583	97.6274
0.01	6	19	1617	3630887	97.6274
0.01	6	20	2155	4811722	97.6274
0.1	2	2	2695	3934315	76.5625
0.1	2	3	1617	2941036	76.5625
0.1	2	4	2694	2025903	76.5625
0.1	2	5	1616	1531688	76.5625
0.1	2	6	2695	1668042	76.5625
0.1	2	7	1617	1318265	76.5625
0.1	2	8	2155	1687983	76.5625
0.1	2	9	1617	1424977	76.5625
0.1	2	10	2156	1509591	76.5625
0.1	2	11	1617	1300480	76.5625
0.1	2	12	1617	1075738	76.5625
0.1	2	13	1617	1270838	76.5625
0.1	2	14	2156	1364615	76.5625
0.1	2	15	2156	1537616	76.5625
0.1	2	16	1616	1337128	76.5625
0.1	2	17	1617	1613069	76.5625
0.1	2	18	2156	1284851	76.5625
0.1	2	19	2156	1359225	76.5625
0.1	2	20	2155	1348985	76.5625
0.1	3	2	2155	1802239	81.0186
0.1	3	3	1617	2307234	81.0186

0.1	3	4	1617	1699301	81.0186
0.1	3	5	2156	2017280	81.0186
0.1	3	6	2155	1608218	81.0186
0.1	3	7	6467	2217229	81.0186
0.1	3	8	2155	1908951	81.0186
0.1	3	9	1617	1911646	81.0186
0.1	3	10	2156	1906795	81.0186
0.1	3	11	2155	1996800	81.0186
0.1	3	12	1617	1956379	81.0186
0.1	3	13	2156	1945061	81.0186
0.1	3	14	2156	2002189	81.0186
0.1	3	15	2156	1802778	81.0186
0.1	3	16	2156	1894939	81.0186
0.1	3	17	4311	2208606	81.0186
0.1	3	18	2155	2126686	81.0186
0.1	3	19	2156	1946139	81.0186
0.1	3	20	2695	1853979	81.0186
0.1	4	2	2156	2413406	85.0116
0.1	4	3	2156	2758872	85.0116
0.1	4	4	2156	2394543	85.0116
0.1	4	5	2156	2161718	85.0116
0.1	4	6	2156	2832168	85.0116
0.1	4	7	2156	2412867	85.0116
0.1	4	8	2156	2187049	85.0116
0.1	4	9	2156	2412329	85.0116
0.1	4	10	2155	2685036	85.0116
0.1	4	11	1617	2557844	85.0116
0.1	4	12	2156	2086265	85.0116
0.1	4	13	2156	2084109	85.0116
0.1	4	14	2155	2437120	85.0116
0.1	4	15	2156	2277591	85.0116
0.1	4	16	2156	2362745	85.0116
0.1	4	17	2156	2339570	85.0116
0.1	4	18	2155	2243638	85.0116
0.1	4	19	2155	2357895	85.0116
0.1	4	20	2155	2047460	85.0116
0.1	5	2	2156	2925406	94.213
0.1	5	3	2155	3104336	94.213
0.1	5	4	2156	2758332	94.213
0.1	5	5	2156	3013793	94.213
0.1	5	6	2156	2799292	94.213
0.1	5	7	1616	2600421	94.213
0.1	5	8	2156	2422568	94.213
0.1	5	9	1617	3063916	94.213
0.1	5	10	2156	3070383	94.213
0.1	5	11	2156	3138290	94.213
0.1	5	12	2695	2683958	94.213

0.1	5	13	1617	2213457	94.213
0.1	5	14	2155	2973911	94.213
0.1	5	15	2156	2969599	94.213
0.1	5	16	1617	2827318	94.213
0.1	5	17	2156	2633836	94.213
0.1	5	18	2156	3313448	94.213
0.1	5	19	2156	2623057	94.213
0.1	5	20	2156	2958820	94.213
0.1	6	2	2695	5322644	97.4538
0.1	6	3	2156	4959393	97.6274
0.1	6	4	2695	5032690	97.6274
0.1	6	5	2156	8018458	97.6274
0.1	6	6	2156	4888791	97.6274
0.1	6	7	2156	3723048	97.6852
0.1	6	8	2695	5457380	97.6852
0.1	6	9	2156	4647882	97.6274
0.1	6	10	2694	4706627	97.6274
0.1	6	11	2156	5535527	97.6274
0.1	6	12	2155	4843519	97.6274
0.1	6	13	2156	4609617	97.6274
0.1	6	14	2695	4900109	97.6274
0.1	6	15	2156	4938913	97.6274
0.1	6	16	3234	4463561	97.6274
0.1	6	17	2156	4066358	97.6274
0.1	6	18	2695	5435284	97.6274
0.1	6	19	1617	4531469	97.6274
0.1	6	20	2156	4074981	97.6274

Table A.8: Results of 10-fold Cross Validation on Car data set

A.5 Haberman data set

The Haberman data set is a data set containing 3 attributes. The table below shows the results of analysis of 5-fold cross validations on Haberman data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	1617	1278922	73.2027
0	2	3	2694	1343056	74.1831
0	2	4	1617	1054719	72.8759
0	2	5	2156	995436	75.4902
0	2	6	2155	1044480	71.5687
0	2	7	2156	1143107	71.8955
0	2	8	2155	1095680	70.2615
0	2	9	2156	3209970	71.5687
0	2	10	2156	709255	71.8955
0	2	11	1617	589608	71.5687
0	2	12	2156	556732	72.5491
0	2	13	2156	628952	71.2419
0	2	14	1617	1083284	73.8563
0	2	15	1077	512539	74.8367
0	2	16	1617	561044	72.8759
0	2	17	1617	496370	74.5099
0	2	18	1617	575596	73.2027
0	2	19	2155	945852	73.8563
0	2	20	2155	883334	73.5295
0	3	2	2155	596615	66.6667
0	3	3	1617	517928	68.6275
0	3	4	2156	983040	69.6079
0	3	5	2156	714105	68.3007
0	3	6	1617	840218	67.3203
0	3	7	2155	3183562	70.9151
0	3	8	2156	12730474	65.3595
0	3	9	1077	9070483	67.6471
0	3	10	2156	19330423	69.6079
0	3	11	2156	2382147	65.0327
0	3	12	2156	2140699	68.6275
0	3	13	1617	2549760	67.6471
0	3	14	4311	3261170	67.3203
0	3	15	2156	3272488	66.9935
0	3	16	2156	3568909	67.6471
0	3	17	2156	3787182	67.3203
0	3	18	1617	4298643	70.9151
0	3	19	1617	5217010	68.3007
0	3	20	1617	5191679	70.5883
0.000001	2	2	2695	1707923	73.2027
0.000001	2	3	2695	1472943	74.1831
0.000001	2	4	2156	1026695	72.8759

0.000001	2	5	2156	2228547	75.4902
0.000001	2	6	2156	1187301	71.5687
0.000001	2	7	2156	1013760	71.8955
0.000001	2	8	2156	1056337	70.2615
0.000001	2	9	1617	781474	71.2419
0.000001	2	10	1617	813271	71.8955
0.000001	2	11	1616	1187301	71.2419
0.000001	2	12	1617	679074	71.8955
0.000001	2	13	1616	612244	70.5883
0.000001	2	14	1617	794947	74.5099
0.000001	2	15	1617	653743	75.1634
0.000001	2	16	4312	787402	72.8759
0.000001	2	17	2156	797642	74.1831
0.000001	2	18	1617	642965	73.5295
0.000001	2	19	1616	716800	74.8367
0.000001	2	20	1616	649432	73.8563
0.000001	3	2	2156	826745	66.3399
0.000001	3	3	1616	782013	67.6471
0.000001	3	4	1617	936152	69.6079
0.000001	3	5	1617	835368	68.3007
0.000001	3	6	1617	1299941	67.9739
0.000001	3	7	2156	5990399	71.2419
0.000001	3	8	2695	1013221	65.6863
0.000001	3	9	2156	1623848	66.0131
0.000001	3	10	2156	2284597	68.9543
0.000001	3	11	2156	1490189	66.3399
0.000001	3	12	1617	2209145	68.9543
0.000001	3	13	2156	2569162	67.9739
0.000001	3	14	2156	2617128	67.9739
0.000001	3	15	2156	3041819	67.3203
0.000001	3	16	2156	3523637	67.3203
0.000001	3	17	2156	4189237	67.6471
0.000001	3	18	2156	4654888	70.5883
0.000001	3	19	2695	5487022	67.9739
0.000001	3	20	1616	5395940	68.9543
0.00001	2	2	2695	1723014	73.2027
0.00001	2	3	2156	1410964	74.1831
0.00001	2	4	2155	953398	72.8759
0.00001	2	5	2156	1064421	75.4902
0.00001	2	6	2156	2517962	71.5687
0.00001	2	7	2155	1292935	71.8955
0.00001	2	8	2155	1070888	70.2615
0.00001	2	9	1617	844531	71.2419
0.00001	2	10	2156	771234	72.2223
0.00001	2	11	1617	704404	71.5687
0.00001	2	12	2156	750753	72.5491
0.00001	2	13	2156	813272	71.5687

0.00001	2	14	1078	540025	75.1634
0.00001	2	15	1617	680691	74.8367
0.00001	2	16	1617	693087	72.5491
0.00001	2	17	2156	627335	73.8563
0.00001	2	18	4850	725962	73.8563
0.00001	2	19	1617	712488	74.8367
0.00001	2	20	2156	960943	72.8759
0.00001	3	2	2156	499065	66.6667
0.00001	3	3	1617	529246	68.6275
0.00001	3	4	1617	765844	69.6079
0.00001	3	5	2694	886029	67.6471
0.00001	3	6	1617	868783	66.6667
0.00001	3	7	1617	5647090	71.5687
0.00001	3	8	2695	9440740	65.6863
0.00001	3	9	2156	9427266	66.9935
0.00001	3	10	2155	2374063	68.3007
0.00001	3	11	2695	2697970	65.6863
0.00001	3	12	2156	2754560	68.6275
0.00001	3	13	1617	4527696	66.9935
0.00001	3	14	2156	3619031	66.9935
0.00001	3	15	2156	1942905	66.6667
0.00001	3	16	2156	3571065	67.6471
0.00001	3	17	2156	3714425	67.6471
0.00001	3	18	1617	4252833	70.5883
0.00001	3	19	2694	6839241	68.6275
0.00001	3	20	2155	6617195	69.2811
0.0001	2	2	2156	1400185	73.2027
0.0001	2	3	1617	1738105	74.1831
0.0001	2	4	1617	943697	72.8759
0.0001	2	5	1617	955553	75.4902
0.0001	2	6	2695	1076816	71.5687
0.0001	2	7	2156	1064421	71.8955
0.0001	2	8	2156	1016454	70.2615
0.0001	2	9	1617	948009	71.2419
0.0001	2	10	1617	801414	72.5491
0.0001	2	11	1616	693086	70.5883
0.0001	2	12	1617	649431	71.8955
0.0001	2	13	1078	593920	70.9151
0.0001	2	14	1617	506071	75.4902
0.0001	2	15	1617	613322	74.8367
0.0001	2	16	1617	646198	73.2027
0.0001	2	17	1617	839680	74.5099
0.0001	2	18	1617	880101	73.5295
0.0001	2	19	2155	1043402	74.1831
0.0001	2	20	2156	722189	73.2027
0.0001	3	2	1617	787402	66.6667
0.0001	3	3	1617	817583	67.9739

0.0001	3	4	1617	842375	69.6079
0.0001	3	5	1617	755065	67.9739
0.0001	3	6	2156	725962	68.9543
0.0001	3	7	2155	1172749	70.9151
0.0001	3	8	2156	949625	66.9935
0.0001	3	9	2156	16152790	66.9935
0.0001	3	10	2156	14826440	67.9739
0.0001	3	11	2156	2371907	66.3399
0.0001	3	12	2156	3681010	68.6275
0.0001	3	13	2156	2529280	67.3203
0.0001	3	14	2156	3114576	66.9935
0.0001	3	15	1617	3302669	67.6471
0.0001	3	16	2156	3443873	66.6667
0.0001	3	17	2156	3969886	68.3007
0.0001	3	18	2156	2799292	69.9347
0.0001	3	19	2695	5023528	67.9739
0.0001	3	20	2156	5591040	69.6079
0.001	2	2	2156	1499890	73.2027
0.001	2	3	1617	1263832	74.1831
0.001	2	4	1617	1009987	72.8759
0.001	2	5	1617	921061	75.4902
0.001	2	6	2156	1011065	71.5687
0.001	2	7	2156	1110770	71.8955
0.001	2	8	1617	1178677	70.2615
0.001	2	9	3773	711949	71.2419
0.001	2	10	1617	570745	72.2223
0.001	2	11	1617	682307	71.2419
0.001	2	12	1617	659133	71.8955
0.001	2	13	1617	662905	70.5883
0.001	2	14	1617	673684	74.5099
0.001	2	15	1078	625717	74.8367
0.001	2	16	1617	560506	72.8759
0.001	2	17	1078	831056	74.1831
0.001	2	18	1617	836985	74.1831
0.001	2	19	1078	874172	74.5099
0.001	2	20	1078	883335	73.2027
0.001	3	2	2156	647275	66.6667
0.001	3	3	1617	694703	67.6471
0.001	3	4	1617	1018610	69.6079
0.001	3	5	1617	2674256	67.6471
0.001	3	6	1617	994897	67.6471
0.001	3	7	1617	1302096	69.9347
0.001	3	8	2155	5946744	66.3399
0.001	3	9	1616	6248016	67.9739
0.001	3	10	2155	14884647	68.9543
0.001	3	11	1617	2582636	65.3595
0.001	3	12	2156	2160640	68.9543

0.001	3	13	2156	5125388	67.6471
0.001	3	14	2155	4172530	67.3203
0.001	3	15	2156	3045591	67.3203
0.001	3	16	1617	7302197	66.6667
0.001	3	17	1617	4799326	67.3203
0.001	3	18	1617	6764867	70.5883
0.001	3	19	2155	6491620	67.9739
0.001	3	20	3773	5117843	69.6079
0.01	2	2	1617	1726248	73.2027
0.01	2	3	1616	1407191	74.1831
0.01	2	4	2156	1040707	72.8759
0.01	2	5	4312	993819	75.4902
0.01	2	6	1617	1131250	71.5687
0.01	2	7	2156	990585	71.8955
0.01	2	8	2156	1160892	70.2615
0.01	2	9	1617	895192	71.2419
0.01	2	10	2156	1059032	71.8955
0.01	2	11	1617	808960	71.2419
0.01	2	12	1617	622485	72.5491
0.01	2	13	1078	662367	71.5687
0.01	2	14	1617	810577	74.5099
0.01	2	15	1616	647814	75.4902
0.01	2	16	1078	665061	72.5491
0.01	2	17	1078	582602	74.1831
0.01	2	18	2156	576673	73.2027
0.01	2	19	1617	818122	74.8367
0.01	2	20	1078	602543	73.5295
0.01	3	2	2156	460261	66.6667
0.01	3	3	1617	460800	67.6471
0.01	3	4	1078	940463	69.6079
0.01	3	5	1617	1027773	68.3007
0.01	3	6	2156	924294	67.6471
0.01	3	7	2156	5392706	69.9347
0.01	3	8	2156	11300647	65.6863
0.01	3	9	2695	7930071	68.3007
0.01	3	10	1616	2591258	68.9543
0.01	3	11	2156	2381608	66.0131
0.01	3	12	2156	3071461	69.6079
0.01	3	13	2156	9193902	67.9739
0.01	3	14	2155	3121583	67.3203
0.01	3	15	2156	3156075	67.6471
0.01	3	16	1617	3089246	67.3203
0.01	3	17	1617	3306981	67.3203
0.01	3	18	2155	4699081	70.9151
0.01	3	19	1617	4561650	68.9543
0.01	3	20	2694	6711511	69.6079
0.1	2	2	2155	1732716	73.2027

0.1	2	3	2156	1506357	74.1831
0.1	2	4	1617	1103764	72.8759
0.1	2	5	2156	1035318	75.4902
0.1	2	6	1616	1156581	71.5687
0.1	2	7	1617	1194307	71.8955
0.1	2	8	2156	952320	70.2615
0.1	2	9	3773	1382400	71.2419
0.1	2	10	2155	1069272	71.8955
0.1	2	11	1078	1350063	71.2419
0.1	2	12	1617	738896	72.8759
0.1	2	13	1617	697398	70.9151
0.1	2	14	2156	623023	75.1634
0.1	2	15	2156	516312	75.817
0.1	2	16	1617	537331	73.2027
0.1	2	17	1617	732969	74.5099
0.1	2	18	1078	513078	74.1831
0.1	2	19	2694	597693	74.8367
0.1	2	20	1616	790635	73.5295
0.1	3	2	2156	619251	66.6667
0.1	3	3	2155	640269	68.6275
0.1	3	4	1078	673145	69.6079
0.1	3	5	1617	677457	67.6471
0.1	3	6	2155	677995	67.9739
0.1	3	7	1617	752371	70.2615
0.1	3	8	3773	1448151	65.3595
0.1	3	9	2695	11437000	67.6471
0.1	3	10	2155	8811250	68.3007
0.1	3	11	1617	2482931	65.0327
0.1	3	12	1617	2474307	68.6275
0.1	3	13	2156	2693659	67.9739
0.1	3	14	1617	3350096	67.9739
0.1	3	15	2156	3158231	67.6471
0.1	3	16	1617	3283266	67.6471
0.1	3	17	2156	3866947	67.6471
0.1	3	18	2156	4835436	69.9347
0.1	3	19	2156	5074727	67.9739
0.1	3	20	2155	7542029	69.2811

Table A.9: Results of 5-fold Cross Validation on Haberman data set

The table below shows the results of analysis of 10-fold cross validations on Haberman data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	1078	2488320	72.8759
0	2	3	1617	1735411	74.1831
0	2	4	2156	1032623	72.2223
0	2	5	1617	1126399	75.1634
0	2	6	2156	1041246	72.5491
0	2	7	2156	1196463	73.2027
0	2	8	1617	1223410	72.5491
0	2	9	2155	1053103	72.5491
0	2	10	1078	624101	72.5491
0	2	11	1617	606854	70.2615
0	2	12	1617	619790	73.2027
0	2	13	2156	631107	70.9151
0	2	14	1077	661288	73.8563
0	2	15	1617	542181	75.1634
0	2	16	1617	506611	73.5295
0	2	17	1078	483975	73.2027
0	2	18	2155	541103	72.8759
0	2	19	1617	683385	73.5295
0	2	20	1616	717339	73.2027
0	3	2	1617	5372226	70.5883
0	3	3	1078	509844	67.6471
0	3	4	2156	672606	68.9543
0	3	5	1617	701171	67.6471
0	3	6	1078	3233145	66.9935
0	3	7	2156	6623663	71.5687
0	3	8	1617	9799678	67.9739
0	3	9	2156	5475166	68.6275
0	3	10	1617	14939080	68.3007
0	3	11	2156	3497229	66.0131
0	3	12	2156	2263579	69.9347
0	3	13	1617	2617128	68.6275
0	3	14	4851	3014872	67.3203
0	3	15	2155	2869894	66.9935
0	3	16	1617	3183023	68.3007
0	3	17	2156	3924615	67.9739
0	3	18	2156	4678601	70.2615
0	3	19	2156	5131856	67.9739
0	3	20	2156	5319949	69.2811
0.000001	2	2	2156	1502046	72.8759
0.000001	2	3	1616	1192152	74.1831
0.000001	2	4	2156	1072505	72.2223
0.000001	2	5	2156	1174905	75.1634
0.000001	2	6	2695	1114543	72.5491

0.000001	2	7	1617	1109692	73.2027
0.000001	2	8	2155	1096218	72.5491
0.000001	2	9	1617	994357	72.5491
0.000001	2	10	1617	866089	72.2223
0.000001	2	11	2156	613861	69.6079
0.000001	2	12	1617	810038	73.5295
0.000001	2	13	2156	590148	71.2419
0.000001	2	14	1617	681768	74.1831
0.000001	2	15	1616	2531974	75.1634
0.000001	2	16	1617	881717	73.5295
0.000001	2	17	2156	817044	73.5295
0.000001	2	18	1617	619790	73.2027
0.000001	2	19	1617	683385	73.5295
0.000001	2	20	1617	856387	71.8955
0.000001	3	2	1617	770695	70.5883
0.000001	3	3	2695	811115	67.6471
0.000001	3	4	1617	960943	68.9543
0.000001	3	5	1616	882257	66.9935
0.000001	3	6	2695	1801162	67.3203
0.000001	3	7	2156	5369532	72.5491
0.000001	3	8	1617	1494501	67.6471
0.000001	3	9	1617	1546779	67.3203
0.000001	3	10	2155	2012969	67.3203
0.000001	3	11	2694	2132076	66.3399
0.000001	3	12	2156	2259806	70.5883
0.000001	3	13	2156	3007865	69.2811
0.000001	3	14	2156	2865583	67.9739
0.000001	3	15	2156	3179789	67.9739
0.000001	3	16	2155	5988782	68.3007
0.000001	3	17	2156	4038332	68.6275
0.000001	3	18	2156	4963704	70.2615
0.000001	3	19	2695	8121397	67.9739
0.000001	3	20	2156	5015444	69.2811
0.00001	2	2	1617	1514981	72.8759
0.00001	2	3	1616	1243351	74.1831
0.00001	2	4	1617	1018611	72.2223
0.00001	2	5	1077	1168977	75.1634
0.00001	2	6	1617	1073044	72.5491
0.00001	2	7	2695	1202392	73.2027
0.00001	2	8	2156	876329	72.5491
0.00001	2	9	1078	710333	72.5491
0.00001	2	10	2156	827284	72.2223
0.00001	2	11	1617	930762	69.6079
0.00001	2	12	1617	821894	73.5295
0.00001	2	13	1617	516851	71.5687
0.00001	2	14	1078	506610	74.5099
0.00001	2	15	1617	699554	74.5099

0.00001	2	16	1617	658594	73.2027
0.00001	2	17	1616	704943	73.5295
0.00001	2	18	1617	711949	73.2027
0.00001	2	19	1078	721111	73.2027
0.00001	2	20	1617	869861	73.2027
0.00001	3	2	1617	488825	70.2615
0.00001	3	3	1617	510383	67.6471
0.00001	3	4	1078	601465	68.6275
0.00001	3	5	2156	645659	68.3007
0.00001	3	6	1616	1017533	67.6471
0.00001	3	7	2695	8458239	70.9151
0.00001	3	8	2155	7437473	66.3399
0.00001	3	9	1617	12676579	67.9739
0.00001	3	10	2156	1908952	68.6275
0.00001	3	11	4312	2211300	66.0131
0.00001	3	12	2695	2438198	70.5883
0.00001	3	13	2156	2744320	67.9739
0.00001	3	14	2156	3515554	67.3203
0.00001	3	15	2156	2974450	68.6275
0.00001	3	16	2695	3459503	68.6275
0.00001	3	17	2155	5792067	68.3007
0.00001	3	18	2156	4715250	70.2615
0.00001	3	19	1617	6311073	68.6275
0.00001	3	20	1616	5349591	69.9347
0.0001	2	2	1617	1352219	72.8759
0.0001	2	3	1617	1634088	74.1831
0.0001	2	4	1617	1027233	72.2223
0.0001	2	5	1617	1130711	75.1634
0.0001	2	6	1617	1046097	72.5491
0.0001	2	7	2156	1026694	73.2027
0.0001	2	8	1617	1018610	72.5491
0.0001	2	9	1616	791713	72.5491
0.0001	2	10	2156	803032	72.5491
0.0001	2	11	2156	565894	69.9347
0.0001	2	12	1077	635958	73.5295
0.0001	2	13	1617	495293	71.5687
0.0001	2	14	2156	536791	74.1831
0.0001	2	15	1616	580446	75.1634
0.0001	2	16	1617	842375	73.2027
0.0001	2	17	2156	846686	73.2027
0.0001	2	18	1617	1070349	73.2027
0.0001	2	19	2156	1205625	73.5295
0.0001	2	20	2156	1010526	72.5491
0.0001	3	2	2156	706020	70.5883
0.0001	3	3	2156	786324	67.9739
0.0001	3	4	2156	902737	69.2811
0.0001	3	5	2694	845069	67.6471

0.0001	3	6	2695	958248	68.6275
0.0001	3	7	1617	1179755	71.2419
0.0001	3	8	1617	1414737	67.9739
0.0001	3	9	2156	10690559	68.3007
0.0001	3	10	1617	20416401	67.6471
0.0001	3	11	1617	2215613	66.3399
0.0001	3	12	2695	3205120	70.2615
0.0001	3	13	1617	3496690	67.6471
0.0001	3	14	2155	4417751	67.9739
0.0001	3	15	2156	2761027	67.9739
0.0001	3	16	2156	5456841	69.2811
0.0001	3	17	1617	3901440	67.6471
0.0001	3	18	1617	4072825	69.6079
0.0001	3	19	2156	4910348	68.9543
0.0001	3	20	2156	5381388	69.2811
0.001	2	2	1617	1402341	72.8759
0.001	2	3	2156	1360842	74.1831
0.001	2	4	2156	1111309	72.2223
0.001	2	5	1078	1053642	75.1634
0.001	2	6	1617	943158	72.5491
0.001	2	7	1617	1028312	73.2027
0.001	2	8	1078	1111309	72.5491
0.001	2	9	1617	768539	72.5491
0.001	2	10	1617	640270	71.8955
0.001	2	11	1617	672607	70.2615
0.001	2	12	1617	627335	73.5295
0.001	2	13	1617	646198	71.5687
0.001	2	14	1617	594458	74.1831
0.001	2	15	1617	613322	75.1634
0.001	2	16	1078	770695	73.5295
0.001	2	17	1617	705482	72.8759
0.001	2	18	1078	833213	72.8759
0.001	2	19	1078	826745	73.5295
0.001	2	20	1617	868244	72.5491
0.001	3	2	1617	765844	70.5883
0.001	3	3	1078	1035857	67.9739
0.001	3	4	1078	955554	69.2811
0.001	3	5	2156	1029389	66.9935
0.001	3	6	2156	1006753	67.6471
0.001	3	7	2156	6081481	71.2419
0.001	3	8	1617	5487561	66.9935
0.001	3	9	2156	11961935	68.6275
0.001	3	10	1617	13449968	67.9739
0.001	3	11	2156	2059318	66.3399
0.001	3	12	1617	2335259	70.5883
0.001	3	13	2156	2581019	67.9739
0.001	3	14	1617	2948580	67.9739

0.001	3	15	2156	3297280	67.9739
0.001	3	16	2155	3437406	68.3007
0.001	3	17	3772	3729515	67.9739
0.001	3	18	2695	5399174	70.2615
0.001	3	19	2156	5157187	67.9739
0.001	3	20	2155	5222400	68.9543
0.01	2	2	1616	1540311	72.8759
0.01	2	3	1078	1164665	74.1831
0.01	2	4	2155	883874	72.2223
0.01	2	5	1617	1221794	75.1634
0.01	2	6	1617	1135562	72.5491
0.01	2	7	1078	1050408	73.2027
0.01	2	8	1078	1128555	72.5491
0.01	2	9	1617	838602	72.5491
0.01	2	10	1617	764766	72.2223
0.01	2	11	2156	644042	70.2615
0.01	2	12	1078	653204	73.5295
0.01	2	13	1616	661288	71.2419
0.01	2	14	1617	981962	74.1831
0.01	2	15	3772	644042	75.1634
0.01	2	16	1617	607933	73.2027
0.01	2	17	1617	579368	73.5295
0.01	2	18	1078	702248	73.5295
0.01	2	19	1617	607932	73.5295
0.01	2	20	1078	598231	72.2223
0.01	3	2	1616	458644	70.5883
0.01	3	3	1617	461878	67.6471
0.01	3	4	1078	660210	68.9543
0.01	3	5	2155	821895	67.9739
0.01	3	6	1078	3070383	66.6667
0.01	3	7	1617	5614214	71.5687
0.01	3	8	2155	6363890	67.3203
0.01	3	9	1617	10738525	67.9739
0.01	3	10	1616	1926198	66.9935
0.01	3	11	2695	2991158	66.0131
0.01	3	12	2155	2359511	70.5883
0.01	3	13	2156	2898458	68.3007
0.01	3	14	1617	2936185	67.6471
0.01	3	15	1617	3014332	67.3203
0.01	3	16	1617	3130206	68.3007
0.01	3	17	2156	4048572	68.3007
0.01	3	18	2156	4603149	70.9151
0.01	3	19	2155	5044547	67.9739
0.01	3	20	1616	5574871	69.2811
0.1	2	2	1617	1232573	72.8759
0.1	2	3	1617	1199158	74.1831
0.1	2	4	1617	1011604	72.2223

0.1	2	5	2156	1155503	75.1634
0.1	2	6	2156	1080590	72.5491
0.1	2	7	1617	1343596	73.2027
0.1	2	8	1078	1228800	72.5491
0.1	2	9	1078	1159276	72.5491
0.1	2	10	1617	822434	72.5491
0.1	2	11	4850	813810	70.5883
0.1	2	12	1616	828901	73.5295
0.1	2	13	1617	669373	71.5687
0.1	2	14	1616	745904	74.5099
0.1	2	15	1078	504993	75.1634
0.1	2	16	2695	555116	73.5295
0.1	2	17	2156	577213	73.5295
0.1	2	18	1078	651048	73.5295
0.1	2	19	1078	623562	73.5295
0.1	2	20	2156	772311	72.8759
0.1	3	2	1078	513078	70.2615
0.1	3	3	1616	619251	67.6471
0.1	3	4	5389	686080	69.2811
0.1	3	5	1078	676379	68.3007
0.1	3	6	1617	730274	68.3007
0.1	3	7	1078	1100531	69.9347
0.1	3	8	2156	1737027	67.3203
0.1	3	9	2155	10391443	68.3007
0.1	3	10	1617	1868531	67.6471
0.1	3	11	1616	2302922	65.3595
0.1	3	12	2156	2479157	69.9347
0.1	3	13	2156	2913549	67.3203
0.1	3	14	1616	3069844	67.3203
0.1	3	15	2156	3319376	67.3203
0.1	3	16	2156	3664303	68.6275
0.1	3	17	2156	4121330	68.3007
0.1	3	18	2156	4769145	69.6079
0.1	3	19	2694	6827384	67.9739
0.1	3	20	2156	3351174	69.2811

Table A.10: Results of 10-fold Cross Validation on Haberman data set

A.6 Diabetes4D data set

The Diabetes4D data set is a modification of the Diabetes data set containing 4 attributes. The table below shows the results of analysis of 5-fold cross validations on Diabetes4D data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	2156	5612594	73.4375
0	2	3	2695	5142633	76.0417
0	2	4	2156	4172528	73.8282
0	2	5	2156	2053388	74.7396
0	2	10	2155	2596646	72.5261
0	2	15	2156	2407476	70.4428
0	2	20	2155	2368672	68.6198
0	2	25	2156	3152301	69.4011
0	2	30	2156	12304161	68.75
0	3	2	2695	1615224	73.0469
0	3	3	2156	1942904	73.1771
0	3	4	2156	1919190	69.4011
0	3	5	2155	2063089	72.2657
0	3	10	2156	5026759	73.0469
0	3	15	2156	9644457	71.0938
0	3	20	1617	18844282	70.7032
0	3	25	2156	36501803	68.4896
0	3	30	2155	70215632	67.448
0	4	2	1617	1640555	71.3542
0	4	3	1617	1511746	74.7396
0	4	4	2156	2502870	72.2657
0	4	5	2156	5556005	71.6146
0	4	10	1616	41916064	69.6615
0	4	15	2156	186173853	69.2709
0	4	20	2156	538348235	69.7917
0	4	25	2155	1894090985	69.0105
0	4	30	1617	3173118401	70.8334
0.000001	2	2	2695	4692072	73.4375
0.000001	2	3	2156	5315095	76.0417
0.000001	2	4	2695	4353614	73.8282
0.000001	2	5	2156	1978474	74.7396
0.000001	2	10	2695	2201599	72.6563
0.000001	2	15	3234	2388075	70.4428
0.000001	2	20	2156	3150145	68.4896
0.000001	2	25	2155	2983611	69.5313
0.000001	2	30	1617	4045336	68.4896
0.000001	3	2	2155	1723014	73.0469
0.000001	3	3	2155	1831342	73.1771
0.000001	3	4	2156	1894398	69.4011
0.000001	3	5	2156	1690137	72.2657

0.000001	3	10	2156	4842439	72.7865
0.000001	3	15	2156	17275946	71.4844
0.000001	3	20	2156	23324548	69.5313
0.000001	3	25	2156	44289587	68.8803
0.000001	3	30	1617	49314190	67.1875
0.000001	4	2	1617	1422282	71.3542
0.000001	4	3	2156	2469994	75
0.000001	4	4	1617	2994929	72.1355
0.000001	4	5	2156	21730883	72.2657
0.000001	4	10	2156	42933058	68.8803
0.000001	4	15	2156	163868454	69.5313
0.000001	4	20	3233	518110236	70.7032
0.000001	4	25	2156	1532448382	70.0521
0.000001	4	30	1617	2033401241	69.6615
0.00001	2	2	2694	5010051	73.4375
0.00001	2	3	2695	5488636	76.0417
0.00001	2	4	1617	3545732	73.8282
0.00001	2	5	2156	2112673	74.7396
0.00001	2	10	2695	2524967	72.6563
0.00001	2	15	2156	2261961	70.4428
0.00001	2	20	3233	4254448	68.4896
0.00001	2	25	2155	3476208	69.0105
0.00001	2	30	2156	2978760	68.6198
0.00001	3	2	2156	1816791	73.0469
0.00001	3	3	2156	1679359	73.3073
0.00001	3	4	4850	2060933	69.4011
0.00001	3	5	1617	1721935	72.2657
0.00001	3	10	2156	5594809	72.7865
0.00001	3	15	2155	10809660	71.3542
0.00001	3	20	2695	24833061	69.2709
0.00001	3	25	2156	53184368	67.9688
0.00001	3	30	1617	67310169	67.3178
0.00001	4	2	1617	1333355	71.3542
0.00001	4	3	1617	2214533	74.8698
0.00001	4	4	2156	2360588	72.1355
0.00001	4	5	2156	4698540	71.4844
0.00001	4	10	2156	28584133	69.5313
0.00001	4	15	2156	147449434	68.75
0.00001	4	20	1616	462693010	69.2709
0.00001	4	25	2155	1664134155	69.7917
0.00001	4	30	1617	2016901378	69.9219
0.0001	2	2	2694	5467617	73.4375
0.0001	2	3	2155	5110296	76.0417
0.0001	2	4	2156	4317505	73.8282
0.0001	2	5	2156	2092731	74.7396
0.0001	2	10	1617	2307771	72.5261
0.0001	2	15	1617	2131535	70.4428

0.0001	2	20	2155	3309674	68.4896
0.0001	2	25	3773	2680722	69.9219
0.0001	2	30	2156	12405482	68.4896
0.0001	3	2	2694	1561330	73.0469
0.0001	3	3	1617	1419048	73.3073
0.0001	3	4	2156	1804934	69.4011
0.0001	3	5	2695	2355737	72.2657
0.0001	3	10	2156	4771837	72.7865
0.0001	3	15	1617	10797803	71.7448
0.0001	3	20	2156	23619353	69.4011
0.0001	3	25	2156	49625163	68.6198
0.0001	3	30	1617	45323287	67.5782
0.0001	4	2	1617	1848050	71.3542
0.0001	4	3	1617	2024284	74.7396
0.0001	4	4	2156	2814381	72.1355
0.0001	4	5	1617	3937007	71.6146
0.0001	4	10	2156	42080982	69.9219
0.0001	4	15	2156	148503614	70.1823
0.0001	4	20	3234	625908799	71.224
0.0001	4	25	1617	1167062793	69.6615
0.0001	4	30	1617	3019465149	69.0105
0.001	2	2	2694	5605588	73.4375
0.001	2	3	2695	5284375	76.0417
0.001	2	4	2156	4034018	73.8282
0.001	2	5	2156	2592874	74.7396
0.001	2	10	2156	2488319	72.6563
0.001	2	15	2156	2696352	70.4428
0.001	2	20	2156	4150431	68.4896
0.001	2	25	2155	3457884	69.5313
0.001	2	30	2155	4110010	68.6198
0.001	3	2	2156	1627081	73.0469
0.001	3	3	2156	1496117	73.1771
0.001	3	4	2695	1680976	69.4011
0.001	3	5	2156	1898710	72.2657
0.001	3	10	2156	5032148	72.9167
0.001	3	15	2156	10639892	71.3542
0.001	3	20	2156	23889904	69.6615
0.001	3	25	2156	50485322	68.2292
0.001	3	30	2156	69581831	67.1875
0.001	4	2	1617	1972546	71.3542
0.001	4	3	2156	2143393	75
0.001	4	4	2156	2529278	72.2657
0.001	4	5	2156	4519071	71.7448
0.001	4	10	2156	40634448	69.6615
0.001	4	15	1617	144335936	69.7917
0.001	4	20	2156	532196694	70.7032
0.001	4	25	1616	1357971295	69.7917

0.001	4	30	1617	2602760486	70.7032
0.01	2	2	2156	4803095	73.4375
0.01	2	3	2156	4966935	76.0417
0.01	2	4	1616	4364392	73.8282
0.01	2	5	2155	1734871	74.7396
0.01	2	10	2694	2272740	72.5261
0.01	2	15	2156	2831088	70.4428
0.01	2	20	2156	3777479	68.4896
0.01	2	25	2156	3495610	69.4011
0.01	2	30	2155	3757539	68.4896
0.01	3	2	2156	1919729	73.0469
0.01	3	3	2155	1710079	73.3073
0.01	3	4	1617	2158482	69.4011
0.01	3	5	2155	1620075	72.2657
0.01	3	10	2156	7892340	73.1771
0.01	3	15	2156	8773518	71.224
0.01	3	20	2156	22670267	69.7917
0.01	3	25	2155	48478822	69.2709
0.01	3	30	1616	73347454	67.0573
0.01	4	2	2155	1382938	71.3542
0.01	4	3	1616	1662651	74.8698
0.01	4	4	2156	2630600	72.1355
0.01	4	5	2155	4116478	71.4844
0.01	4	10	2156	44396837	69.5313
0.01	4	15	1617	126112522	69.6615
0.01	4	20	3234	560862208	70.3125
0.01	4	25	2155	1405281680	69.5313
0.01	4	30	2155	2823106275	70.1823
0.1	2	2	2156	6075010	73.4375
0.1	2	3	2156	4581589	76.0417
0.1	2	4	2694	3795265	73.8282
0.1	2	5	2695	1906795	74.7396
0.1	2	10	2155	2675333	72.6563
0.1	2	15	2695	3282726	70.4428
0.1	2	20	2155	3878801	68.4896
0.1	2	25	2156	3094633	69.2709
0.1	2	30	2156	6087407	69.0105
0.1	3	2	2155	1557557	73.0469
0.1	3	3	2156	1642172	73.1771
0.1	3	4	2156	2132613	69.4011
0.1	3	5	2156	2196748	72.1355
0.1	3	10	2694	4841361	73.1771
0.1	3	15	2695	8467397	70.4428
0.1	3	20	1617	22390554	70.4428
0.1	3	25	2156	28637489	68.099
0.1	3	30	1617	73360927	67.1875
0.1	4	2	1616	1285389	71.3542

0.1	4	3	2156	2701202	74.8698
0.1	4	4	2695	3005168	72.1355
0.1	4	5	1617	4485656	71.7448
0.1	4	10	2156	38277094	68.8803
0.1	4	15	1617	152002997	68.4896
0.1	4	20	3233	591715845	69.7917
0.1	4	25	1617	1293480897	69.6615
0.1	4	30	2156	2082924003	69.2709

Table A.11: Results of 5-fold Cross Validation on Diabetes4D data set

The table below shows the results of analysis of 10-fold cross validations on Diabetes4D data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	2156	4881243	73.4375
0	2	3	2155	4010844	76.0417
0	2	4	5389	2075485	74.6094
0	2	5	2156	1992487	73.698
0	2	10	2156	2036680	73.3073
0	2	15	1616	1953144	71.4844
0	2	20	2156	2191898	70.1823
0	2	25	2156	6241545	69.1407
0	2	30	2156	2565388	67.8386
0	3	2	1617	1539771	72.7865
0	3	3	2156	2097043	73.5678
0	3	4	2156	1894937	69.0105
0	3	5	1617	1594205	71.6146
0	3	10	2155	4499669	72.2657
0	3	15	2156	10389281	70.8334
0	3	20	2156	43179895	70.4428
0	3	25	2156	47006419	67.8386
0	3	30	2156	63010450	68.099
0	4	2	1617	1470786	71.3542
0	4	3	1616	2669944	75.6511
0	4	4	2156	3007324	72.1355
0	4	5	2156	9223539	71.224
0	4	10	4850	38032951	69.6615
0	4	15	3773	151371890	70.9636
0	4	20	2156	495097199	70.7032
0	4	25	1617	2725262602	69.7917
0	4	30	2155	1984221787	70.573
0.000001	2	2	2156	5680501	73.4375
0.000001	2	3	2694	4062583	76.0417
0.000001	2	4	2156	2291602	74.6094

0.000001	2	5	2156	2221540	73.698
0.000001	2	10	2156	2009195	73.3073
0.000001	2	15	2156	3132899	71.3542
0.000001	2	20	1617	2520655	70.3125
0.000001	2	25	2156	3455729	69.2709
0.000001	2	30	2156	3062296	68.2292
0.000001	3	2	2155	1539771	72.7865
0.000001	3	3	2156	1914339	73.698
0.000001	3	4	2155	2074407	69.0105
0.000001	3	5	2155	2298070	71.7448
0.000001	3	10	2155	6208131	71.875
0.000001	3	15	2156	8481409	70.9636
0.000001	3	20	1617	23519108	70.4428
0.000001	3	25	2156	49977094	68.4896
0.000001	3	30	2156	61092338	67.5782
0.000001	4	2	1616	1882003	71.3542
0.000001	4	3	2155	2672638	75.6511
0.000001	4	4	2156	2892529	72.1355
0.000001	4	5	2156	2849952	72.2657
0.000001	4	10	2156	39069885	68.8803
0.000001	4	15	2156	264703821	70.573
0.000001	4	20	1617	536582645	70.573
0.000001	4	25	1616	1037468674	70.573
0.000001	4	30	1617	2723654384	72.0053
0.00001	2	2	2156	5069875	73.4375
0.00001	2	3	2156	3874490	76.0417
0.00001	2	4	2695	2457059	74.6094
0.00001	2	5	2156	2007038	73.698
0.00001	2	10	2155	1991409	73.3073
0.00001	2	15	2694	2641918	71.3542
0.00001	2	20	1616	3262247	69.7917
0.00001	2	25	2156	3194339	69.0105
0.00001	2	30	2156	3415846	68.099
0.00001	3	2	1617	1606601	72.7865
0.00001	3	3	5389	1645944	73.698
0.00001	3	4	2155	1863678	69.0105
0.00001	3	5	2155	2803064	71.7448
0.00001	3	10	2156	6110042	72.0053
0.00001	3	15	2695	9170184	70.9636
0.00001	3	20	2156	45192862	70.8334
0.00001	3	25	2156	44997764	67.9688
0.00001	3	30	1617	80270767	68.099
0.00001	4	2	3233	1723014	71.3542
0.00001	4	3	2694	2760486	75.5209
0.00001	4	4	2155	2529278	72.2657
0.00001	4	5	1617	4246902	72.2657
0.00001	4	10	4312	43214926	69.6615

0.00001	4	15	1617	135351151	69.9219
0.00001	4	20	2695	396998604	69.9219
0.00001	4	25	2156	1173788852	70.8334
0.00001	4	30	2156	2730733453	70.7032
0.0001	2	2	2156	4437151	73.4375
0.0001	2	3	2156	3527947	76.0417
0.0001	2	4	2155	2250643	74.6094
0.0001	2	5	2695	1903561	73.698
0.0001	2	10	2156	1695527	73.1771
0.0001	2	15	3234	3332310	71.4844
0.0001	2	20	2156	3591543	69.9219
0.0001	2	25	1617	3456806	69.1407
0.0001	2	30	1616	2270584	67.8386
0.0001	3	2	1617	1334433	72.7865
0.0001	3	3	2156	1727864	73.5678
0.0001	3	4	2156	1690677	69.0105
0.0001	3	5	1617	1852361	71.875
0.0001	3	10	2695	4840822	71.3542
0.0001	3	15	2156	12534291	70.9636
0.0001	3	20	2156	24047276	70.573
0.0001	3	25	1617	51960420	68.8803
0.0001	3	30	2156	75600792	67.5782
0.0001	4	2	2155	1845894	71.3542
0.0001	4	3	2155	2648386	75.3907
0.0001	4	4	2156	2238247	72.3959
0.0001	4	5	2156	4575121	71.875
0.0001	4	10	2156	38763763	69.2709
0.0001	4	15	1617	176567123	71.3542
0.0001	4	20	1617	453221556	69.4011
0.0001	4	25	1617	1297036870	71.7448
0.0001	4	30	2156	2177433750	70.3125
0.001	2	2	2156	5283298	73.4375
0.001	2	3	2695	4169294	76.0417
0.001	2	4	2155	2102432	74.6094
0.001	2	5	2156	1789304	73.698
0.001	2	10	2156	2219923	73.3073
0.001	2	15	2156	2853186	71.3542
0.001	2	20	2156	5360367	69.7917
0.001	2	25	2156	8562790	69.2709
0.001	2	30	2156	4634406	68.099
0.001	3	2	2155	1593666	72.7865
0.001	3	3	1617	1733793	73.698
0.001	3	4	1617	1820024	69.0105
0.001	3	5	2155	2212378	71.875
0.001	3	10	2156	6156931	72.5261
0.001	3	15	2156	10255623	70.9636
0.001	3	20	2695	23634982	70.573

0.001	3	25	2155	42715323	68.75
0.001	3	30	2695	75068312	67.9688
0.001	4	2	2156	2045843	71.3542
0.001	4	3	1617	2091653	75.3907
0.001	4	4	2155	2609582	72.2657
0.001	4	5	2155	4751895	72.2657
0.001	4	10	2695	38969641	69.5313
0.001	4	15	2695	175158315	70.8334
0.001	4	20	1616	501575881	70.3125
0.001	4	25	1617	1155165537	70.8334
0.001	4	30	2156	2744315457	70.7032
0.01	2	2	2156	4762136	73.4375
0.01	2	3	2695	3752149	76.0417
0.01	2	4	2694	3951560	74.6094
0.01	2	5	2156	2293219	73.698
0.01	2	10	2155	1662112	73.3073
0.01	2	15	2156	2636529	71.3542
0.01	2	20	2156	3652983	69.7917
0.01	2	25	3773	2727610	69.6615
0.01	2	30	2156	3223442	68.099
0.01	3	2	2156	1897632	72.7865
0.01	3	3	2156	1632471	73.698
0.01	3	4	2156	1827030	69.0105
0.01	3	5	1617	2383763	72.0053
0.01	3	10	2156	4862918	71.7448
0.01	3	15	2156	10043816	70.8334
0.01	3	20	1617	23399462	70.3125
0.01	3	25	2156	45371253	68.75
0.01	3	30	1617	82956340	68.4896
0.01	4	2	1617	1291317	71.3542
0.01	4	3	3772	2396698	75.5209
0.01	4	4	1617	2356815	72.1355
0.01	4	5	4312	4207021	72.2657
0.01	4	10	1616	28354541	68.8803
0.01	4	15	1617	184765585	70.573
0.01	4	20	1617	575003099	68.75
0.01	4	25	2156	1508487338	70.0521
0.01	4	30	2695	2879327070	70.1823
0.1	2	2	2695	5215391	73.4375
0.1	2	3	2695	3874490	76.0417
0.1	2	4	2695	2179502	74.6094
0.1	2	5	2695	1990331	73.698
0.1	2	10	1616	2099738	73.3073
0.1	2	15	2156	2418794	71.0938
0.1	2	20	2156	2289447	70.0521
0.1	2	25	2156	6209748	69.1407
0.1	2	30	5928	3314524	68.099

0.1	3	2	1617	1426054	72.7865
0.1	3	3	2156	1733793	73.698
0.1	3	4	2694	1898171	69.0105
0.1	3	5	2155	2147703	71.7448
0.1	3	10	2156	3769396	72.2657
0.1	3	15	2156	9011733	71.4844
0.1	3	20	2156	13585238	70.4428
0.1	3	25	2155	47457518	68.099
0.1	3	30	2695	77366381	68.3594
0.1	4	2	1078	1423359	71.3542
0.1	4	3	2156	2493707	75.5209
0.1	4	4	4851	2902230	72.1355
0.1	4	5	2156	5123769	72.1355
0.1	4	10	2156	25134871	68.75
0.1	4	15	1617	134269484	69.6615
0.1	4	20	1617	581855810	70.9636
0.1	4	25	2694	1207565738	70.4428
0.1	4	30	1617	2786955327	71.224

Table A.12: Results of 10-fold Cross Validation on Diabetes4D data set

A.7 Diabetes data set

The Diabetes data set is a data set containing 8 attributes. The table below shows the results of analysis of 5-fold cross validations on Diabetes data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0.00001	2	2	2695	4757825	73.4375
0.00001	2	3	2694	4747584	76.0417
0.00001	2	4	2694	5094127	73.8282
0.00001	2	5	2695	5012746	74.7396
0.00001	3	2	1617	5150717	73.0469
0.00001	3	3	2156	5542531	73.1771
0.00001	3	4	2156	4196241	69.4011
0.00001	3	5	2156	4168216	72.2657
0.00001	4	2	2156	2941034	72.5261
0.00001	4	3	1617	3827062	73.5678
0.00001	4	4	1617	9213838	69.2709
0.00001	4	5	4311	17670456	72.1355
0.00001	5	2	4312	3756999	72.1355
0.00001	5	3	2156	6473292	70.7032
0.00001	5	4	2156	23214604	72.5261
0.00001	5	5	2155	18675592	69.6615
0.00001	6	2	2156	4415592	69.9219
0.00001	6	3	2156	9463371	70.3125
0.00001	6	4	3773	28707551	70.573
0.00001	6	5	2156	93567128	69.2709
0.00001	7	2	2156	6314842	69.4011
0.00001	7	3	2156	31710564	70.9636
0.00001	7	4	1616	146683590	69.9219
0.00001	7	5	1617	469353856	66.9271
0.00001	8	2	6468	8930352	68.6198
0.00001	8	3	1617	177078045	70.0521
0.00001	8	4	1617	791682431	69.6615
0.00001	8	5	1617	3029888384	68.4896
0.000001	2	2	2695	4913041	73.4375
0.000001	2	3	2155	4992266	76.0417
0.000001	2	4	2156	5519895	73.8282
0.000001	2	5	2156	5109217	74.7396
0.000001	3	2	2155	5117840	73.0469
0.000001	3	3	2156	5644931	73.1771
0.000001	3	4	2695	4761058	69.4011
0.000001	3	5	2695	4418826	72.2657
0.000001	4	2	2156	3508545	72.5261
0.000001	4	3	2156	5061251	73.5678
0.000001	4	4	2156	8888853	69.2709
0.000001	4	5	2156	5802842	72.2657
0.000001	5	2	2156	3330692	72.2657

0.000001	5	3	1617	7044037	70.7032
0.000001	5	4	2156	11058115	72.3959
0.000001	5	5	2156	24083925	69.6615
0.000001	6	2	2155	4446852	69.9219
0.000001	6	3	2695	19646235	70.1823
0.000001	6	4	2695	27300360	70.573
0.000001	6	5	2156	82165705	68.8803
0.000001	7	2	2156	6811212	69.4011
0.000001	7	3	2156	35676675	70.9636
0.000001	7	4	1617	153175207	69.0105
0.000001	7	5	5929	569297806	67.5782
0.000001	8	2	1617	9214378	68.3594
0.000001	8	3	2156	199608725	68.75
0.000001	8	4	1617	839171207	70.9636
0.000001	8	5	1617	3478058389	67.5782
0.0001	2	2	2156	3741370	73.4375
0.0001	2	3	2695	5394859	76.0417
0.0001	2	4	2156	5423423	73.8282
0.0001	2	5	2156	5759727	74.7396
0.0001	3	2	2156	4589134	73.0469
0.0001	3	3	2155	3946169	73.1771
0.0001	3	4	4850	4856452	69.4011
0.0001	3	5	1617	4107316	72.2657
0.0001	4	2	2156	3540882	72.5261
0.0001	4	3	2695	4567576	73.5678
0.0001	4	4	1616	8256129	69.2709
0.0001	4	5	2156	5450910	71.875
0.0001	5	2	2156	3832452	72.1355
0.0001	5	3	2155	6147768	70.7032
0.0001	5	4	2156	17833217	71.875
0.0001	5	5	1617	16710052	69.6615
0.0001	6	2	4851	3579686	69.9219
0.0001	6	3	1617	13489843	70.1823
0.0001	6	4	2156	28266154	70.3125
0.0001	6	5	2156	76658744	68.75
0.0001	7	2	1617	5771583	69.4011
0.0001	7	3	1617	29814548	70.7032
0.0001	7	4	2156	129831794	69.9219
0.0001	7	5	2156	496894048	67.9688
0.0001	8	2	2156	8967001	68.099
0.0001	8	3	2156	153496419	68.75
0.0001	8	4	2156	856611533	70.573
0.0001	8	5	3772	3597598452	69.2709
0.001	2	2	2695	4723870	73.4375
0.001	2	3	4851	3903593	76.0417
0.001	2	4	1617	5400249	73.8282
0.001	2	5	2155	4959391	74.7396

0.001	3	2	1617	5208923	73.0469
0.001	3	3	2695	5570017	73.1771
0.001	3	4	2156	4050725	69.4011
0.001	3	5	2695	4196781	72.2657
0.001	4	2	2156	2881210	72.5261
0.001	4	3	2156	4607458	73.5678
0.001	4	4	1618	8388172	69.2709
0.001	4	5	2156	6239928	71.875
0.001	5	2	2155	3768857	72.1355
0.001	5	3	2156	8036777	70.7032
0.001	5	4	2156	11958695	72.1355
0.001	5	5	2155	22707454	69.7917
0.001	6	2	1616	3602861	69.9219
0.001	6	3	1617	10050823	70.3125
0.001	6	4	1617	28378793	70.1823
0.001	6	5	2156	75622888	69.1407
0.001	7	2	1617	7056433	69.4011
0.001	7	3	2156	36140708	71.0938
0.001	7	4	2156	131566127	69.9219
0.001	7	5	2156	598966838	68.4896
0.001	8	2	1078	12539140	68.099
0.001	8	3	1617	201654028	69.4011
0.001	8	4	1618	702762642	69.7917
0.001	8	5	1617	3160978620	67.8386
0.01	2	2	5390	5191138	73.4375
0.01	2	3	2155	4904417	76.0417
0.01	2	4	2156	5029454	73.8282
0.01	2	5	2155	5315096	74.7396
0.01	3	2	2156	5055323	73.0469
0.01	3	3	5389	5828173	73.1771
0.01	3	4	2156	5151795	69.4011
0.01	3	5	2156	3363568	72.2657
0.01	4	2	2156	3558129	72.5261
0.01	4	3	1617	4824114	73.5678
0.01	4	4	2155	8353140	69.2709
0.01	4	5	2156	5497259	71.3542
0.01	5	2	1617	3316140	72.1355
0.01	5	3	2156	6563836	70.7032
0.01	5	4	2156	12019057	72.2657
0.01	5	5	2156	18136644	70.0521
0.01	6	2	2156	4370860	69.7917
0.01	6	3	2155	33824315	70.4428
0.01	6	4	2156	30341638	69.7917
0.01	6	5	2156	85827850	68.8803
0.01	7	2	2155	5185749	69.0105
0.01	7	3	1616	40107897	70.7032
0.01	7	4	2155	146086976	69.1407

0.01	7	5	2156	593945469	67.9688
0.01	8	2	1617	9171801	67.9688
0.01	8	3	1617	151025347	69.2709
0.01	8	4	2156	669318824	70.8334
0.01	8	5	1617	3477753884	67.7084
0.1	2	2	2156	4924898	73.4375
0.1	2	3	2156	5170657	76.0417
0.1	2	4	2156	5489714	73.8282
0.1	2	5	1616	5453066	74.7396
0.1	3	2	2156	4755130	73.0469
0.1	3	3	2156	5351205	73.1771
0.1	3	4	2695	4858068	69.4011
0.1	3	5	2156	3192721	72.3959
0.1	4	2	2156	3183560	72.5261
0.1	4	3	2156	4133185	73.5678
0.1	4	4	3234	9761408	69.2709
0.1	4	5	2156	6266336	72.1355
0.1	5	2	2156	3626036	72.2657
0.1	5	3	2156	7024636	70.7032
0.1	5	4	1617	11517297	72.6563
0.1	5	5	2156	18001369	69.5313
0.1	6	2	2156	4195164	69.9219
0.1	6	3	1617	7781317	70.573
0.1	6	4	2155	30843398	70.4428
0.1	6	5	1617	95270739	69.0105
0.1	7	2	2155	6989064	69.4011
0.1	7	3	2156	34218824	70.8334
0.1	7	4	2694	122496726	70.3125
0.1	7	5	2156	463505203	67.5782
0.1	8	2	2156	12126308	68.099
0.1	8	3	2156	173676750	68.3594
0.1	8	4	1616	683273780	70.573
0.1	8	5	2155	3748638889	66.9271
0	2	2	1617	5547381	73.4375
0	2	3	2155	4870464	76.0417
0	2	4	2156	5802842	73.8282
0	2	5	2695	5603971	74.7396
0	3	2	2155	4685605	73.0469
0	3	3	2695	5083887	73.1771
0	3	4	2155	4823576	69.4011
0	3	5	2156	4719019	72.2657
0	4	2	2156	3340933	72.5261
0	4	3	1617	4221033	73.5678
0	4	4	2155	10086933	69.6615
0	4	5	2695	25079899	71.7448
0	5	2	2156	7896651	72.1355
0	5	3	1616	7651431	71.224

0	5	4	2156	14005077	72.1355
0	5	5	2156	23516414	69.7917
0	6	2	2695	3952637	69.9219
0	6	3	2156	11420288	70.0521
0	6	4	2694	26728538	70.0521
0	6	5	2156	75345869	68.2292
0	7	2	2156	5069336	69.4011
0	7	3	2156	51706037	70.7032
0	7	4	2156	130427871	69.7917
0	7	5	2155	596636971	67.448
0	8	2	2155	9883210	67.8386
0	8	3	1616	193338615	68.8803
0	8	4	1617	801948293	69.1407
0	8	5	1617	4000053894	66.5365

Table A.13: Results of 5-fold Cross Validation on Diabetes data set

The table below shows the results of analysis of 10-fold cross validations on Diabetes data set.

Diffusion Tolerance	No:attributes used for Classification	No:Partitions	PreProcessing Time	Model building time	Accuracy
0	2	2	2156	5557621	73.4375
0	2	3	2156	5441748	76.0417
0	2	4	2695	3761311	74.6094
0	2	5	1617	4264149	73.698
0	3	2	2156	2690962	72.7865
0	3	3	2156	2980916	73.5678
0	3	4	1617	3318836	69.0105
0	3	5	2695	3574836	71.7448
0	4	2	2155	2200520	72.3959
0	4	3	2156	2450592	74.349
0	4	4	2156	3058524	71.224
0	4	5	3233	21523927	71.0938
0	5	2	2156	5180898	70.9636
0	5	3	1617	3926229	71.875
0	5	4	2156	7539868	73.3073
0	5	5	2155	14203948	70.7032
0	6	2	2155	3550044	68.75
0	6	3	1616	9703202	71.875
0	6	4	1617	28565269	71.6146
0	6	5	2155	75945718	69.9219
0	7	2	2156	6526110	69.7917
0	7	3	2156	33133922	72.0053
0	7	4	2156	142233504	71.224
0	7	5	1616	527078854	67.7084

0	8	2	1617	13036050	69.4011
0	8	3	2156	163830727	69.5313
0	8	4	1617	688912243	72.0053
0	8	5	1616	3435215336	66.9271
0.000001	2	2	2156	4662430	73.4375
0.000001	2	3	2155	5211617	76.0417
0.000001	2	4	2156	3872334	74.6094
0.000001	2	5	2695	3717117	73.698
0.000001	3	2	1617	2224234	72.7865
0.000001	3	3	2156	2003805	73.5678
0.000001	3	4	2156	3109724	69.0105
0.000001	3	5	2695	3798499	71.7448
0.000001	4	2	2695	2438735	72.2657
0.000001	4	3	2156	3622263	74.2188
0.000001	4	4	2156	3305362	71.0938
0.000001	4	5	2156	6845166	71.0938
0.000001	5	2	2156	3293505	71.0938
0.000001	5	3	2156	4377867	71.875
0.000001	5	4	2156	9849256	72.6563
0.000001	5	5	3234	16632443	69.9219
0.000001	6	2	1616	3348478	68.75
0.000001	6	3	1616	5594270	72.0053
0.000001	6	4	2156	26545296	71.7448
0.000001	6	5	2156	73128641	69.0105
0.000001	7	2	1617	8246428	69.7917
0.000001	7	3	2156	57350429	72.0053
0.000001	7	4	2155	140078255	71.0938
0.000001	7	5	1616	523649533	67.5782
0.000001	8	2	1078	8845737	69.1407
0.000001	8	3	2156	156071507	69.1407
0.000001	8	4	1617	623238317	70.4428
0.000001	8	5	2156	3617169774	67.8386
0.00001	2	2	2695	4698001	73.4375
0.00001	2	3	2695	4544401	76.0417
0.00001	2	4	2156	4014617	74.6094
0.00001	2	5	2156	4122944	73.698
0.00001	3	2	2694	2419872	72.7865
0.00001	3	3	2695	2992773	73.698
0.00001	3	4	2156	3257934	69.0105
0.00001	3	5	2156	3641665	71.7448
0.00001	4	2	2156	2586946	72.2657
0.00001	4	3	2156	2405859	74.2188
0.00001	4	4	2695	3100023	71.0938
0.00001	4	5	2155	6735221	70.9636
0.00001	5	2	2156	2570777	70.9636
0.00001	5	3	2156	5418573	72.1355
0.00001	5	4	2156	7227818	72.7865

0.00001	5	5	2156	16141463	70.3125
0.00001	6	2	2155	3899821	68.8803
0.00001	6	3	2156	10917989	71.875
0.00001	6	4	2156	26082340	72.2657
0.00001	6	5	2155	71835168	68.8803
0.00001	7	2	1617	4982026	69.9219
0.00001	7	3	1617	41819054	72.0053
0.00001	7	4	2156	141400831	70.1823
0.00001	7	5	2155	551492075	67.9688
0.00001	8	2	1617	12615672	69.4011
0.00001	8	3	2694	148963874	69.9219
0.00001	8	4	1617	832767439	70.573
0.00001	8	5	1617	3431205570	66.6667
0.0001	2	2	2156	5401327	73.4375
0.0001	2	3	2695	4254986	76.0417
0.0001	2	4	2694	3845926	74.6094
0.0001	2	5	2156	3671845	73.698
0.0001	3	2	1617	2326634	72.7865
0.0001	3	3	2155	2277051	73.698
0.0001	3	4	2695	3351173	69.0105
0.0001	3	5	2155	3956410	71.7448
0.0001	4	2	2695	2490474	72.2657
0.0001	4	3	2156	3595315	74.2188
0.0001	4	4	2155	6121360	71.3542
0.0001	4	5	2156	4721175	70.9636
0.0001	5	2	2156	3226676	70.8334
0.0001	5	3	2155	3382432	71.875
0.0001	5	4	2155	8999876	72.7865
0.0001	5	5	2155	18291322	70.4428
0.0001	6	2	2156	3183021	68.75
0.0001	6	3	2695	9695656	71.7448
0.0001	6	4	2156	31762303	71.7448
0.0001	6	5	4311	82631355	69.0105
0.0001	7	2	1617	6873191	69.7917
0.0001	7	3	5389	43499490	72.1355
0.0001	7	4	2156	139718239	71.0938
0.0001	7	5	1617	477894550	68.2292
0.0001	8	2	2156	8339127	69.4011
0.0001	8	3	1617	176601615	68.75
0.0001	8	4	1617	814254609	70.573
0.0001	8	5	2155	2933405552	66.7969
0.001	2	2	2695	5142093	73.4375
0.001	2	3	2694	4873158	76.0417
0.001	2	4	2156	3849699	74.6094
0.001	2	5	2695	3942397	73.698
0.001	3	2	2156	2367594	72.7865
0.001	3	3	2155	3077387	73.5678

0.001	3	4	2156	2858036	69.0105
0.001	3	5	2155	3402373	71.7448
0.001	4	2	2155	2769110	72.2657
0.001	4	3	2694	2820849	74.2188
0.001	4	4	2156	3729513	71.224
0.001	4	5	2156	5639542	71.224
0.001	5	2	1617	2853185	70.9636
0.001	5	3	2156	4249597	71.875
0.001	5	4	2156	7216500	73.3073
0.001	5	5	2156	14719721	70.573
0.001	6	2	2156	4093303	68.8803
0.001	6	3	1617	10146755	71.6146
0.001	6	4	2155	19703364	72.0053
0.001	6	5	2155	82226067	68.3594
0.001	7	2	2156	6877503	69.7917
0.001	7	3	2156	51569145	71.7448
0.001	7	4	2156	131879254	69.0105
0.001	7	5	2156	520596938	67.9688
0.001	8	2	1617	12897541	69.2709
0.001	8	3	4850	171324247	69.4011
0.001	8	4	4311	790402432	70.4428
0.001	8	5	2156	3077304402	68.75
0.01	2	2	2695	4831121	73.4375
0.01	2	3	2695	5293538	76.0417
0.01	2	4	3234	3912217	74.6094
0.01	2	5	2694	4554102	73.698
0.01	3	2	2694	2794979	72.7865
0.01	3	3	2695	3086010	73.5678
0.01	3	4	2695	3045051	69.0105
0.01	3	5	2695	4918969	71.7448
0.01	4	2	2155	2814382	72.2657
0.01	4	3	2695	4389724	74.2188
0.01	4	4	2695	3930002	71.224
0.01	4	5	2694	4195164	71.224
0.01	5	2	3234	3429320	70.9636
0.01	5	3	2694	3703644	71.875
0.01	5	4	3234	8298706	72.7865
0.01	5	5	2695	16298835	69.7917
0.01	6	2	2695	4197319	68.75
0.01	6	3	2694	10177475	71.4844
0.01	6	4	3234	26859503	71.7448
0.01	6	5	2695	77151881	67.8386
0.01	7	2	2695	5804998	69.7917
0.01	7	3	2694	43327567	71.6146
0.01	7	4	2695	139222408	70.4428
0.01	7	5	2695	495522429	66.2761
0.01	8	2	2695	12975150	69.2709

0.01	8	3	2156	205783441	69.5313
0.01	8	4	2155	744515406	71.4844
0.01	8	5	1617	3411209019	68.2292
0.1	2	2	2695	4703391	73.4375
0.1	2	3	2694	4930287	76.0417
0.1	2	4	2156	3370036	74.6094
0.1	2	5	1617	3832991	73.698
0.1	3	2	2156	2382146	72.7865
0.1	3	3	2156	2057161	73.5678
0.1	3	4	2694	3745142	69.0105
0.1	3	5	2156	3558666	71.7448
0.1	4	2	2694	2644074	72.2657
0.1	4	3	2695	2703897	74.349
0.1	4	4	2156	2556765	71.0938
0.1	4	5	1616	3436865	71.224
0.1	5	2	2156	2163333	70.9636
0.1	5	3	2156	4901723	71.875
0.1	5	4	2695	8748726	72.6563
0.1	5	5	2155	13557751	70.573
0.1	6	2	2156	3657833	68.8803
0.1	6	3	2694	10733669	71.7448
0.1	6	4	2694	30666623	71.875
0.1	6	5	2695	84543539	68.2292
0.1	7	2	2156	7175002	69.7917
0.1	7	3	2156	30570691	71.7448
0.1	7	4	2695	154202978	70.1823
0.1	7	5	2695	536368144	69.0105
0.1	8	2	1617	8355296	69.1407
0.1	8	3	2156	188774273	69.2709
0.1	8	4	2695	660609981	71.224
0.1	8	5	3234	4232572879	67.8386

Table A.14: Results of 10-fold Cross Validation on Diabetes data set