Significance of Attributes to Explore Accuracy Using Various Classifiers

Shraddha Kavathekar
ME (Computer Engineering)1st year
PCCOE, akurdi, Pune, India

Shraddha Tadmare
ME (Computer Engineering)1st year
PCCOE, akurdi, Pune, India

Dhanshri Kamble
ME (Computer Engineering)1st year
PCCOE, akurdi, Pune, India

ABSTRACT

Data mining is a process of extracting knowledge from a huge set of data. The major components of data mining techniques are classification, association rules and sequential analysis. Classification is an important data mining technique with immense applications to classify the different kinds of data used in nearly every field of our life. Classification is a data mining (machine learning) technique used to identify group membership for data occasion. In this paper the basic classification techniques such as Naïve Bayes, Naïve_bayes_simple, Random Forest, and J48 are experimented. The aim of this study is to provide an interdisciplinary review of different classification techniques in data mining and use of variety of datasets such as iris, diabetes and soybean for experimenting accuracy of divergent classifiers. Also, the paper discusses on selection of attributes based on their significance using best first search method.

Keywords
Data mining, Classification, j48, Naïve Bayes, Naïve_Bayes_simple, Random forest classifier, Attribute selection, Accuracy.

I INTRODUCTION

1.1 Data Mining

Data mining [3] is an approach to perceive interesting knowledge, such as associations, patterns, anomalies, changes and significant structures from tremendous amount of data stored in information repositories. Data mining is a major elevation in the type of analytical tools. Data mining is a multi-disciplinary field which is an integration of machine learning, statistics, database technology and artificial intelligence. This technique includes number of phases: Business understanding, Data understanding, Data preparation, Modelling, Evaluation, and Deployment. There are 5 data mining techniques such as Association, Classification, Clustering, Neural Network and Regression.

1.2 Classification[5]

Classification is used to stratify the item according to the features of the item with respect to the predefined set of classes. Classification is a data mining (machine learning) technique used to envisage group membership for data instances. A classification task begins with a data set in which the class assignments are known. For example, a classification model that predicts credit risk could be enrooted based on scrutinize data for many loan applicants over a period of time. This paper compares the different classifiers with their accuracy for variant datasets.

1.3 Algorithms

1.3.1 Naïve Bayes

The Naive Bayes algorithm [5] is a simple contingency classifier that calculates a set of probabilities by counting the frequency and consolidation of values in a given data set. The algorithm uses Bayes theorem and estimate all attributes to be independent given the value of the class variable. The simulation as Naive yet the algorithm tends to perform well and learn speedily in various supervised classification. It performs different applications such as sentiment analysis, document categorization and email span filtering Naive Bayesian classifier is deployed on Bayes theorem and the theorem of total probability.

$$P(C|X) = \frac{P(X|C).\,P(C)}{P(X)} \quad \ldots\ldots (1)$$

Where P (C|X) is the posterior probability, P(C) is the prior probability, P(X) is predictor prior probability [2]

1.3.2 J48 [1]

J48 classifier is a simple C4.5 decision tree for stratification. In the Weka tool, it is an open source java implementation of C4.5 algorithm. With this technique, a binary tree is composed to model the classification process. Once the tree is created, it is applied to each tuple in the database and results in categorization for that tuple. The supplementary features of J48 are handling missing values, decision trees pruning, continuous attribute value ranges, extraction of rules, etc.

1.3.3 Random Forest [8]

Random forest (or random forests) is an ensemble classifier that consists of many decision trees and outputs the class that is the mode of the class's output by individual trees, that operate by constructing a multitude of decision trees at training time and outputting the class that is the mode of the classes (classification) or mean forecasting (regression) of the individual trees. It is one of the most accurate learning algorithms available. For many data sets, it produces a highly accurate classifier. It runs efficiently on large datasets and handles thousands of input variables without variable deletion or any errors. It gives estimates of what variables are important in the classification. It uses a Bagging approach to create a bunch of decision trees with random subset of data. The output of decision tress in the random forests is combined to make the final prediction. the final of the random forest algorithm is extracted - by surveying the results of each decision trees and just by going with prediction that appears the most times in decision trees.

II PROPOSED METHOD

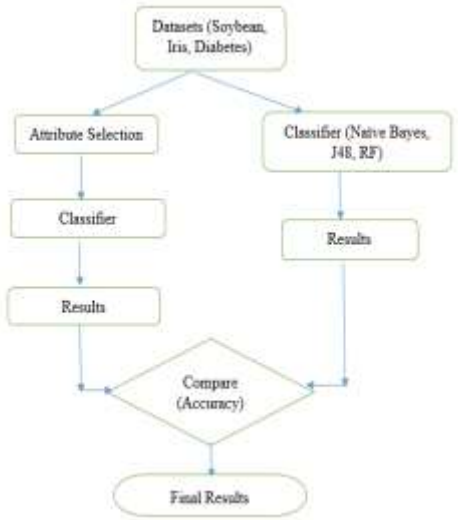


Figure 1. Working Model

Fig (1) shows Different datasets are selected for classification such as iris, diabetes and soybean. Classification techniques used are naïve Bayes, j48, random forests. This paper estimates the accuracy for the above three datasets and comparison is done for different classifiers. The attributes are selected and their accuracy is calculated as shown in the below tables to see whether the accuracy is reduced if the attributes are reduced and which classifier gives highest accuracy for the three datasets. Some of the attributes are pruned from the datasets and their accuracy is calculated. Comparison is done to see whether the classifier maintains the same accuracy without pruning selected attributes.

II DATA SETS

We have used different datasets and tested in Weka to check their accuracy for different classifiers. Datasets were taken from UCI Machine Learning Repository .

1.1 Iris Dataset

The Iris dataset contains different types of irises (Sentosa, versicolour, verginika) petal and sepal length stored in 150*4 numpy, ndarray. This is feasibly the best-known database to be found in the pattern recognition works. In the iris dataset the Number of attributes are 4, Number of instances are 150 and the Attribute characteristic of whether dataset is real. [17]

1.2 Soybean Dataset

In the soybean dataset the Number of attributes are 35, Number of instances are 47 and the Attribute characteristic of whether dataset is categorical. [18]

1.3 Diabetes

In the diabetes dataset the Attributes are 9, including instances 768. The different attributes of dataset are preg, plas, pres, skin, class[19]

III EXPERIMENTAL RESULTS

This paper presents different classifiers in weka and testing different datasets for above algorithms. Following table described their accuracy. The result shows that Iris dataset sworks well with Naïve Bayes as compared to Naive_Bayes_Simple, Random forests and J48. For soybean dataset accuracy is calculated for the entire dataset and by selecting random attributes the results show that for soybean dataset when some random attributes pruned then accuracy is reduced. Naive bayes has maximum accuracy 92.97% for soybean dataset. For iris dataset the results are similar for whole dataset as well as for selected attributes. Naive bayes gives highest accuracy 96%. For diabetes dataset when attributes are randomly selected their accuracy is reduced, whereas for whole dataset it is increased and for naïve bayes is shows highest accuracy 76.30%. The overall observation of this paper gives, Accuracy for Naïve Bayes is highest 96% in comparison with other classifiers as showed in below table. The highest accuracy for datasets for varied classifiers in visualized in the table.

The formula to calculate accuracy is:

1. $$\text{Accuracy} = \frac{TP+TN}{P+N} \quad \text{----- (2)}$$

In the equations (2) above Accuracy represents Total Accuracy, TP is True Positive, TN is True Negative, FP is False Positive and FN is False Negative.

Table 1.1. Operations on Soybean Dataset

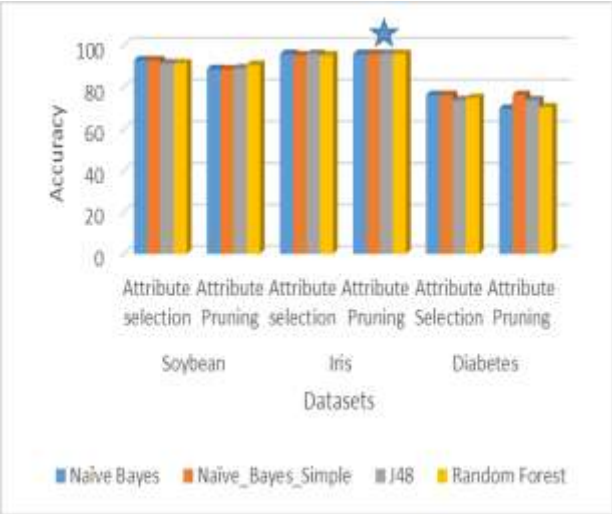
Algorithm Used	Attribute Selection	Attribute Pruning
Naïve Bayes	92.97	88.72
Naïve Bayes simple	92.97	88.57
J48	91.50	89.16
Random Forest	91.50	90.77

Table1.2. Operations on Iris Dataset

Algorithm Used	Attribute Selection	Attribute Pruning
Naïve Bayes	96	96
Naïve Bayes simple	95.33	96
J48	96	96
Random Forest	95.33	96

Table1.3. Operations on Diabetes Dataset

Algorithm Used	Attribute Selection	Attribute Pruning
Naïve Bayes	76.30	69.79
Naïve Bayes simple	76.30	76.30
J48	73.82	73.82
Random Forest	74.86	70.44



IV CONCLUSION

The results obtained demonstrates that the classification performance of four different data mining models - Naive Bayes, Naïve bayes simple, J48, Random Forest are different for varied datasets. When some attributes are pruned randomly the accuracy is reduced. Experimental results have shown the effectiveness of models. Naïve Bayes has highest accuracy for Iris dataset 95.53%. We also calculated error rate for different classifiers for iris dataset. We discovered that the two parameters accuracy and error rate for iris dataset gave different results for different classifiers. Highest accuracy was given by naïve_bayes and lowest error rate was given by J48 4.95.

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