Predicting Future Equipment Market Demand for a Retail Shop

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Declaration

I declare that this Thesis is my own work and has not been submitted in any form for another degree or diploma at any University or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledge in the text and a list of references is given.

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Abstract

Equipment Market in Sri Lanka facing various problem. For example Equipment Market introduce new versions with new features Passion and Fashion. So people would like to buy newly introduced equipment in the market or latest versions. But they don't have a clear idea when they select their dream equipment. So they spend their valuable time for selecting their loveable one. And sellers also have issues for keeping the stock, and they don't know which customers going to buy which one or customers most preferable one. Sales persons also spent time with customers but unfortunately they can't satisfy their customer's requirement.

The Sellers must need their customers feedback for improve their future customer services. Otherwise they don't understand customer expectations.

The Sellers must know how to maintain their stock. For example which equipment has most selling rate which has less is selling rate and which season or which month how to track the stock.

So these above issues have to wind up and both The Sellers and The Consumers save their valuable time, customers get a good customer service and take their dream equipment and the seller give a best idea for the customers.

So seller need a good product for solve above issue.

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CHAPTER 01

1. Introduction

1.1 Prolegomena

How people do things in the modern world have been by the development in Information Technology. Its influences have reflected in many disciplines including Medicine, Engineering, Science, and other allied areas. This Thesis has researched into use of the Modern prediction future equipment market for retail shop. Customer choosing the right equipment is crucial for the success of every equipment company because customer requirement the external market conditions and the internal scope for action, In operational practice return on investment is the most important decision criterion for occupying new equipment. From this point of view, decisions are micro economic investment problems. Consequently, the prediction of turnover for a potential equipment becomes essential for every purchase/sell decision. But the sales forecast still poses one of the greatest challenges of retail market planning of today.

One of the largest and fastest growing industries in the global market is equipments such as ipad, ipod, iphones, smart phones, tablets, laptops. Being the leader in product and process technologies in the marketing sector, it has been recognized as one of the drivers of economic growth. For realizing the sector's full potential well directed efforts have been made to provide a new look to the equipment policy.

The equipment world is rapidly changing day by day. Both sellers and customers get confused. Sellers confused if they keep good stock and the demand is less or suddenly introduce new version of the equipment in the market their investment going to lose. And the market price also going to down day by day in the particular equipment. Customers get confused which model is better choice for their personal use.

This research is aiming to identify customer requirements. The reason behind to identify that area is, reduce the problem facing when the purchaser buy a new equipment/ the seller sell a new equipment. And also to identify where there is a need to maintain stock the equipments to provide/ satisfy their requiments in efficient manner.

1.2 Background and Motivation

Customers always have the issue with select or choose an item which is most compatible for their requirement. Even if they going to buy a dress or gift or shoes or

handbag or house hold items they get confused and they didn't have better idea. For example they plan to buy a Television. They go to shop and seek a television. The problem starts at the moment. In the shop has various models such as Apple, SAMNGSUNG, LG, Abans, Sony, National, screen sizes such as 32", 37", 42", 46", 50", 55", 60", 65", 70", 75", wide screen, Screen Type such as LED, LCD, Dimension 2D or 3D and these days smart TV also available in the market now. They confused which one will going to buy. They get headache to choose which one is satisfy their requirements.

For example they are elderly people like more than 60 years old they don't want any smart Tv or 3D screen. If the customer have children they would like to watch 3D Cartoons or 3D movies like spider man or playing 3D game like X Box they must have to buy a smart TV.

And another big issue is the price or budget. Customer need an item with their affordable price.

So sellers and customers can't make decision for their ideal item. Confused with more than one item may be three or four.

Customers requirements depend on their age salary package their children age profession

So if the seller gives a better solution for their customer to choose their dream equipment, customers get an idea about the equipment.

No need to waste of time and getting irritation both customer and seller.

Sometimes both customer and seller spent a lot of time and customer didn't choose the item.

Above reasons I plan to do the predict of equipment which one is most probably to choose an item when they going to buy.

1.3 Aim and Objectives

By looking at the above requirements we can clearly see that there is a big demand for the equipment market within the next years in Sri Lanka. Sellers must be maintaining their stock to satisfy their customer requirements. When the technology is also involving and the demand of the equipment market is major concern. So sellers need to find the solutions to customers to satisfy their requirements. As well as sellers also need to maintain a proper stock.

According to the Literature review there is no such research is conducted in Sri Lanka related to the equipment market. The ai of the research is to fill the gap and analyze the equipment market predict the equipment to the customer/ provide a good solution for customer to buy their dream ideal equipment.

1.3.1 Research Plan

Business efficiency and cost

Governance and risk

Provide best customer service

Regular update new items

Global challenges

Maintain good inventory control system

1.3.2 Objectives

Prepare Terms of reference in order to identify project background, the project aims, project scope and objectives.

Conducting a detailed literature survey and review on the following areas, in order to gain in-depth knowledge and to propose a solution.

Monthly sales percentage for each and every equipment

Which equipment or model suit for the particular customer. It depends on age, salary and profession.

Offline support forum for customers who verify about equipments or wants more information

Prepare a system requirement specification and define functional requirements and non-functional requirements in order to guide the design and implementation of the prototype.

Carry out an evaluation for the targeted audience of all groups especially farmers and experts, in order to identify the applicability of the prototype and potential methods or further improvements to the prototype.

Preparing and submitting the final report detailing the project life cycle and all activities carried out by the author.

1.4 Structure of the Thesis

This rest of the Thesis is organized in Six Chapters. The rational for the conduct research work is in the Introduction. Issues in Equipment Market is provided in Chapter 2, it is include Literature review also. The next chapter will described about Technology Adopted to the research in Chapter 3. Technology Adopted to the research in Chapter 4. Implement Data Mining Techniques in Chapter 5, Experimenting Data Mining Techniques in Chapter 6, Implement Data Mining Techniques in Chapter 07. Evaluation Chapter 08 concludes the Thesis with the note on further work.

1.5 Summary

The chapter description of the overall picture of the Thesis. Chapter 02 will be discussed about Literature Review.

CHAPTER 02

2. Issues in Equipment market

2.1 Introduction

Chapter 1 presented introduce the research. This chapter discuss about already people predict the future in the market product using techniques, their findings, barriers pros and cons, and conclusion.

2.2 Others work

Jahanbin and core workers have reviewed about New Product Sales Forecasting in the Mobile Phone Industry: an evaluation of current method (Jahanbin et al., n.d.).Their applications and development, through a survey of literature to assess the likely effectiveness of a range of new product. This work mentioned about to Sales forecasting methods in the mobile phone industry using Data Mining Techniques. These methods includes managementjudgment, prediction and preference markets, intention surveys, diffusion models, conjointanalysis, market testing, and agent based modelling. Authors of the current study have faced a big challenge. It is short life cycle products. New product introduction has led to shortened life cycles for products in many industries, especially products in high-tech sector such as mobile phones. Many authors have indicated issue about above mentioned topic.(Kabakchieva, 2013).

However Goodwin, Dyussekeneva and Meeran, have conducted a research on Demand forecasting is crucial for firms operating in this environment who need to make decisions relating to future production capacity, marketing budgets, human resource planning, and research and development(Goodwin et al., 2013). In particular, forecasts of sales time series will be required to estimate the discounted future returns on the investment to assess its likely return and viability. Probably the only limitation of this work is, they used secondary data on the annual national sales of products, rather than data on specific brands or generations of a product and their data did not allow them to distinguish between adoptions and sales. Also their data did not containing formation on the marketing strategies that accompanied the launch of new products or on barriers to entry or regulatory conditions. Further, their analysis was

confined to consumer electronic products, though as they saw earlier, for durable products, variations of sales patterns between product groups may be no greater than variation within groups. In addition, they used proxy estimates of the market saturation level which were derived from information that could not have been known at the time when the forecast was made (though this advantage was common to all of the forecasting methods that were being compared). For many products data on all the years up to market saturation was either not available (because the products had been launched relatively recently) or could not be used (because only the sales figures for the analogies that pre-dated the launch of the targets could be used).
However, this is likely to be a problem for analogy-based new product forecasting in general
where the need to use recent analogies means that their full sales history will not yet have evolved.

In a similar study Mahendra Tiwari and his team proposed the use of data mining technique to help retailers to identify customer profile for a retail store and behaviours, improve better customer fulfillment and retention(Tiwari et al., 2012). The aim is to evaluate the accuracy of different data mining algorithms on various data sets.

In the similar Anshul Goyal and Rajni Mehta, also reviewed about Comparative Analysis of Bayes and Lazy Classification Algorithms(COE, n.d.).The performance investigation depends on many factors about test mode, different nature of data sets and size of data set J48 gives more classification accuracy for class gender in bank dataset having two values Male and Female. The result in the study on these datasets also shows that the efficiency and accuracy of j48 and Naive bayes is good. In the present study few issues like high dimensionality, Scalability and accuracy are focused but there are still many issues that can be taken into consideration for further research which are as follows: 1. Different algorithms which are not included in WEKA can be tested. Also, experiments with various feature selection techniques should be compared. 2. Classification technique of data mining is useful in every domain of our life e.g. University domain category wise, Medical domain, crime domain, Auto Price, Zoo etc. 3. Confusion matrix given by weka tool can also be

removed by changing in implementation of algorithms that are already used in weka tool.

Research	Limitations
New Product Sales Forecasting in the Mobile Phone Industry: an evaluation of current methods	It is short life cycle products. New product introduction has led to shortened life cycles for products in many industries, especially products in high-tech sector such as mobile phones.
Comparative Analysis of Bayes and Lazy Classification Algorithms	1. Different algorithms which are not included in WEKA can be tested. Also, experiments with various feature selection techniques should be compared. 2. Classification technique of data mining is useful in every domain of our life e.g. University domain category wise, Medical domain, crime domain, Auto Price, Zoo etc. 3. Confusion matrix given by WEKA tool can also be removed by changing in implementation of algorithms that are already used in WEKA tool.

Table 2.1: Literature Review Research and Limitations

2.3 Summary

Others work gives a clear picture about this research. I found the parameters, and all other technical issues.

In the next chapter, technologies used to develop the proposed application will be discussed.

CHAPTER 03

3. Technology Adopted to the Research

3.1 Introduction

Chapter 2 presented others work. It discussed about other people who are facing regards prediction the future market demand. Its identified the problems, solutions, and barriers. This Chapter describes the data pre-processing that was carried out for this research work. How the questionnaire is developed and the data mining technology is selected for the evaluation.

3.2 The Questionnaire Method

A questionnaire was designed with the objective of obtaining behavioral patterns of different group of people that were going to be studied as a whole. These questionnaires have had different structures and contained different questions are added for that.

The questionnaire is basically focused on the requirement with different variety of people about equipments.

The questions about age, Maritual status, No.of Children, Education, Profession, salary package, like eupment, brand, and version.

3.3 Data Mining Approach

Data mining technology is adopted to identify the pattern and some statistical analysis to come up with a conclusion about the hypothesis development.

3.3.1 Data mining process

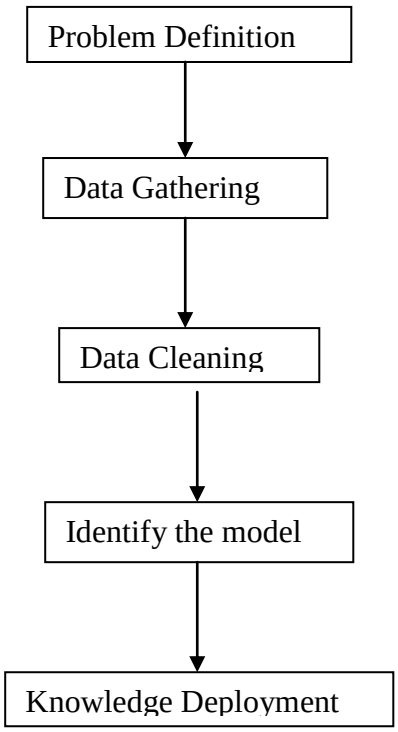


Figure 3.1: Fore casting Model

3.3.2 Problem Definition

This initial phase of a data mining project focuses on understanding the project objectives and requirements. Once you have specified the project from a business perspective, we can formulate it as a data mining problem and develop a preliminary implementation plan.

3.3.3.Data Gathering

The data understanding phase involves data collection and exploration. As we take a closer look at the data, we can determine how well it addresses the business problem.

3.3.4 Data Cleaning

We might decide to remove some of the data or add additional dat. Fill in the missing values, smooth noisy data, identify/ remove outliers, and resolve inconsistencies. This is also time to identify data quality problems and to scan for patterns data.

3.3.5 Identify the model

In this phase, we select different parameters apply various modeling techniques to optimal value.

3.3.6Knowledge Deployment

Knowledge deployment is the use of data mining a target environment. In the deployment phase, insight and actionable information can be derived from data.

3.4 Laravel frame work

Laravel is a free, open-source PHP web framework, created by Taylor Otwell and intended for the development of web applications following the model–view–controller (MVC) architectural pattern. Some of the features of Laravel are a modular packaging systemwith a dedicated dependency manager, different ways for accessing relational databases, utilities that aid in application deploymentand maintenance, and its orientation toward syntactic sugar

3.5 PHP Scripting Language

The proposed predicting system was developed as client server architecture, therefore the PHP server side scripting language was adopted to process the client requests and to perform the database requests. The main reasons to use this server side scripting language over the other languages are appended below.

- Free and open source
- Easy to program since it is similar to C/C++ syntaxes
- Platform independent and supports for major web servers

3.6 MySQL database management Tool

The MySQL free database tool is used to store general data of the system

3.7 XAMPP Server

The XAMPP server is a free web development environment for Windows operating system.

3.8 JQuery JavaScript library

JQuery JavaScript library used to increase the interactivity of the system. Built in functions in this library will be used to perform the requests from the database using the Asynchronous JavaScript and XML(AJAX)

3.9 Bootstrap

It is an HTML, CSS, Java Script framework that can use as basic for creating web sites or web applications.

3.10 CSS

CSS stand for Cascading Style Sheets. CSS describes how HTML elements are to be displayed on screen, paper, or in other media. CSS serves a lot of work. IT can control the layout of multiple web pages all at once. Explain style sheets are stored in CSS files.

3.11 Summary

The questionnaire is designed to support in the future equipment market analysis in a methodical way. When identifying technologies to adapt to the research, data mining approach is identify the best way to do the research.

CHAPTER 04

4. Implement Data Mining Techniques

4.1 Introduction

Chapter 3 discussed the technology for giving Predict Future equipment market demand for a retail shop sufficiently full filled. This chapter present our approach to developing the Predict Future equipment market demand for a retail shop sufficiently full filled under several headings, namely, hypothesis, input, output, process, users and features. This chapter highlights the key features that distinguishes the existing approaches to predict evaluation. The chapter highlights how the novel approach offers a cost effective and efficient solution for prediction.

4.2 Questionnaire

I collect from the particular shop. The questionnaire is already published in the Google Survey and the URL gave to the particular shop. The customer who visited the shop, they request to fill the forum. After 1 year I collected from the Google survey

4.3 Hypothesis

The test with a null hypothesis that the row and the column variables are independent, or unrelated, if that assumption was true one would expect that values in the cells of the table are balanced.

The Chi-Square (x^2) analysis for dimensionally Reduction

	X	**Y**	**Totals**
A	$r_1 * c_1$ / total	$r_1 * c_2$ / total	r_1
B	$r_2 * c_1$ / total	$r_2 * c_2$ / total	r_2
Totals	c_1	c_2	*total*

Table 4.1:Typical cross tabulation.

To determine what is meant by balanced, consider the tabulation data in example as in table 4.2 with two variables, age and brand of this work. For example It is to be decided on whether there is a relation between age (Youth, Middle, Elder) and device (Apple, Samsung, HTC, Laptop) or weather the two variables are independent of each other.

	Apple	Samsung	HTC	Laptop	Total
Youth	12	24	19	8	63
Middle	47	44	15	21	127
Elder	18	22	12	8	60
Total	77	90	46	37	250

Table 4.2: Example - Typical cross tabulation .

Now it is to be understood what kind of distribution in the various cells one would expect if the two variables were independent. Supose the expected value of device = "apple" and age = "Youth" has to be computed as shown in table 4.1 applying the formula in table 4.2. It is 63*77/250 = 19.4. Similarly the expected values of all cells are to be computed. Now the chi square value is given by the equation (4.1).

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} (O_{ij} - E_{ij})^2 / E_{ij}$$

Figure 4.1 Chi-Square Equation

So the difference between expected value and actual value has to be squared and divided by the expected value. This has to be repeated for each cell and added up finally to get chi-square value of 11.7.

In statistics, the number of degree of freedom is the number of values in the final calculation of a statistic that are free to vary in a chi-Square test the degrees of freedom is given by (r-1)*(c-1) which is (4-1)*(2-1) = 3 in this case. Now in a statistical table called, chi-square table, the degrees of freedom row labeled 3 has to be located and the corresponding cell critical value which is close to the chi-square value 11.7 towards its right also has to be located. For that cell find the corresponding probability value which is nothing but I its corresponding column label. Chi-square test says that if this probability value is less than 0.05, the variables are not independent or the null hypothesis may be rejected. In our work, this value was observed to be much below 0.05 and was close to 0. Hence it was concluded that the variables are dependent.

	Apple	Samsung	HTC	Laptop	Total
Youth	63*77/250 = 19	90*63/250 =23	63*46 /250 = 12	63*37/250 =9	63
Middle	127*77/250 =39	90*127/250 =45	127*46/250 = 23	127*37/250 = 19	127
Elder	77*60/250 =19	90*60/250 =22	60*46/250 =11	60*37/250 =9	60
Total	77	90	46	37	250

Table 4.3:Steps and out put- Typical cross Tabulation.

List of attributes extracted and found to be the deciding attributes by square test: They are age, has children, job, sex, education and salary. The significance of each of these attributes is given below.

Age: value taken by set {Youth , Middle, Elder}

(Youth < 25, Middle 26-40 Elder 40 >)

Has children: It tells about customer has children or hasn't. If the customer has children the value is Yes otherwise the value is No.

Job: It describe about customer job. It can take any value from the set {Doctor, Engineer, Teacher, Other}

Sex: {M/F} But the data set shows male and female both are same percentage which is 50% so it not influences our output. So we can ignore this attribute.

Education: value taken by set {Bachelors, Masters, Other}

Salary: value taken by set {Low, Middle, Upper Middle, High} it indicate Low <25,000. Middle 25,000 – 50,000. Upper middle 50,000-75,000. High > 75,000.

Statistics and data mining are two closely related fields. Hence lot of researches are still happening in the domain of better attribute dependency analysis techniques related to the fields of statistics and data mining. One such work is described in.

4.3.1 Data cleansing techniques.

The cleansing stage makes data more consistent using checks and validations. Cleaning stage converts the data to standard formats by fixing data ranges, encoding etc to standard file format like excel sheet or data base formats depending on the model used. For replacing missing values for numeric attributes, arithmetic mean substitution can be used. For categorical data mode substains may be used, where the most repeated value is substituted. For example if the data for marital status is missing

in data corresponding to has children = “Yes” it can be replaced with married since that is the most usual case.

Since this research work had used the data very carefully collected by Google survey, the scope for data cleaning was very limited. The Google survey answers had used concepts like mode substitutions, table look up functions etc for data cleaning. The main data preprocessing function that was done in this work was the data normalization and attribute transformations. It was done for the modeling. Also the computation of placement chances for each of the attribute permutations (For example Age =Youth, Has Children =Yes, profession = Doctor , Education = Masters, Salary = High How many have buy an apple model phone) and preparation of the final data sheet for data mining are worth mentioning. Thought the data sets used for all the models were same, they were tested using different Test data different model by using WEKA tool. The respective data set preparations are described in the following sections.

4.4. Data Set

For prediction problem using naïve Bayes classifier, J48 decision tree, KStar and ZeroR models and a package called WEKA was used, WEKA is a collection of machine learning algoritham for dat mining tasks. WEKA contains tools for data pre-processing, classification, regression, clustering, Association rules and visualization. It is also well-suited for developing new machine learning algorithms.

All of WEKA’s techniques are predicted on the assumption that the data is available as a single flat file or relation, where each data point is described by a fixed number of attributes (normally, numeric, or nominal but some other types are also supported)

WEKA’s main user interface is the Explorer, but essentially the same functionality can be accessed through the Component-Based Knowledge Flow interface and from the commend line. There is also the Experimenter, which allows the systematic comparison of the predictive performance of WEKA’s machine learning algorithm on a collection of datasets.

The explorer interface has several panels that give access to the main components of the workbench. The Pre-Process panel has facilities for importing data from a database, a CSV file etc. and for pre-processing this data using a so-called filtering algorithm. These filters can be used to transform the data (Example numeric attributes

into discrete ones) and make it possible to delete instances and attributes according to specific criteria. WEKA input must be in arff format (Attribute related file format)
In WEKA software, a relation name is represented a
@RELATION equipment
A list of Attributes definitions
@ATTRIBUTE Age {Youth, Middle, Elder}
@ATTRIBUTE HasChildren {Yes, No}
@ATTRIBUTE Profession {Doctor, Engineer, Teacher, Other}
@ATTRIBUTE Education {Beachelor, Masters, Other}
@ATTRIBUTE Salary {Low, Middle, UpperMiddle, High}
@ATTRIBUTE Device {Apple, Samsung, Laptop, HTC}
@DATA Youth,Yes,Doctor,Bachelors, High, Apple

The same dataset used in all 4 models. Sample data is shown in Table 4.4. Only difference is that for data porting from excel format to arff format, WEKA package was used in Figure 4.2. It is a popular tool developed by University of Waikato, New Zealand.

Age	Has Children	Job	Education	Salary	Device
Middle	No	Engineer	Masters	Middle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	Yes	Other	Other	Middle	HTC
Elder	Yes	Engineer	Masters	High	Samsung
Elder (Continues…..)	Yes	Other	Masters	High	HTC

Table 4.4 Sample Partial Dataset

A data sheet similar to the one given in table 4.4 was prepared. From this data sheet the decision tree was constructed using the decision tree construction algorithm J48. The test data set consisted of 250 such records each representing one particular combination of input attribute say for example Age = Youth, Has Children =Yes, Profession = Doctor, Education = Bachelor, Salary = High and its corresponding placement chance as one among (Apple Samsung HTC Laptop)

4.5 Test Set

Test Set refer to that portion of the data used only at the end of the model building and selecting process to access how well the final model might perform on additional data. In this situation I have used 3 different Test Set generated by WEKA tool to select the above mentioned 4 models

4.6.1 First Test set conditions

1. Inver Selection : False
2. NoReplacement : True
3. Random seed : 1
4. Sample size Percentage : 60% and WEKA generate the test set with 150 Instances

4.5.1. Sample Test data set

@relation equipment-weka.filters.unsupervised.instance.Resample-S1-Z60.0-no-replacement					
@attribut	Middle	Elder}			
@attribut	No}				
@attribut	Engineer	Teacher	Other}		
@attribut	Bachelors	Other}			
@attribut	Middle	upperMid	High}		
@attribut	Samsung	Laptop	HTC}		
@data					
Middle	No	Engineer	Masters	Middle	Samsung
Middle	No	Other	Other	upperMid	Samsung
Middle	Yes	Other	Other	Middle	HTC
Elder	No	Engineer	Masters	upperMid	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Elder	Yes	Doctor	Bachelors	High	Samsung
Middle	No	Teacher	Bachelors	Low	Laptop

Continue……

Figure 4.2:Test Data set 1

4.6.2 Second Test set conditions

1. Inver Selection : True
2. NoReplacement : True
3. Random Seed : 1
4. Sample size Percentage : 60% and WEKA generate the test set with 60

Instances

4.6.1.1 Sample Test data set

@relation	equipment-weka.filters.unsupervised.instance.Resample-S1-					
@attribut	Middle	Elder}				
@attribut	No}					
@attribut	Engineer	Teacher	Other}			
@attribut	Bachelors	Other}				
@attribut	Middle	upperMid	High}			
@attribut	Samsung	Laptop	HTC}			
@data						
Elder	No	Engineer	Masters	upperMid	Samsung	
Middle	No	Other	Bachelors	Middle	Samsung	
Middle	No	Other	Other	Middle	Laptop	
Elder	No	Other	Masters	High	Apple	
Youth	No	Other	Other	upperMid	Samsung	
Middle	No	Other	Bachelors	Middle	Samsung	
Youth	No	Other	Other	Low	Samsung	

Table 4.4:Test data set 3

4.6.1.2 Third Test Set Condition

1. Inver Selection : False
2. NoReplacement : True
3. Random Seed : 1
4. Sample size Percentage : 50% and WEKA generate the test set with 30 Instances

4.6 Summary

This chapter described the various data pre-processing steps that were adopted for this research work. In Google survey questionnaire data collection process is very systematic since its inception. The next chapter shows the design of the novel approach presented here. In dataset all users who are any age, that is in age A, Data of the age Youth was used as training set and data of age elder was used as test set for this work also to further verify the results, data of the age elder was used as test set eth its data of the age middle and Youth as training set. The results were good and comparable with the case of the model with youth test data. Even thought the same training data and test data were used for all the models. Their individual data format requirements varied and in this chapter the data formats for the individuals models and corresponding transformations were discussed.

CHAPTER 05

5. Experimenting with data mining models

5.1 Introduction

This chapter explains the experimental set up and the procedure used for each of the data mining models. In each of the sub sections the tools, input file formats and the experimental procedure used for respective models and described.

5.2 Experimental Background

As explained in chapter 1, the main goal of this work is to propose an efficient data mining model for phone user chance prediction. The effectiveness of each of the four models for this problem was to be tested. As already known, each of the models have tested by three test data set. As Google surway data set had a plan to have a web based application which can help the device hunting for users or customers to choose a good or suitable device. Each and every models with correctly differences analysis

In the following sections, the modelling and experimental background for each of the four models are described. In the next chapte the detailed performance comparison of these models with respect to various evaluation creteria and evaluation.

5.3 Find the model

All four (Naïve Bayes, J48, ZeroR, KStar) models tested by three above mentioned test set. Then the correctly instance observed below.

	Naïve Bayes	KStar	J48	ZeroR
1st data set	54.5%	52.7%	53%	50%
2nd Data set	63%	50%	56%	52%
3rd data set	50%	50%	50%	52%

Figure 5.1:Results in all four models with three test data set.

2nd Test data set and models Naïve Bayes and J48 were selected.

5.4 J48 Decision Tree

As described in chapter 4, the initial database got by Google survey was in spreed sheet format. Later it was converted to CSV files (Comma Sepeated files) and thi file was loaded to MS Excel. Important attributes were found using chi square attribute analysis and they were Age(Youth, Middle, Elder), Has children(Yes, No), Education(Bachelors, Masters, Other), Profession(Doctor, Engineer, Teacher, Other), Salary(High, Low, Middle, UpperMiddle).

A new table was created in which the placement chance for each possible input combination was stored. For e.g for Age (Youth), has children (yes), Profession (Doctor), Education (Bachelors) Salary (High), the percentage of customer who had acctually bought apple database was computed. If this percentage is greater than 95%, this combination was classified as “Apple”, device . This decision tree is physically stored as an adjacency list. As an example, the adjacency list corresponding to the partial view of the decision tree given in figure 5.1 is showed in table 5.1

The decision tree was constructed and it was tested with data. The performance analysis of this model is described in chapter 6. As discussed earlier, decision tree algorithms are also available with WEKA data mining package. Now in order to optimise its performance using a parameter tuning strategy, it was implemented in WEKA.

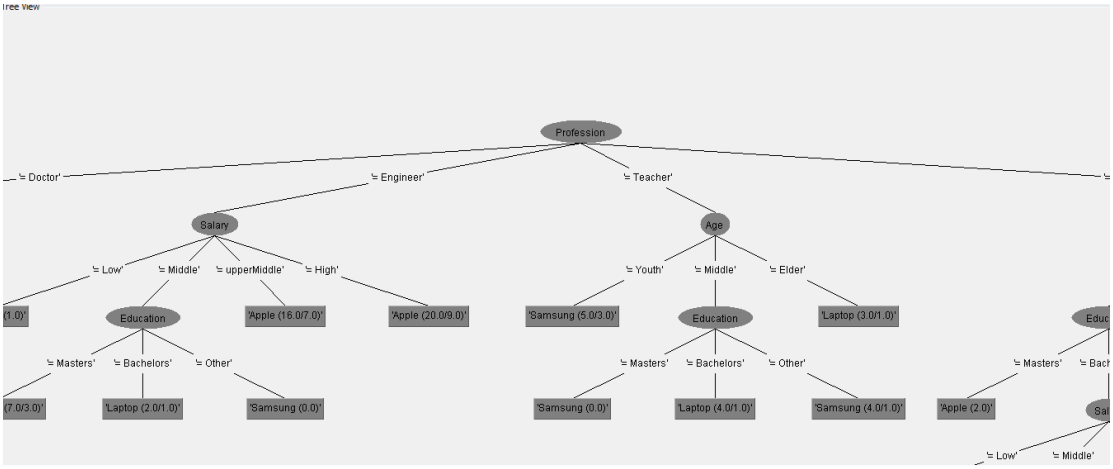


Table 5.2:Partial J48 output.

5.5 Naïve Bayes classifier

This classifier was implemented using WEKA 3.6 package.Naive Bayes algorithms are available in the clasify pane of this package and using default settings and supplying a separate training and test et option, the experment can be conucted. The same training and test data sets were used as the case of other models. WEKA contains tools for data pre-processing, modelling, testing and visualisation. It is also well-suited for developing new machine learning schemes. The Initial database has taken from Google Survey was loaded to MS Excel and converted to CSV files (Comma Seperated files). This file was loaded in WEKA Knowledge flow interface and converted into ARFF files (Attribute Relation File Format), which is the WEKA standard file format.

An experimental setup for using WEKA to model classifiers is shown in figure 5.3

Training set for naïve Bayes Theoram

=== Classifier model (full training set) ===

Naive Bayes Classifier

	Class			
Attribute	Apple	Samsung	Laptop	HTC
	(0.31)	(0.36)	(0.15)	(0.19)
==========	==========	==========	==========	==========
Age				
Youth	13.0	25.0	9.0	20.0
Middle	48.0	45.0	22.0	16.0

Elder	19.0	23.0	9.0	13.0
[total]	80.0	93.0	40.0	49.0

Child

Yes	31.0	28.0	13.0	18.0
No	48.0	64.0	26.0	30.0
[total]	79.0	92.0	39.0	48.0

Profession

Doctor	13.0	11.0	3.0	2.0
Engineer	22.0	14.0	6.0	8.0
Teacher	1.0	7.0	8.0	4.0
Other	45.0	62.0	24.0	36.0
[total]	81.0	94.0	41.0	50.0

Education

Masters	32.0	23.0	8.0	16.0
Bachelors	33.0	37.0	15.0	10.0
Other	15.0	33.0	17.0	23.0
[total]	80.0	93.0	40.0	49.0

Salary

Low	11.0	20.0	11.0	14.0

Middle	11.0	26.0	16.0	12.0
upperMiddle	31.0	32.0	11.0	13.0
High	28.0	16.0	3.0	11.0
[total]	81.0	94.0	41.0	50.0

5.6 Interface

The Interface of this solution gives access to system developers testers administrators users such as shop owner, directors, sellers or sales persons, warehouse manager, and manager. The interface can be access through computers and laptops. Through the interface customer can receive sms, email notification. The interface enabling access the equipment prediction system for 24 hours for 7 days. (24/7)

5.6.1 Predict Device

This is for research part. When the customer wishes to buy a device first sales person identify the model which suitable for the particular customer. The device depends on his or her age, gender, marital status, profession and salary scale. So the sales person enter the details and get the model. Below shown screen is the sample for the predict device. (Figure 5.4)

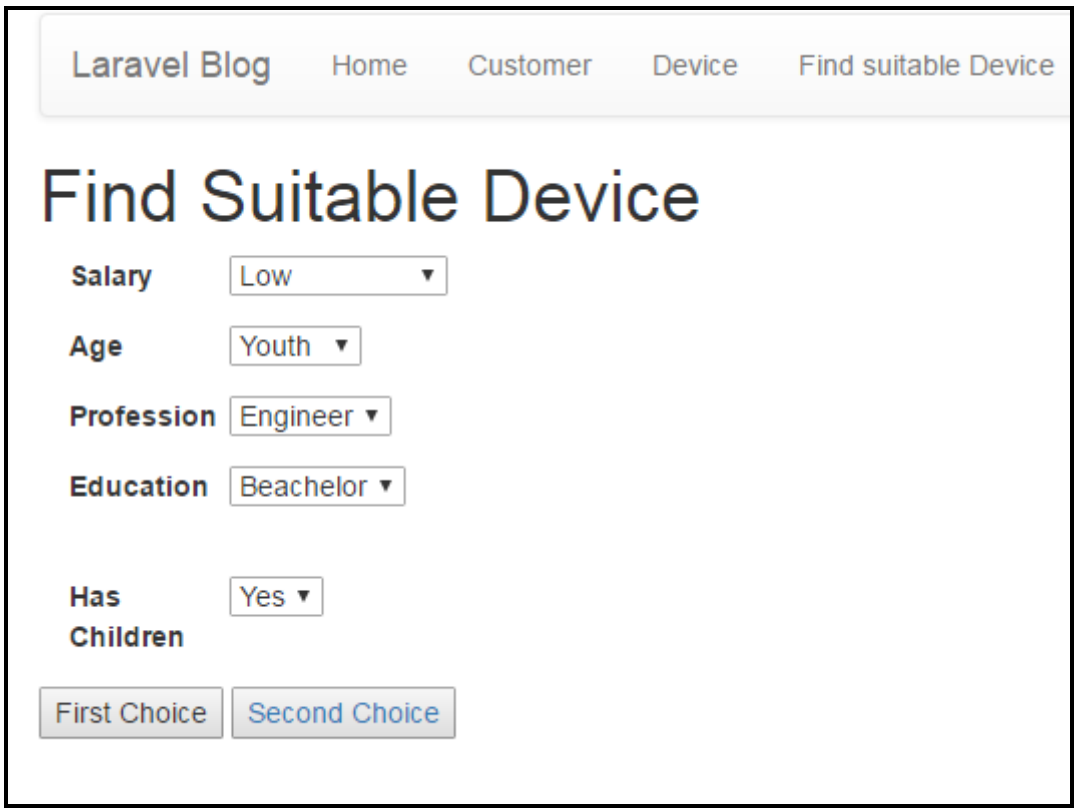


Figure 5.3:Interface 1 – Customers Input Form.

If the customer data filled click First choice.

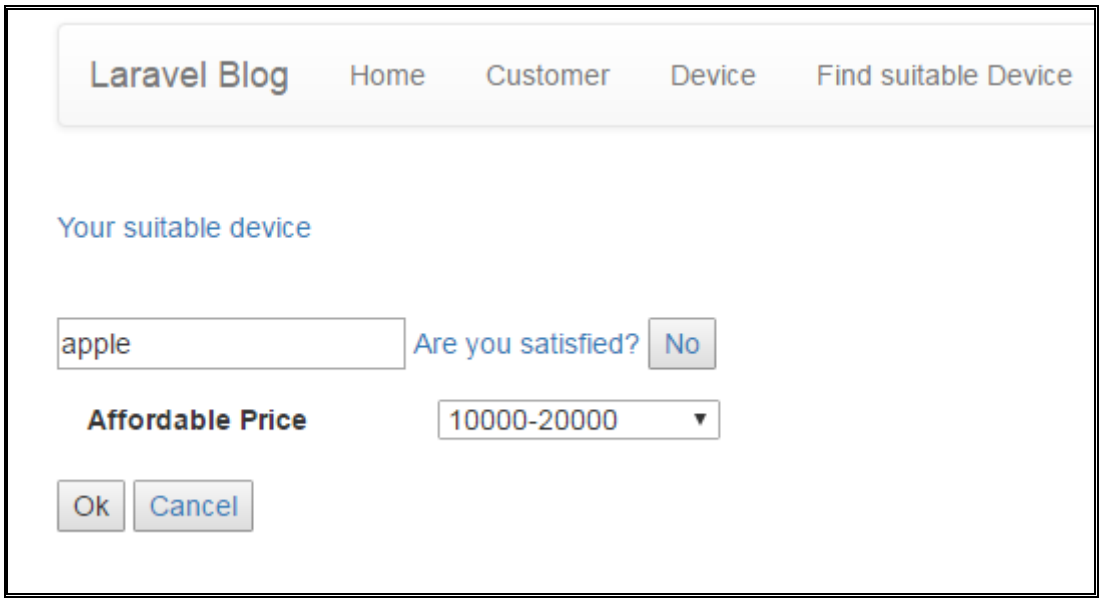


Figure 5.3:Interface 2 Customers J48 results.

If the customer satisfied click Yes. And select the affordable price. Below shown page will display.

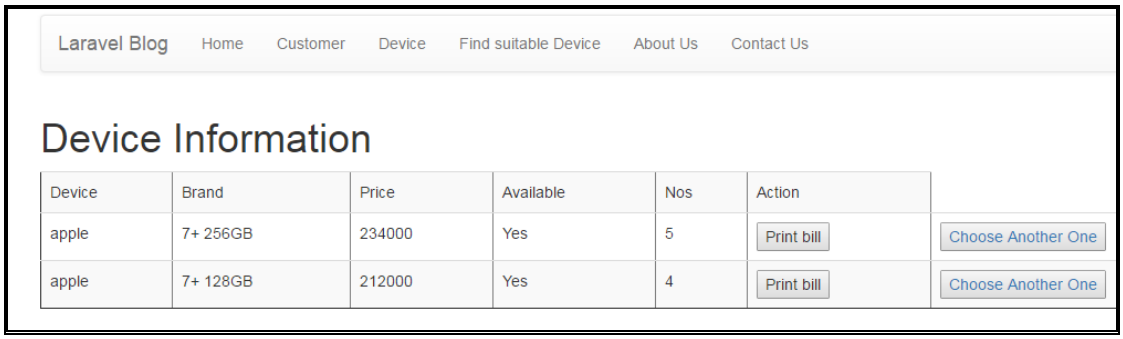


Figure 5.4:Interface 3- More details about the device

If the customer satisfy click print bill. Or else click choose another one.

If the customer not satisfy and click choose another device. Below shown screen will be display.

Here customer select another price range.

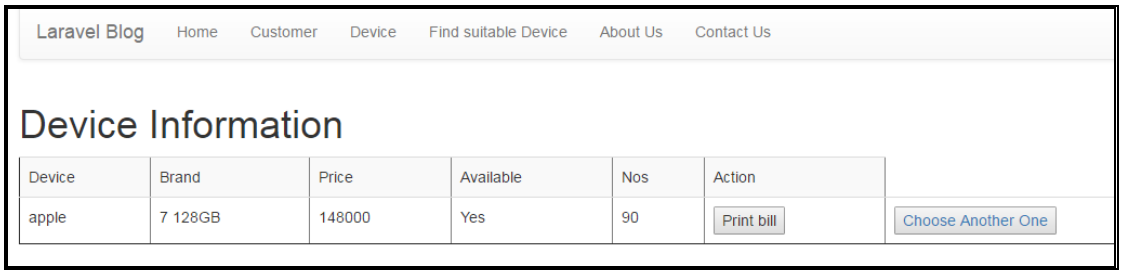


Figure 5.5:Interface 4 – Another price range output

If the customer not satisfied click No. above Figure 5.2 will be display. Click 2nd choice. Most of the people will be satisfied 1st choice otherwise 2nd choice also.

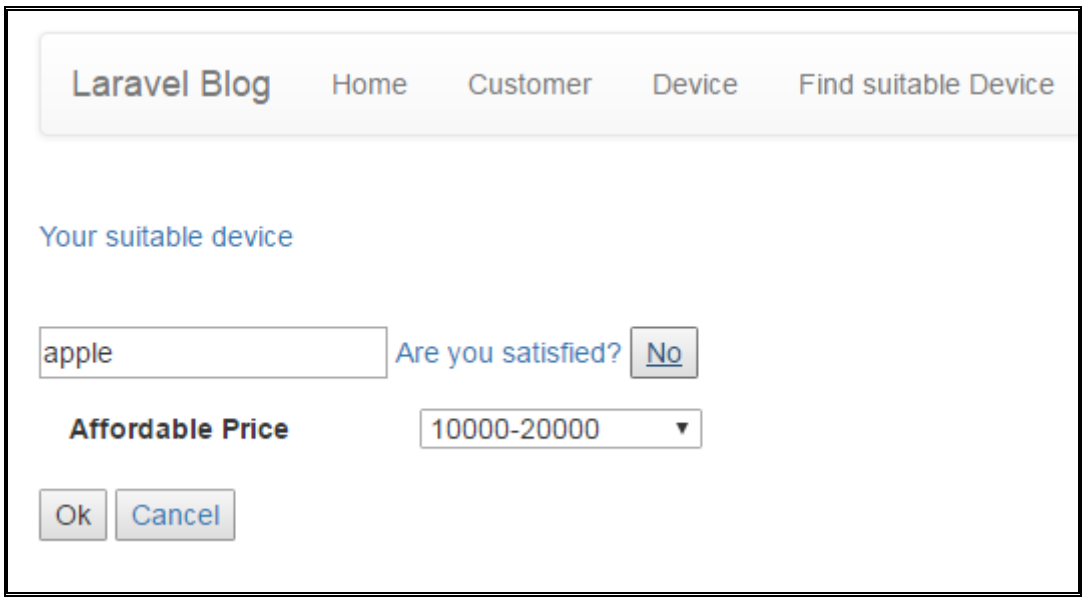


Figure 5.6:Interface 5- Try Naïve bays output

Some people will not be satisfy both choices then again click No button Then below shown screen will be display.

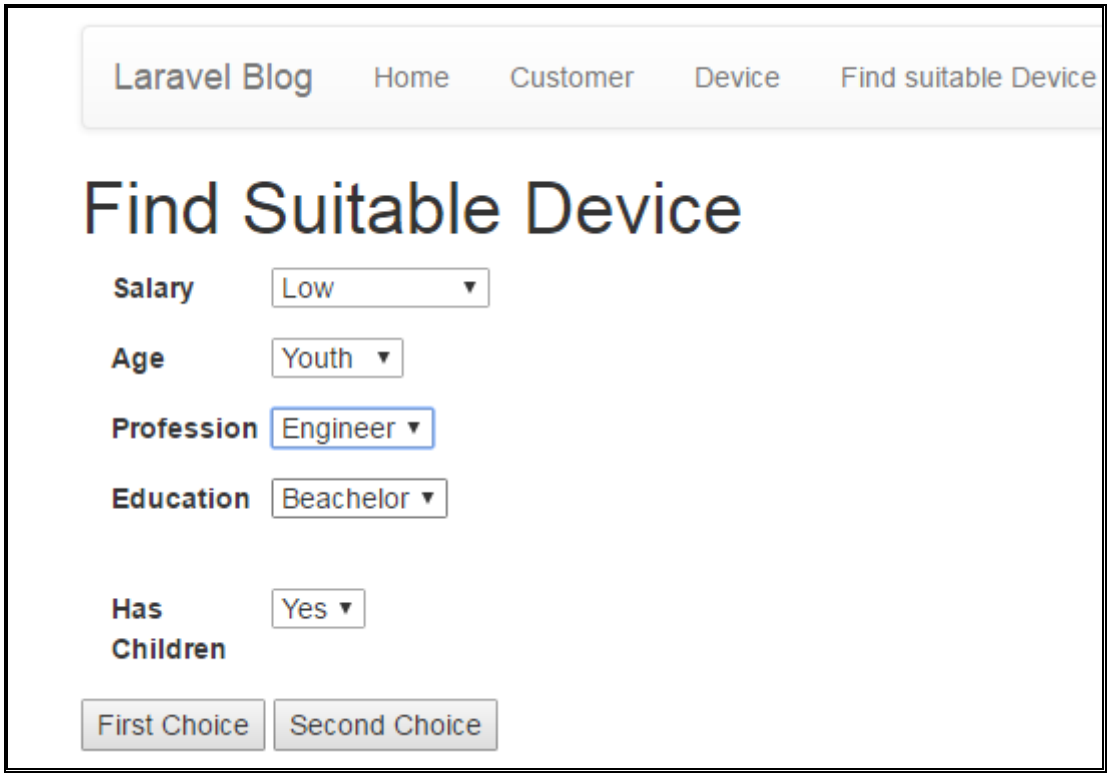


Figure 5.7:Interface 6 Naïve bays input form

Then click Second Choice.

Figure 5.8:Interface 7 Naïve Bays output

Above shown screen shows different device from first choice. If the customer satisfied with second choice, select affordable price and click ok.

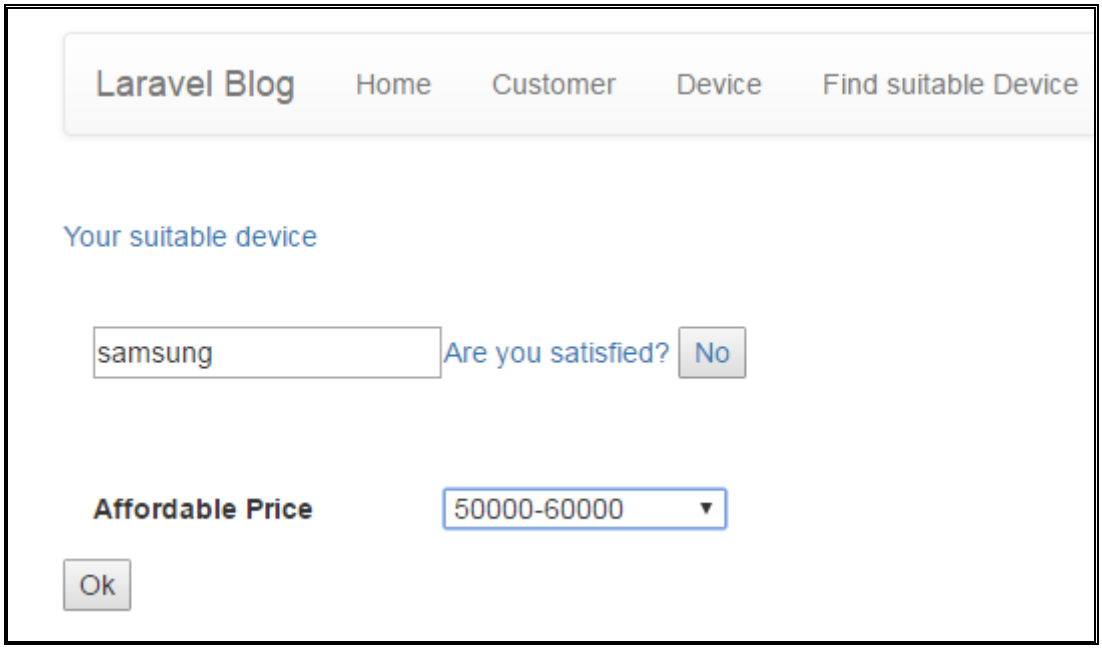


Figure 5.9:Interface 8 – select the affordable price range

The results will be shown below.

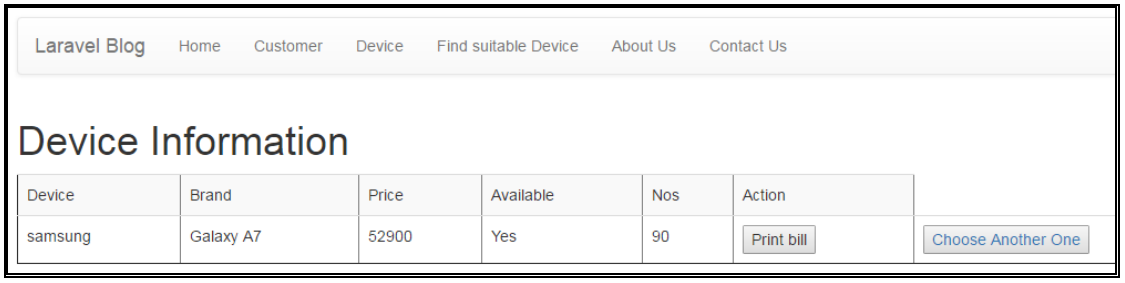


Figure 5.10:Interface 9- output of the price range

If the customer satisfy click print bill or not satisfy click choose another device.

If the customer not satisfy with second choice click not satisfy again. Below shown screen will be display.

Figure 5.11:Interface 10 another selection

Below shown screen will be display.

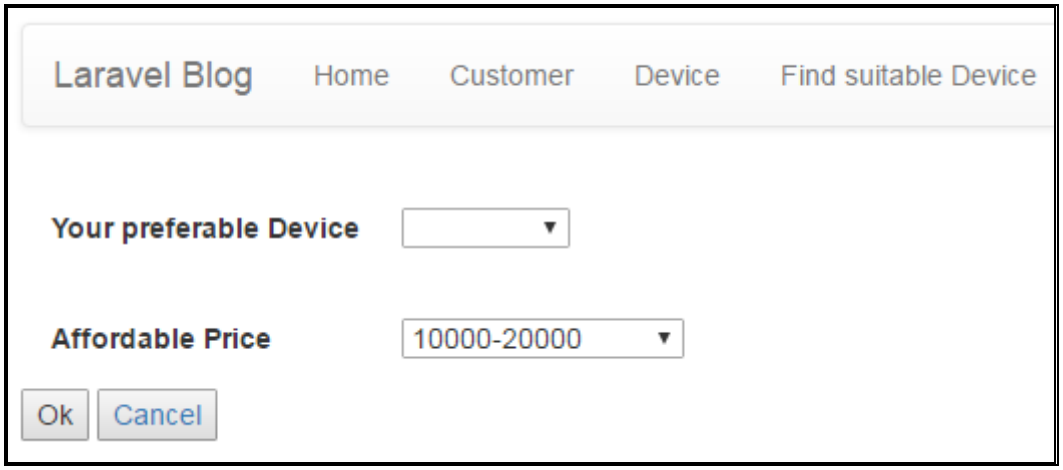


Figure 5.12:Interface 11 select model and price range

Here customer select the device and affordable price. Then click ok.

Figure 5.13:Interface 12

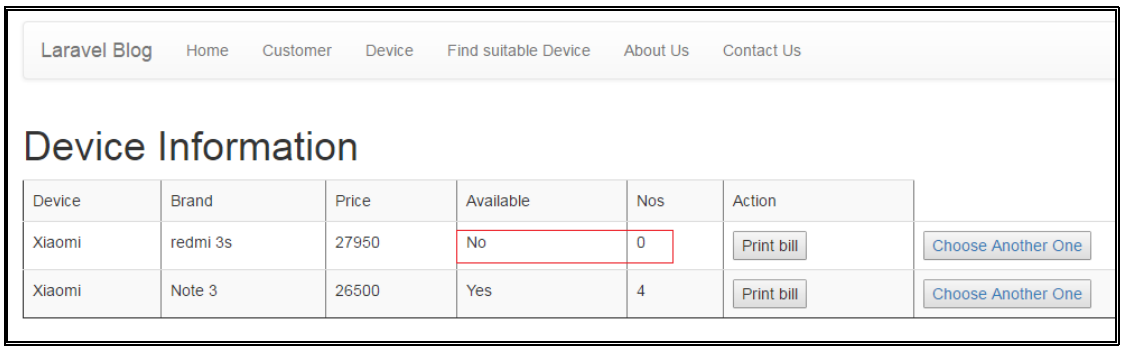


Figure 5.14:Interface 13

Above showne screen shows Xiamoi redmi 3s not available in the shop. So if the customer likes Note 3 click print bill or Choose another device.

5.7 Other Features

5.7.1 Insert Customer

When a new customer likes to buy a device admin store the details about the customer in the customer database for future prediction purpose. First customer fill a form. The sample form will be shown below (figure 5.2.1)

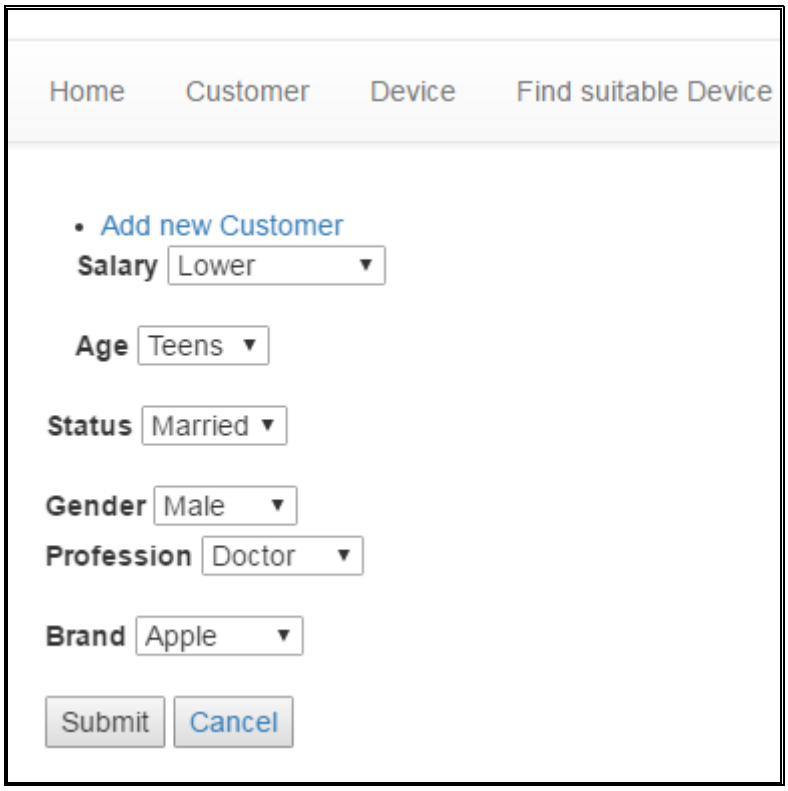


Figure 5.15:Interface 14 insert Customer details

5.7.1 Insert Device

When the shop introduce new model device the admin people enter the device information to the device database for their reference. Sample image will be shown below. This is for sales person's quick reference. (Figure 5.3).

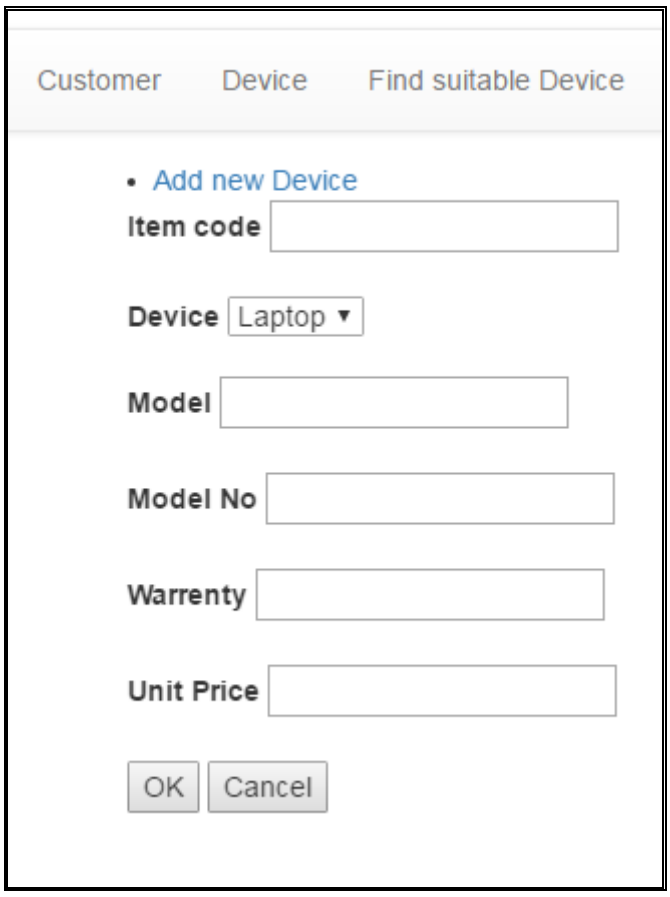


Figure 5.16:Interface 15 Insert Device details

5.8 Equipment Prediction Engine

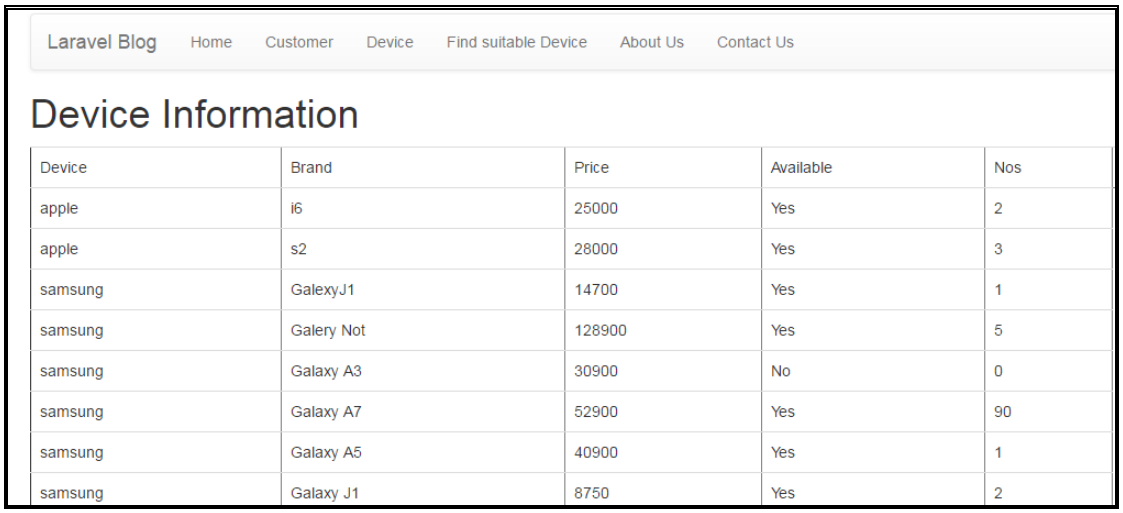
Equipment Prediction Engine is primarily a web Application. The Desktop Application works as an intermediate to connect various resources such as different databases. This engine maintain customer profile, process the quires. This engine should also responsible for accuracy and update information in the databases such as information about new model devices introduce in the market. The engine is primarily users web technology because the entire solution should be made available on the system. This engine specifically designed maintain security and privacy.

5.8.1 Customer Database

It include records of all customers from beginning the shop . This database also include salary profession, gender, marital status, Education, No. of children, and age. This database will be updated.

5.8.2 Device Database

It includes list of devices with versions price, availability, and how many devices available in our stock.



Device	Brand	Price	Available	Nos
apple	i6	25000	Yes	2
apple	s2	28000	Yes	3
samsung	GalexyJ1	14700	Yes	1
samsung	Galery Not	128900	Yes	5
samsung	Galaxy A3	30900	No	0
samsung	Galaxy A7	52900	Yes	90
samsung	Galaxy A5	40900	Yes	1
samsung	Galaxy J1	8750	Yes	2

Figure 5.17:Interface 16 all device Information

5.9 Summary

In this chapter analysis and design of equipment Prediction System such as Interface, insert customer, insert device, update customer, update device, predict device, print bill , customer database, and device database. Next chapter implementation of these modules will be discussed.

Chapter 06

6. Implement Data Mining Techniques

6.1 Introduction

Above chapter discussed about design of research. In this chapter discussed about Implementation of Data Mining Techniques, development module and database manager module will be discussed separately

6.2 Data mining Technique by using WEKA TOOL

6.2.1 WEKA

In chapter 04 we identify parameters, and J48 Classification to predict the future device market. So now we implement the parameter to WEKA tool to find the output. Example data set will be shown below.

Parameter 1: Age

No	Category	Age
1.	Youth	< 25
2.	Middle	26-40
3.	Elder	>40

Table 6.1: Parameter 1 - age

Parameter 2: Salary

No	Category	Salary
1.	Lowest	< 25,000
2.	Middle	25,000 – 50,000
3.	Upper Middle	50,000 – 75,000.
4.	High	75,000 >

Table 6.2: Parameter 2 Salary

Sample data (full data attached appendix 3)

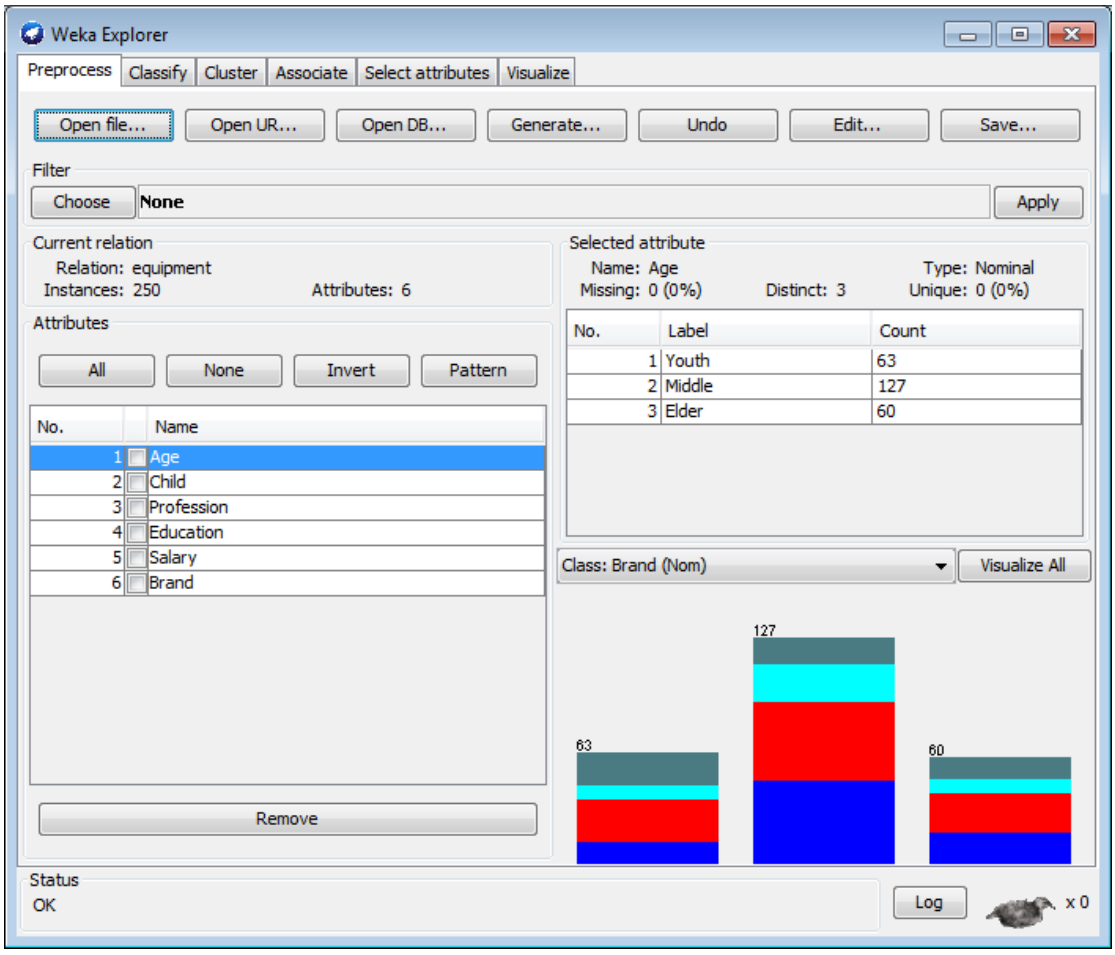
Age	Gender	Status	Profession	Salary	Device
Middle	Female	Single	Engineer	Middle	Samsung
Middle	Male	Single	Other	Other	Samsung
Middle	Male	Single	Other	Other	Samsung
Middle	Female	Married	Other	Lowest	Samsung
Middle	Female	Married	Other	Lowest	Apple
Middle	Female	Married	Other	Other	Apple
Middle	Female	Married	Other	Middle	Samsung
Elder	Male	Married	Engineer	Other	Samsung
Elder	Male	Married	Other	Other	Other
Elder	Male	Single	Engineer	Other	Samsung
Youth	Male	Single	Other	Other	Samsung
Middle	Female	Single	Other	Middle	Samsung

Table 6.3: Sample Data (Full Data Attached in the Appendix B)

Above table insert to WEKA to predict the equipment

Now, we discussed about the steps of WEKA.

Step 1: insert the parameters.



Step 2 : Select the Classification.

Figure 6.1: Select the Classification

```
=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure   ROC Area  Class
                 0.532     0.312      0.432     0.532     0.477      0.711    Apple
                 0.5       0.45       0.385     0.5       0.435      0.591    Samsung
                 0.189     0.038      0.467     0.189     0.269      0.696    Laptop
                 0.196     0.069      0.391     0.196     0.261      0.694    HTC
Weighted Avg.    0.408     0.276      0.412     0.408     0.391      0.662

=== Confusion Matrix ===

  a  b  c  d   <-- classified as
 41 33  0  3 |  a = Apple
 30 45  6  9 |  b = Samsung
  8 20  7  2 |  c = Laptop
 16 19  2  9 |  d = HTC
```

Figure 6.2: WEKA Tool J48 output

Step 3 Output:

Scheme:weka.classifiers.trees.J48 -C 0.25 -M 2

Relation: equipment

Instances: 220

Attributes: 6

Age

Gender

Status

Profession

Salary

Brand

Test mode:10-fold cross-validation

J48 pruned tree

Profession = Doctor

| Salary = Low: Apple (0.0)

| Salary = Middle: Samsung (7.0/1.0)

| Salary = upperMiddle: Apple (5.0)
| Salary = High
| | Education = Masters: Apple (11.0/4.0)
| | Education = Bachelors: Samsung (2.0)
| | Education = Other: Apple (0.0)
Profession = Engineer
| Salary = Low: Apple (1.0)
| Salary = Middle
| | Education = Masters: Samsung (7.0/3.0)
| | Education = Bachelors: Laptop (2.0/1.0)
| | Education = Other: Samsung (0.0)
| Salary = upperMiddle: Apple (16.0/7.0)
| Salary = High: Apple (20.0/9.0)
Profession = Teacher
| Age = Youth: Samsung (5.0/3.0)
| Age = Middle
| | Education = Masters: Samsung (0.0)
| | Education = Bachelors: Laptop (4.0/1.0)
| | Education = Other: Samsung (4.0/1.0)
| Age = Elder: Laptop (3.0/1.0)
Profession = Other
| Age = Youth
| | Education = Masters: Apple (2.0)
| | Education = Bachelors
| | | Salary = Low: Samsung (2.0/1.0)
| | | Salary = Middle: Apple (4.0/2.0)
| | | Salary = upperMiddle: Samsung (4.0)
| | | Salary = High: Samsung (0.0)
| | Education = Other: Samsung (40.0/25.0)
| Age = Middle
| | Salary = Low
| | | Child = Yes: Apple (6.0/1.0)
| | | Child = No: Samsung (6.0/3.0)
| | Salary = Middle

| | | Education = Masters: Samsung (4.0/2.0)

| | | Education = Bachelors: Samsung (16.0/8.0)

| | | Education = Other

| | | | Child = Yes: HTC (3.0)

| | | | Child = No: Laptop (9.0/4.0)

| | Salary = upperMiddle

| | | Education = Masters

| | | | Child = Yes: Samsung (2.0)

| | | | Child = No: HTC (4.0/2.0)

| | | Education = Bachelors: Apple (17.0/7.0)

| | | Education = Other

| | | | Child = Yes: Apple (2.0)

| | | | Child = No: Samsung (4.0)

| | Salary = High: Apple (8.0/2.0)

| Age = Elder: Samsung (30.0/19.0)

Number of Leaves : 36

Size of the tree : 53

6.3 Summary

Chapter 06 discussed about Implementation of WEKA. In chapter 07 will be discussed about evaluation

Chapter 7

7. Evaluation

7.1 Introduction

Chapter 06 discussed about Implementation of WEKA. In this chapter will be discussed about evaluation

7.2 J48 classifier results

Below shown screen will be displayed when we generate from WEKA by using J48 classifier results.

The result will be shown below table.

Age	children	profession	education	salary	J48 output
Youth	Yes	Doctor	Bachelors	Low	apple
Youth	Yes	Doctor	Bachelors	Middle	samsung

Continue…..

Table 7.1: J48 Output (Full Data Attached in the Appendix C)

7.3 Naïve Bays classifier output

Below shown screen will be displayed when we generate from WEKA by using Naïve Bays classifier results.

The result will be shown below table.

age	children	profession	education	salary	Naïve Bayes output
Youth	Yes	Doctor	Bachelors	Low	Apple
Youth	Yes	Doctor	Bachelors	Middle	Apple
Youth	Yes	Doctor	Masters	Low	Apple

Continue…….

Table 7.2: Naïve Bayes Output (Full Data Attached in the Appendix C)

7.4 Summary

Chapter 07 discussed about evaluation. In chapter 08 will be discussed about Conclusion and further work.

Chapter 08

8 Conclusion and Further Work.

8.1 Introduction

Chapter 7 presented the approach to develop an prediction system for future equipment market. more than 80% of responses conclude positive features of the solution in terms of accuracy and the efficiency.

This Thesis presents a new approach and efficient in the area of data mining. I applied typical forecasting concepts and several dimensions to through training and testing the classification model with real sales data. Finally I obtained more accurate forecasting results than could be executing a single model. However the research has some weak points. Because human being not a robot, they have feeling and 6 sensors. Their like or touch and feel feelings are we can't consider or it gives a different output than our system.

This System published in the web and the particular shop customers tested. This system got 80% accuracy.

8.2 Limitation

Fast growing equipment market always introduced new model with high features and the old model prices decreased.

8.3 Further work

As further work needs to be implemented to improve the performance. An online payment mechanism through this application can be introduce, send promotion notifications, seasonal offers, discounts, and introduced new equipment details through e-mail or sms.

Also a mobile application can be implemented to access these system through mobile devices which will improve the user satisfaction.

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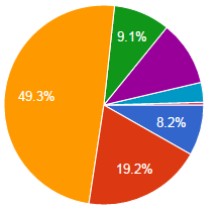
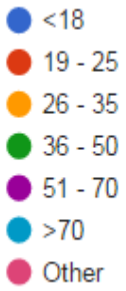
Appendixes

Appendix A

Survey answers

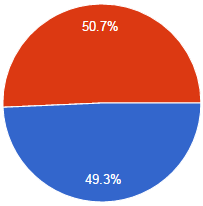
Age





Age	Response
0-25	60
26 - 35	110
36 >	49

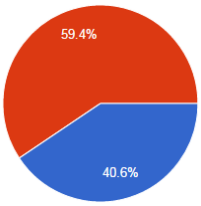
Gender



Gender	Response
Male	110
Female	110

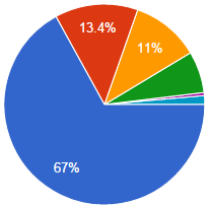
- No need

Marital status



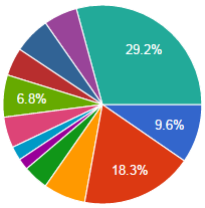
Status	Response
Single	132
Married	87

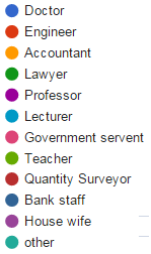
No of Children



No.of Children	Response
No	148
Yes	71

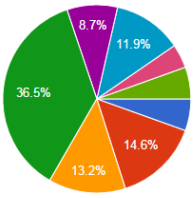
Professional

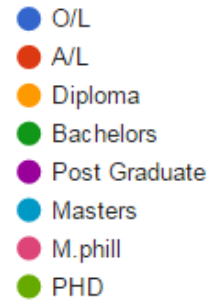




Profession	Response
Engineer	42
Doctor	22
Teacher	16
other	140

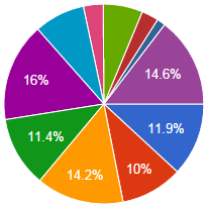
Education

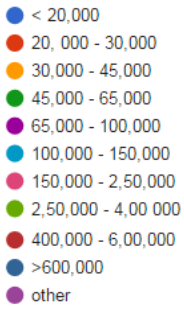




Education	Response
Diploma	62
Bachelors	82
Masters	47
other	84

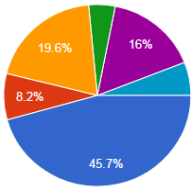
Salary Package

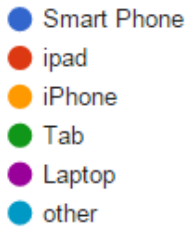




Salary	Response
< 20,000	26
20,000 - 30,000	22
30,000- 45,000	30
45,000 - 65,000	25
65,000 - 100,000	35
other	82

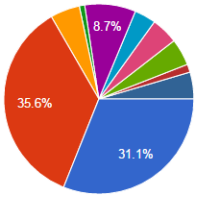
Equipment

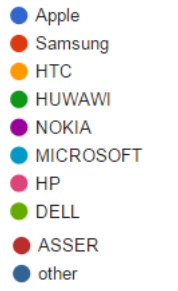




Equipmment	Response
Smart Phone	143
iPad	35
other	41

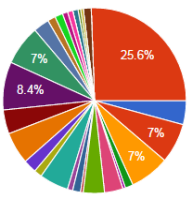
Brand





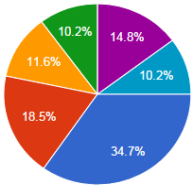
Brand	Response
Apple	48
Samsung	118
other	53

Version



Version	Response
S6	15
Grand prime	15
iphone 6S	18
iphone 7	7
other	55

Affordable Price



- < 30,000
- 30,000 - 50,000
- 50,000 - 70,000
- 70,000 - 100,000
- 100,000 - 1,50,000
- 150,000>

Affordable price	Response
< 30,000	75
30,000 - 100,000	82
100,000 >	54

Table 2: Survey Answers

Appendix B

Final input

```
@RELATION equipment
@ATTRIBUTE Age {Youth        Middle      Elder}
@ATTRIBUTE Child {Yes        No}

@ATTRIBUTE Profession
{Doctor                      Engineer    Teacher      Other}
@ATTRIBUTE Education
{Masters                     Bachelors   Other}

@ATTRIBUTE Salary {Low       Middle      upperMiddle  High}
@ATTRIBUTE Brand{Apple       Samsung     Laptop       HTC}
@DATA
```

Middle	No	Engineer	Masters	Middle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	Yes	Other	Other	Low	Apple
Middle	Yes	Other	Other	Low	Apple
Middle	No	Other	Bachelors	upperMiddle	Apple
Middle	Yes	Other	Other	Middle	HTC
Elder	Yes	Engineer	Masters	High	Samsung
Elder	Yes	Other	Masters	High	HTC
Elder	No	Engineer	Masters	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Other	Bachelors	Middle	Apple
Elder	Yes	Doctor	Bachelors	High	Samsung
Middle	No	Teacher	Bachelors	Low	Laptop
Youth	No	Other	Bachelors	Middle	Apple
Middle	Yes	Other	Masters	upperMiddle	Samsung
Middle	Yes	Other	Bachelors	upperMiddle	Apple
Elder	Yes	Other	Other	upperMiddle	Samsung
Youth	No	Other	Bachelors	upperMiddle	Samsung
Elder	No	Doctor	Masters	Middle	Samsung
Middle	No	Other	Bachelors	upperMiddle	Apple
Youth	No	Other	Other	upperMiddle	HTC
Youth	Yes	Other	Other	Low	Samsung
Middle	No	Other	Other	Middle	Laptop
Middle	No	Engineer	Masters	Middle	Laptop

Middle	No	Other	Other	High	Apple
Middle	No	Engineer	Masters	High	HTC
Middle	No	Other	Bachelors	upperMiddle	Laptop
Elder	Yes	Doctor	Masters	High	Apple
Elder	Yes	Other	Masters	upperMiddle	Laptop
Middle	No	Engineer	Bachelors	upperMiddle	Apple
Elder	No	Doctor	Bachelors	upperMiddle	Apple
Youth	No	Other	Bachelors	Low	Samsung
Youth	No	Engineer	Bachelors	upperMiddle	Apple
Youth	No	Other	Other	Low	HTC
Middle	No	Other	Other	Middle	Laptop
Middle	No	Other	Other	Middle	Laptop
Middle	No	Engineer	Bachelors	High	Samsung
Elder	Yes	Other	Bachelors	Middle	Apple
Elder	Yes	Other	Bachelors	High	Samsung
Elder	No	Other	Masters	High	Apple
Middle	No	Other	Bachelors	upperMiddle	Samsung
Middle	No	Other	Masters	Middle	Samsung
Middle	No	Other	Bachelors	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Other	Bachelors	Middle	HTC
Middle	No	Other	Bachelors	High	Samsung
Youth	No	Other	Other	upperMiddle	Laptop
Youth	No	Other	Other	Low	Samsung
Youth	No	Other	Other	Low	Samsung
Middle	Yes	Other	Bachelors	Middle	Laptop
Middle	Yes	Other	Masters	Middle	Apple
Middle	No	Engineer	Masters	Middle	HTC
Middle	No	Other	Bachelors	Middle	Samsung
Elder	Yes	Other	Bachelors	Middle	Samsung
Youth	No	Other	Other	upperMiddle	Samsung
Elder	No	Engineer	Masters	Low	Apple
Middle	No	Other	Other	Middle	Laptop
Middle	Yes	Other	Bachelors	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Laptop
Youth	No	Teacher	Other	Low	Laptop
Elder	Yes	Other	Bachelors	Low	HTC
Middle	No	Other	Bachelors	Low	Laptop
Middle	No	Other	Masters	upperMiddle	Apple
Youth	Yes	Other	Bachelors	Low	HTC
Elder	Yes	Engineer	Masters	High	Laptop
Elder	Yes	Other	Other	Low	Samsung
Middle	No	Other	Bachelors	High	Apple

Youth	No	Engineer	Bachelors	upperMiddle	Apple
Youth	No	Other	Other	Low	Samsung
Elder	Yes	Other	Masters	High	HTC
Middle	Yes	Engineer	Bachelors	upperMiddle	Apple
Middle	No	Engineer	Masters	upperMiddle	HTC
Youth	No	Other	Other	Low	Samsung
Elder	Yes	Engineer	Masters	High	Apple
Middle	Yes	Other	Other	Middle	HTC
Youth	No	Other	Other	Low	Laptop
Elder	No	Doctor	Masters	High	HTC
Elder	Yes	Doctor	Masters	High	Laptop
Middle	Yes	Other	Bachelors	upperMiddle	Apple
Middle	No	Other	Other	Middle	Apple
Youth	No	Other	Other	upperMiddle	Laptop
Youth	No	Other	Other	upperMiddle	HTC
Youth	Yes	Other	Bachelors	Middle	Laptop
Middle	No	Engineer	Masters	Middle	Samsung
Elder	Yes	Other	Masters	High	HTC
Elder	No	Engineer	Masters	upperMiddle	Apple
Elder	Yes	Teacher	Other	Low	Laptop
Middle	Yes	Other	Bachelors	Low	Apple
Middle	Yes	Other	Masters	High	Apple
Elder	Yes	Other	Other	Middle	HTC
Middle	No	Other	Bachelors	Middle	HTC
Middle	No	Doctor	Masters	High	Apple
Middle	No	Teacher	Other	Low	Laptop
Youth	No	Other	Other	upperMiddle	HTC
Youth	No	Other	Other	Low	Apple
Middle	No	Engineer	Masters	High	HTC
Middle	No	Doctor	Bachelors	upperMiddle	Apple
Middle	No	Other	Other	Low	HTC
Youth	No	Other	Other	Low	Samsung
Youth	No	Other	Other	Low	Samsung
Youth	No	Engineer	Bachelors	High	HTC
Middle	No	Other	Other	Middle	Samsung
Middle	No	Other	Bachelors	upperMiddle	Apple
Middle	No	Teacher	Bachelors	Middle	Samsung
Middle	No	Other	Other	Middle	Samsung
Youth	No	Other	Other	upperMiddle	Apple
Youth	No	Other	Other	Low	HTC
Middle	Yes	Engineer	Masters	High	Apple
Youth	No	Other	Bachelors	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	HTC
Elder	Yes	Other	Other	upperMiddle	HTC

Middle	No	Teacher	Bachelors	Middle	Laptop
Middle	No	Other	Masters	upperMiddle	HTC
Middle	No	Other	Bachelors	Middle	Laptop
Middle	Yes	Engineer	Masters	High	Apple
Middle	Yes	Other	Bachelors	Middle	Laptop
Middle	No	Other	Bachelors	upperMiddle	Laptop
Elder	Yes	Other	Other	upperMiddle	HTC
Middle	Yes	Other	Bachelors	Low	Samsung
Middle	Yes	Doctor	Bachelors	Middle	Laptop
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Doctor	Bachelors	Middle	Samsung
Middle	Yes	Other	Bachelors	upperMiddle	Samsung
Youth	No	Other	Other	Low	HTC
Elder	Yes	Engineer	Masters	upperMiddle	Apple
Middle	No	Teacher	Other	Low	Samsung
Middle	No	Teacher	Other	Low	Samsung
Middle	No	Other	Other	Middle	Samsung
Middle	No	Other	Bachelors	upperMiddle	Apple
Middle	No	Doctor	Masters	High	Apple
Elder	No	Doctor	Masters	upperMiddle	Apple
Middle	No	Engineer	Masters	High	Apple
Middle	No	Engineer	Bachelors	High	Samsung
Middle	No	Engineer	Masters	upperMiddle	Apple
Middle	No	Engineer	Masters	High	Apple
Middle	No	Engineer	Masters	High	Apple
Middle	No	Engineer	Masters	High	Apple
Youth	No	Engineer	Bachelors	upperMiddle	Apple
Youth	No	Other	Masters	upperMiddle	Apple
Youth	No	Other	Other	Low	Laptop
Elder	Yes	Other	Bachelors	upperMiddle	Samsung
Middle	No	Other	Bachelors	Low	Samsung
Middle	No	Other	Bachelors	Low	Apple
Middle	No	Other	Masters	Middle	HTC
Middle	No	Teacher	Other	Low	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Other	Other	Low	Samsung
Middle	No	Engineer	Masters	Middle	Samsung
Youth	No	Teacher	Other	Low	Samsung
Middle	Yes	Engineer	Bachelors	upperMiddle	Samsung
Middle	No	Other	Bachelors	High	Apple
Middle	No	Other	Masters	upperMiddle	Samsung
Middle	No	Doctor	Bachelors	Middle	Samsung
Middle	Yes	Doctor	Masters	High	Apple
Youth	No	Other	Other	Low	HTC

Youth	No	Teacher	Other	Low	Samsung
Middle	Yes	Engineer	Masters	High	Apple
Middle	Yes	Other	Other	upperMiddle	Apple
Middle	No	Other	Masters	High	Apple
Middle	No	Other	Bachelors	Middle	Apple
Middle	Yes	Engineer	Bachelors	Middle	HTC
Middle	No	Other	Masters	upperMiddle	HTC
Middle	Yes	Other	Masters	Middle	Samsung
Middle	Yes	Engineer	Bachelors	upperMiddle	Laptop
Youth	Yes	Other	Other	Low	Apple
Middle	Yes	Doctor	Bachelors	upperMiddle	Apple
Middle	Yes	Other	Bachelors	Middle	Samsung
Middle	No	Engineer	Bachelors	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Apple
Middle	Yes	Other	Other	upperMiddle	Apple
Youth	No	Other	Other	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Samsung
Youth	No	Other	Other	Low	HTC
Elder	Yes	Other	Masters	High	Samsung
Youth	No	Other	Other	Middle	Laptop
Middle	No	Engineer	Bachelors	Middle	Laptop
Middle	No	Other	Bachelors	upperMiddle	Apple
Youth	No	Other	Bachelors	upperMiddle	Samsung
Youth	No	Other	Masters	Low	Apple
Elder	Yes	Doctor	Masters	High	Apple
Elder	Yes	Other	Masters	High	Apple
Elder	Yes	Doctor	Masters	High	Samsung
Elder	Yes	Engineer	Masters	High	Apple
Middle	No	Other	Other	Low	Samsung
Elder	Yes	Other	Masters	High	Samsung
Youth	No	Doctor	Bachelors	Middle	Samsung
Elder	Yes	Other	Masters	High	Samsung
Youth	No	Other	Other	Low	HTC
Youth	No	Teacher	Bachelors	Middle	HTC
Middle	No	Other	Bachelors	Middle	Samsung
Elder	Yes	Teacher	Other	Low	Laptop
Youth	No	Teacher	Other	Low	HTC
Youth	Yes	Other	Other	Low	HTC
Elder	No	Doctor	Bachelors	Middle	Samsung
Elder	Yes	Doctor	Masters	High	Samsung
Elder	Yes	Other	Bachelors	Middle	Apple
Middle	Yes	Other	Masters	High	Samsung
Elder	Yes	Engineer	Masters	High	Apple

Youth	No	Other	Bachelors	Middle	HTC
Elder	No	Doctor	Masters	High	Apple
Youth	No	Other	Other	Low	HTC
Elder	No	Other	Other	Low	Laptop
Elder	No	Teacher	Bachelors	upperMiddle	HTC
Youth	Yes	Other	Other	Low	HTC
Elder	Yes	Other	Masters	upperMiddle	HTC
Elder	Yes	Other	Masters	High	HTC
Elder	Yes	Other	Masters	High	Apple
Elder	Yes	Other	Masters	High	Samsung
Youth	No	Engineer	Bachelors	upperMiddle	Samsung
Elder	Yes	Other	Bachelors	upperMiddle	Samsung
Youth	No	Other	Other	Middle	Apple
Middle	No	Engineer	Bachelors	High	Apple
Middle	No	Engineer	Masters	Middle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	Yes	Other	Other	Low	Apple
Middle	Yes	Other	Other	Low	Apple
Middle	No	Other	Bachelors	upperMiddle	Apple
Middle	Yes	Other	Other	Middle	HTC
Elder	Yes	Engineer	Masters	High	Samsung
Elder	Yes	Other	Masters	High	HTC
Elder	No	Engineer	Masters	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Other	Bachelors	Middle	Apple
Elder	Yes	Doctor	Bachelors	High	Samsung
Middle	No	Teacher	Bachelors	Low	Laptop
Youth	No	Other	Bachelors	Middle	Apple
Middle	Yes	Other	Masters	upperMiddle	Samsung
Middle	Yes	Other	Bachelors	upperMiddle	Apple
Elder	Yes	Other	Other	upperMiddle	Samsung
Youth	No	Other	Bachelors	upperMiddle	Samsung
Elder	No	Doctor	Masters	Middle	Samsung
Middle	No	Other	Bachelors	upperMiddle	Apple
Youth	No	Other	Other	upperMiddle	HTC
Youth	No	Other	Other	Low	Samsung
Middle	No	Other	Other	Middle	Laptop
Middle	No	Engineer	Masters	Middle	Laptop
Middle	No	Other	Other	High	Apple
Middle	No	Engineer	Masters	High	HTC
Middle	No	Other	Bachelors	upperMiddle	Laptop
Elder	Yes	Doctor	Masters	High	Apple

Elder	Yes	Other	Masters	upperMiddle	Laptop
Middle	No	Engineer	Bachelors	upperMiddle	Apple
Elder	No	Doctor	Bachelors	upperMiddle	Apple
Elder	Yes	Other	Masters	upperMiddle	Laptop

Appendix C -

J48 Results

age	children	profession	education	salary	J48 output
Youth	Yes	Doctor	Bachelors	Low	apple
Youth	Yes	Doctor	Bachelors	Middle	samsung
Youth	Yes	Doctor	Bachelors	UpperMiddle	apple
Youth	Yes	Doctor	Bachelors	High	samsung
Youth	Yes	Doctor	Masters	Low	apple
Youth	Yes	Doctor	Masters	Middle	samsung
Youth	Yes	Doctor	Masters	UpperMiddle	apple
Youth	Yes	Doctor	Masters	High	apple
Youth	Yes	Doctor	Other	Low	apple
Youth	Yes	Doctor	Other	Middle	samsung
Youth	Yes	Doctor	Other	UpperMiddle	apple
Youth	Yes	Doctor	Other	High	apple
Youth	Yes	Engineer	Bachelors	Low	apple
Youth	Yes	Engineer	Bachelors	Middle	laptop
Youth	Yes	Engineer	Bachelors	UpperMiddle	apple
Youth	Yes	Engineer	Bachelors	High	apple
Youth	Yes	Engineer	Masters	Low	apple
Youth	Yes	Engineer	Masters	Middle	samsung
Youth	Yes	Engineer	Masters	UpperMiddle	apple
Youth	Yes	Engineer	Masters	High	apple
Youth	Yes	Engineer	Other	Low	apple
Youth	Yes	Engineer	Other	Middle	samsung
Youth	Yes	Engineer	Other	UpperMiddle	apple
Youth	Yes	Engineer	Other	High	apple
Youth	Yes	Teacher	Bachelors	Low	samsung
Youth	Yes	Teacher	Bachelors	Middle	samsung
Youth	Yes	Teacher	Bachelors	UpperMiddle	samsung
Youth	Yes	Teacher	Bachelors	High	samsung
Youth	Yes	Teacher	Masters	Low	samsung
Youth	Yes	Teacher	Masters	Middle	samsung
Youth	Yes	Teacher	Masters	UpperMiddle	samsung
Youth	Yes	Teacher	Masters	High	samsung

Youth	Yes	Teacher	Other	Low	samsung
Youth	Yes	Teacher	Other	Middle	samsung
Youth	Yes	Teacher	Other	UpperMiddle	samsung
Youth	Yes	Teacher	Other	High	samsung
Youth	Yes	Other	Bachelors	Low	samsung
Youth	Yes	Other	Bachelors	Middle	apple
Youth	Yes	Other	Bachelors	UpperMiddle	samsung
Youth	Yes	Other	Bachelors	High	samsung
Youth	Yes	Other	Masters	Low	apple
Youth	Yes	Other	Masters	Middle	apple
Youth	Yes	Other	Masters	UpperMiddle	apple
Youth	Yes	Other	Masters	High	apple
Youth	Yes	Other	Other	Low	samsung
Youth	Yes	Other	Other	Middle	samsung
Youth	Yes	Other	Other	UpperMiddle	samsung
Youth	Yes	Other	Other	High	samsung
Youth	No	Doctor	Bachelors	Low	apple
Youth	No	Doctor	Bachelors	Middle	samsung
Youth	No	Doctor	Bachelors	UpperMiddle	apple
Youth	No	Doctor	Bachelors	High	samsung
Youth	No	Doctor	Masters	Low	apple
Youth	No	Doctor	Masters	Middle	samsung
Youth	No	Doctor	Masters	UpperMiddle	apple
Youth	No	Doctor	Masters	High	apple
Youth	No	Doctor	Other	Low	apple
Youth	No	Doctor	Other	Middle	samsung
Youth	No	Doctor	Other	UpperMiddle	apple
Youth	No	Doctor	Other	High	apple
Youth	No	Engineer	Bachelors	Low	apple
Youth	No	Engineer	Bachelors	Middle	laptop
Youth	No	Engineer	Bachelors	UpperMiddle	apple
Youth	No	Engineer	Bachelors	High	apple
Youth	No	Engineer	Masters	Low	apple
Youth	No	Engineer	Masters	Middle	samsung
Youth	No	Engineer	Masters	UpperMiddle	apple
Youth	No	Engineer	Masters	High	apple
Youth	No	Engineer	Other	Low	apple
Youth	No	Engineer	Other	Middle	samsung
Youth	No	Engineer	Other	UpperMiddle	apple
Youth	No	Engineer	Other	High	apple
Youth	No	Teacher	Bachelors	Low	samsung
Youth	No	Teacher	Bachelors	Middle	samsung
Youth	No	Teacher	Bachelors	UpperMiddle	samsung
Youth	No	Teacher	Bachelors	High	samsung

Youth	No	Teacher	Masters	Low	samsung
Youth	No	Teacher	Masters	Middle	samsung
Youth	No	Teacher	Masters	UpperMiddle	samsung
Youth	No	Teacher	Masters	High	samsung
Youth	No	Teacher	Other	Low	samsung
Youth	No	Teacher	Other	Middle	samsung
Youth	No	Teacher	Other	UpperMiddle	samsung
Youth	No	Teacher	Other	High	samsung
Youth	No	Other	Bachelors	Low	samsung
Youth	No	Other	Bachelors	Middle	apple
Youth	No	Other	Bachelors	UpperMiddle	samsung
Youth	No	Other	Bachelors	High	samsung
Youth	No	Other	Masters	Low	apple
Youth	No	Other	Masters	Middle	apple
Youth	No	Other	Masters	UpperMiddle	apple
Youth	No	Other	Masters	High	apple
Youth	No	Other	Other	Low	samsung
Youth	No	Other	Other	Middle	samsung
Youth	No	Other	Other	UpperMiddle	samsung
Youth	No	Other	Other	High	samsung
Middle	Yes	Doctor	Bachelors	Low	apple
Middle	Yes	Doctor	Bachelors	Middle	samsung
Middle	Yes	Doctor	Bachelors	UpperMiddle	apple
Middle	Yes	Doctor	Bachelors	High	samsung
Middle	Yes	Doctor	Masters	Low	apple
Middle	Yes	Doctor	Masters	Middle	samsung
Middle	Yes	Doctor	Masters	UpperMiddle	apple
Middle	Yes	Doctor	Masters	High	apple
Middle	Yes	Doctor	Other	Low	apple
Middle	Yes	Doctor	Other	Middle	samsung
Middle	Yes	Doctor	Other	UpperMiddle	apple
Middle	Yes	Doctor	Other	High	apple
Middle	Yes	Engineer	Bachelors	Low	apple
Middle	Yes	Engineer	Bachelors	Middle	laptop
Middle	Yes	Engineer	Bachelors	UpperMiddle	apple
Middle	Yes	Engineer	Bachelors	High	apple
Middle	Yes	Engineer	Masters	Low	apple
Middle	Yes	Engineer	Masters	Middle	samsung
Middle	Yes	Engineer	Masters	UpperMiddle	apple
Middle	Yes	Engineer	Masters	High	apple
Middle	Yes	Engineer	Other	Low	apple
Middle	Yes	Engineer	Other	Middle	samsung
Middle	Yes	Engineer	Other	UpperMiddle	apple
Middle	Yes	Engineer	Other	High	apple

Middle	Yes	Teacher	Bachelors	Low	laptop
Middle	Yes	Teacher	Bachelors	Middle	laptop
Middle	Yes	Teacher	Bachelors	UpperMiddle	laptop
Middle	Yes	Teacher	Bachelors	High	laptop
Middle	Yes	Teacher	Masters	Low	samsung
Middle	Yes	Teacher	Masters	Middle	samsung
Middle	Yes	Teacher	Masters	UpperMiddle	samsung
Middle	Yes	Teacher	Masters	High	samsung
Middle	Yes	Teacher	Other	Low	samsung
Middle	Yes	Teacher	Other	Middle	samsung
Middle	Yes	Teacher	Other	UpperMiddle	samsung
Middle	Yes	Teacher	Other	High	samsung
Middle	Yes	Other	Bachelors	Low	apple
Middle	Yes	Other	Bachelors	Middle	samsung
Middle	Yes	Other	Bachelors	UpperMiddle	apple
Middle	Yes	Other	Bachelors	High	apple
Middle	Yes	Other	Masters	Low	apple
Middle	Yes	Other	Masters	Middle	samsung
Middle	Yes	Other	Masters	UpperMiddle	samsung
Middle	Yes	Other	Masters	High	apple
Middle	Yes	Other	Other	Low	apple
Middle	Yes	Other	Other	Middle	HTC
Middle	Yes	Other	Other	UpperMiddle	apple
Middle	Yes	Other	Other	High	apple
Middle	No	Doctor	Bachelors	Low	apple
Middle	No	Doctor	Bachelors	Middle	samsung
Middle	No	Doctor	Bachelors	UpperMiddle	apple
Middle	No	Doctor	Bachelors	High	samsung
Middle	No	Doctor	Masters	Low	apple
Middle	No	Doctor	Masters	Middle	samsung
Middle	No	Doctor	Masters	UpperMiddle	apple
Middle	No	Doctor	Masters	High	apple
Middle	No	Doctor	Other	Low	apple
Middle	No	Doctor	Other	Middle	samsung
Middle	No	Doctor	Other	UpperMiddle	apple
Middle	No	Doctor	Other	High	apple
Middle	No	Engineer	Bachelors	Low	apple
Middle	No	Engineer	Bachelors	Middle	laptop
Middle	No	Engineer	Bachelors	UpperMiddle	apple
Middle	No	Engineer	Bachelors	High	apple
Middle	No	Engineer	Masters	Low	apple
Middle	No	Engineer	Masters	Middle	samsung
Middle	No	Engineer	Masters	UpperMiddle	apple
Middle	No	Engineer	Masters	High	apple

Middle	No	Engineer	Other	Low	apple
Middle	No	Engineer	Other	Middle	samsung
Middle	No	Engineer	Other	UpperMiddle	apple
Middle	No	Engineer	Other	High	apple
Middle	No	Teacher	Bachelors	Low	laptop
Middle	No	Teacher	Bachelors	Middle	laptop
Middle	No	Teacher	Bachelors	UpperMiddle	laptop
Middle	No	Teacher	Bachelors	High	laptop
Middle	No	Teacher	Masters	Low	samsung
Middle	No	Teacher	Masters	Middle	samsung
Middle	No	Teacher	Masters	UpperMiddle	samsung
Middle	No	Teacher	Masters	High	samsung
Middle	No	Teacher	Other	Low	samsung
Middle	No	Teacher	Other	Middle	samsung
Middle	No	Teacher	Other	UpperMiddle	samsung
Middle	No	Teacher	Other	High	samsung
Middle	No	Other	Bachelors	Low	samsung
Middle	No	Other	Bachelors	Middle	samsung
Middle	No	Other	Bachelors	UpperMiddle	apple
Middle	No	Other	Bachelors	High	apple
Middle	No	Other	Masters	Low	samsung
Middle	No	Other	Masters	Middle	samsung
Middle	No	Other	Masters	UpperMiddle	HTC
Middle	No	Other	Masters	High	apple
Middle	No	Other	Other	Low	samsung
Middle	No	Other	Other	Middle	laptop
Middle	No	Other	Other	UpperMiddle	samsung
Middle	No	Other	Other	High	apple
Elder	Yes	Doctor	Bachelors	Low	apple
Elder	Yes	Doctor	Bachelors	Middle	samsung
Elder	Yes	Doctor	Bachelors	UpperMiddle	apple
Elder	Yes	Doctor	Bachelors	High	samsung
Elder	Yes	Doctor	Masters	Low	apple
Elder	Yes	Doctor	Masters	Middle	samsung
Elder	Yes	Doctor	Masters	UpperMiddle	apple
Elder	Yes	Doctor	Masters	High	apple
Elder	Yes	Doctor	Other	Low	apple
Elder	Yes	Doctor	Other	Middle	samsung
Elder	Yes	Doctor	Other	UpperMiddle	apple
Elder	Yes	Doctor	Other	High	apple
Elder	Yes	Engineer	Bachelors	Low	apple
Elder	Yes	Engineer	Bachelors	Middle	laptop
Elder	Yes	Engineer	Bachelors	UpperMiddle	apple
Elder	Yes	Engineer	Bachelors	High	apple

Elder	Yes	Engineer	Masters	Low	apple
Elder	Yes	Engineer	Masters	Middle	samsung
Elder	Yes	Engineer	Masters	UpperMiddle	apple
Elder	Yes	Engineer	Masters	High	apple
Elder	Yes	Engineer	Other	Low	apple
Elder	Yes	Engineer	Other	Middle	samsung
Elder	Yes	Engineer	Other	UpperMiddle	apple
Elder	Yes	Engineer	Other	High	apple
Elder	Yes	Teacher	Bachelors	Low	laptop
Elder	Yes	Teacher	Bachelors	Middle	laptop
Elder	Yes	Teacher	Bachelors	UpperMiddle	laptop
Elder	Yes	Teacher	Bachelors	High	laptop
Elder	Yes	Teacher	Masters	Low	laptop
Elder	Yes	Teacher	Masters	Middle	laptop
Elder	Yes	Teacher	Masters	UpperMiddle	laptop
Elder	Yes	Teacher	Masters	High	laptop
Elder	Yes	Teacher	Other	Low	laptop
Elder	Yes	Teacher	Other	Middle	laptop
Elder	Yes	Teacher	Other	UpperMiddle	laptop
Elder	Yes	Teacher	Other	High	laptop
Elder	Yes	Other	Bachelors	Low	samsung
Elder	Yes	Other	Bachelors	Middle	samsung
Elder	Yes	Other	Bachelors	UpperMiddle	samsung
Elder	Yes	Other	Bachelors	High	samsung
Elder	Yes	Other	Masters	Low	samsung
Elder	Yes	Other	Masters	Middle	samsung
Elder	Yes	Other	Masters	UpperMiddle	samsung
Elder	Yes	Other	Masters	High	samsung
Elder	Yes	Other	Other	Low	samsung
Elder	Yes	Other	Other	Middle	samsung
Elder	Yes	Other	Other	UpperMiddle	samsung
Elder	Yes	Other	Other	High	samsung
Elder	No	Doctor	Bachelors	Low	apple
Elder	No	Doctor	Bachelors	Middle	samsung
Elder	No	Doctor	Bachelors	UpperMiddle	apple
Elder	No	Doctor	Bachelors	High	samsung
Elder	No	Doctor	Masters	Low	apple
Elder	No	Doctor	Masters	Middle	samsung
Elder	No	Doctor	Masters	UpperMiddle	apple
Elder	No	Doctor	Masters	High	apple
Elder	No	Doctor	Other	Low	apple
Elder	No	Doctor	Other	Middle	samsung
Elder	No	Doctor	Other	UpperMiddle	apple
Elder	No	Doctor	Other	High	apple

Elder	No	Engineer	Bachelors	Low	apple
Elder	No	Engineer	Bachelors	Middle	laptop
Elder	No	Engineer	Bachelors	UpperMiddle	apple
Elder	No	Engineer	Bachelors	High	apple
Elder	No	Engineer	Masters	Low	apple
Elder	No	Engineer	Masters	Middle	samsung
Elder	No	Engineer	Masters	UpperMiddle	apple
Elder	No	Engineer	Masters	High	apple
Elder	No	Engineer	Other	Low	apple
Elder	No	Engineer	Other	Middle	samsung
Elder	No	Engineer	Other	UpperMiddle	apple
Elder	No	Engineer	Other	High	apple
Elder	No	Teacher	Bachelors	Low	laptop
Elder	No	Teacher	Bachelors	Middle	laptop
Elder	No	Teacher	Bachelors	UpperMiddle	laptop
Elder	No	Teacher	Bachelors	High	laptop
Elder	No	Teacher	Masters	Low	laptop
Elder	No	Teacher	Masters	Middle	laptop
Elder	No	Teacher	Masters	UpperMiddle	laptop
Elder	No	Teacher	Masters	High	laptop
Elder	No	Teacher	Other	Low	laptop
Elder	No	Teacher	Other	Middle	laptop
Elder	No	Teacher	Other	UpperMiddle	laptop
Elder	No	Teacher	Other	High	laptop
Elder	No	Other	Bachelors	Low	samsung
Elder	No	Other	Bachelors	Middle	samsung
Elder	No	Other	Bachelors	UpperMiddle	samsung
Elder	No	Other	Bachelors	High	samsung
Elder	No	Other	Masters	Low	samsung
Elder	No	Other	Masters	Middle	samsung
Elder	No	Other	Masters	UpperMiddle	samsung
Elder	No	Other	Masters	High	samsung
Elder	No	Other	Other	Low	samsung
Elder	No	Other	Other	Middle	samsung
Elder	No	Other	Other	UpperMiddle	samsung
Elder	No	Other	Other	High	samsung

Naïve Bays Result

age	children	profession	education	salary	Naïve Bayes Output
Youth	Yes	Doctor	Bachelors	Low	apple
Youth	Yes	Doctor	Bachelors	Middle	apple
Youth	Yes	Doctor	Bachelors	UpperMiddle	apple

Youth	Yes	Doctor	Bachelors	High	apple
Youth	Yes	Doctor	Masters	Low	apple
Youth	Yes	Doctor	Masters	Middle	apple
Youth	Yes	Doctor	Masters	UpperMiddle	apple
Youth	Yes	Doctor	Masters	High	apple
Youth	Yes	Doctor	Other	Low	apple
Youth	Yes	Doctor	Other	Middle	apple
Youth	Yes	Doctor	Other	UpperMiddle	apple
Youth	Yes	Doctor	Other	High	apple
Youth	Yes	Engineer	Bachelors	Low	samsung
Youth	Yes	Engineer	Bachelors	Middle	samsung
Youth	Yes	Engineer	Bachelors	UpperMiddle	samsung
Youth	Yes	Engineer	Bachelors	High	samsung
Youth	Yes	Engineer	Masters	Low	apple
Youth	Yes	Engineer	Masters	Middle	apple
Youth	Yes	Engineer	Masters	UpperMiddle	apple
Youth	Yes	Engineer	Masters	High	apple
Youth	Yes	Engineer	Other	Low	samsung
Youth	Yes	Engineer	Other	Middle	samsung
Youth	Yes	Engineer	Other	UpperMiddle	samsung
Youth	Yes	Engineer	Other	High	samsung
Youth	Yes	Teacher	Bachelors	Low	samsung
Youth	Yes	Teacher	Bachelors	Middle	samsung
Youth	Yes	Teacher	Bachelors	UpperMiddle	samsung
Youth	Yes	Teacher	Bachelors	High	samsung
Youth	Yes	Teacher	Masters	Low	apple
Youth	Yes	Teacher	Masters	Middle	apple
Youth	Yes	Teacher	Masters	UpperMiddle	apple
Youth	Yes	Teacher	Masters	High	apple
Youth	Yes	Teacher	Other	Low	samsung
Youth	Yes	Teacher	Other	Middle	samsung
Youth	Yes	Teacher	Other	UpperMiddle	samsung
Youth	Yes	Teacher	Other	High	samsung
Youth	Yes	Other	Bachelors	Low	samsung
Youth	Yes	Other	Bachelors	Middle	samsung
Youth	Yes	Other	Bachelors	UpperMiddle	samsung
Youth	Yes	Other	Bachelors	High	samsung
Youth	Yes	Other	Masters	Low	apple
Youth	Yes	Other	Masters	Middle	apple
Youth	Yes	Other	Masters	UpperMiddle	apple
Youth	Yes	Other	Masters	High	apple
Youth	Yes	Other	Other	Low	apple
Youth	Yes	Other	Other	Middle	apple
Youth	Yes	Other	Other	UpperMiddle	apple

Youth	Yes	Other	Other	High	apple
Youth	No	Doctor	Bachelors	Low	apple
Youth	No	Doctor	Bachelors	Middle	apple
Youth	No	Doctor	Bachelors	UpperMiddle	apple
Youth	No	Doctor	Bachelors	High	apple
Youth	No	Doctor	Masters	Low	apple
Youth	No	Doctor	Masters	Middle	apple
Youth	No	Doctor	Masters	UpperMiddle	apple
Youth	No	Doctor	Masters	High	apple
Youth	No	Doctor	Other	Low	apple
Youth	No	Doctor	Other	Middle	apple
Youth	No	Doctor	Other	UpperMiddle	apple
Youth	No	Doctor	Other	High	apple
Youth	No	Engineer	Bachelors	Low	apple
Youth	No	Engineer	Bachelors	Middle	apple
Youth	No	Engineer	Bachelors	UpperMiddle	apple
Youth	No	Engineer	Bachelors	High	apple
Youth	No	Engineer	Masters	Low	apple
Youth	No	Engineer	Masters	Middle	apple
Youth	No	Engineer	Masters	UpperMiddle	apple
Youth	No	Engineer	Masters	High	apple
Youth	No	Engineer	Other	Low	apple
Youth	No	Engineer	Other	Middle	apple
Youth	No	Engineer	Other	UpperMiddle	apple
Youth	No	Engineer	Other	High	apple
Youth	No	Teacher	Bachelors	Low	samsung
Youth	No	Teacher	Bachelors	Middle	samsung
Youth	No	Teacher	Bachelors	UpperMiddle	samsung
Youth	No	Teacher	Bachelors	High	samsung
Youth	No	Teacher	Masters	Low	
Youth	No	Teacher	Masters	Middle	
Youth	No	Teacher	Masters	UpperMiddle	
Youth	No	Teacher	Masters	High	
Youth	No	Teacher	Other	Low	samsung
Youth	No	Teacher	Other	Middle	samsung
Youth	No	Teacher	Other	UpperMiddle	samsung
Youth	No	Teacher	Other	High	samsung
Youth	No	Other	Bachelors	Low	samsung
Youth	No	Other	Bachelors	Middle	samsung
Youth	No	Other	Bachelors	UpperMiddle	samsung
Youth	No	Other	Bachelors	High	samsung
Youth	No	Other	Masters	Low	
Youth	No	Other	Masters	Middle	
Youth	No	Other	Masters	UpperMiddle	

Youth	No	Other	Masters	High	
Youth	No	Other	Other	Low	samsung
Youth	No	Other	Other	Middle	samsung
Youth	No	Other	Other	UpperMiddle	samsung
Youth	No	Other	Other	High	samsung
Middle	Yes	Doctor	Bachelors	Low	apple
Middle	Yes	Doctor	Bachelors	Middle	apple
Middle	Yes	Doctor	Bachelors	UpperMiddle	apple
Middle	Yes	Doctor	Bachelors	High	apple
Middle	Yes	Doctor	Masters	Low	apple
Middle	Yes	Doctor	Masters	Middle	apple
Middle	Yes	Doctor	Masters	UpperMiddle	apple
Middle	Yes	Doctor	Masters	High	apple
Middle	Yes	Doctor	Other	Low	apple
Middle	Yes	Doctor	Other	Middle	apple
Middle	Yes	Doctor	Other	UpperMiddle	apple
Middle	Yes	Doctor	Other	High	apple
Middle	Yes	Engineer	Bachelors	Low	apple
Middle	Yes	Engineer	Bachelors	Middle	apple
Middle	Yes	Engineer	Bachelors	UpperMiddle	apple
Middle	Yes	Engineer	Bachelors	High	apple
Middle	Yes	Engineer	Masters	Low	apple
Middle	Yes	Engineer	Masters	Middle	apple
Middle	Yes	Engineer	Masters	UpperMiddle	apple
Middle	Yes	Engineer	Masters	High	apple
Middle	Yes	Engineer	Other	Low	apple
Middle	Yes	Engineer	Other	Middle	apple
Middle	Yes	Engineer	Other	UpperMiddle	apple
Middle	Yes	Engineer	Other	High	apple
Middle	Yes	Teacher	Bachelors	Low	apple
Middle	Yes	Teacher	Bachelors	Middle	apple
Middle	Yes	Teacher	Bachelors	UpperMiddle	apple
Middle	Yes	Teacher	Bachelors	High	apple
Middle	Yes	Teacher	Masters	Low	apple
Middle	Yes	Teacher	Masters	Middle	apple
Middle	Yes	Teacher	Masters	UpperMiddle	apple
Middle	Yes	Teacher	Masters	High	apple
Middle	Yes	Teacher	Other	Low	apple
Middle	Yes	Teacher	Other	Middle	apple
Middle	Yes	Teacher	Other	UpperMiddle	apple
Middle	Yes	Teacher	Other	High	apple
Middle	Yes	Other	Bachelors	Low	samsung
Middle	Yes	Other	Bachelors	Middle	apple
Middle	Yes	Other	Bachelors	UpperMiddle	samsung

Middle	Yes	Other	Bachelors	High	samsung
Middle	Yes	Other	Masters	Low	apple
Middle	Yes	Other	Masters	Middle	apple
Middle	Yes	Other	Masters	UpperMiddle	apple
Middle	Yes	Other	Masters	High	apple
Middle	Yes	Other	Other	Low	samsung
Middle	Yes	Other	Other	Middle	samsung
Middle	Yes	Other	Other	UpperMiddle	samsung
Middle	Yes	Other	Other	High	samsung
Middle	No	Doctor	Bachelors	Low	apple
Middle	No	Doctor	Bachelors	Middle	apple
Middle	No	Doctor	Bachelors	UpperMiddle	apple
Middle	No	Doctor	Bachelors	High	apple
Middle	No	Doctor	Masters	Low	apple
Middle	No	Doctor	Masters	Middle	apple
Middle	No	Doctor	Masters	UpperMiddle	apple
Middle	No	Doctor	Masters	High	apple
Middle	No	Doctor	Other	Low	apple
Middle	No	Doctor	Other	Middle	apple
Middle	No	Doctor	Other	UpperMiddle	apple
Middle	No	Doctor	Other	High	apple
Middle	No	Engineer	Bachelors	Low	samsung
Middle	No	Engineer	Bachelors	Middle	samsung
Middle	No	Engineer	Bachelors	UpperMiddle	samsung
Middle	No	Engineer	Bachelors	High	samsung
Middle	No	Engineer	Masters	Low	samsung
Middle	No	Engineer	Masters	Middle	samsung
Middle	No	Engineer	Masters	UpperMiddle	samsung
Middle	No	Engineer	Masters	High	apple
Middle	No	Engineer	Other	Low	samsung
Middle	No	Engineer	Other	Middle	samsung
Middle	No	Engineer	Other	UpperMiddle	samsung
Middle	No	Engineer	Other	High	samsung
Middle	No	Teacher	Bachelors	Low	samsung
Middle	No	Teacher	Bachelors	Middle	samsung
Middle	No	Teacher	Bachelors	UpperMiddle	samsung
Middle	No	Teacher	Bachelors	High	apple
Middle	No	Teacher	Masters	Low	apple
Middle	No	Teacher	Masters	Middle	apple
Middle	No	Teacher	Masters	UpperMiddle	apple
Middle	No	Teacher	Masters	High	apple
Middle	No	Teacher	Other	Low	apple
Middle	No	Teacher	Other	Middle	apple
Middle	No	Teacher	Other	UpperMiddle	apple

Middle	No	Teacher	Other	High	apple
Middle	No	Other	Bachelors	Low	apple
Middle	No	Other	Bachelors	Middle	apple
Middle	No	Other	Bachelors	UpperMiddle	samsung
Middle	No	Other	Bachelors	High	samsung
Middle	No	Other	Masters	Low	samsung
Middle	No	Other	Masters	Middle	samsung
Middle	No	Other	Masters	UpperMiddle	samsung
Middle	No	Other	Masters	High	samsung
Middle	No	Other	Other	Low	samsung
Middle	No	Other	Other	Middle	samsung
Middle	No	Other	Other	UpperMiddle	samsung
Middle	No	Other	Other	High	samsung
Elder	Yes	Doctor	Bachelors	Low	apple
Elder	Yes	Doctor	Bachelors	Middle	apple
Elder	Yes	Doctor	Bachelors	UpperMiddle	apple
Elder	Yes	Doctor	Bachelors	High	apple
Elder	Yes	Doctor	Masters	Low	apple
Elder	Yes	Doctor	Masters	Middle	apple
Elder	Yes	Doctor	Masters	UpperMiddle	apple
Elder	Yes	Doctor	Masters	High	apple
Elder	Yes	Doctor	Other	Low	apple
Elder	Yes	Doctor	Other	Middle	apple
Elder	Yes	Doctor	Other	UpperMiddle	apple
Elder	Yes	Doctor	Other	High	apple
Elder	Yes	Engineer	Bachelors	Low	samsung
Elder	Yes	Engineer	Bachelors	Middle	samsung
Elder	Yes	Engineer	Bachelors	UpperMiddle	samsung
Elder	Yes	Engineer	Bachelors	High	samsung
Elder	Yes	Engineer	Masters	Low	apple
Elder	Yes	Engineer	Masters	Middle	apple
Elder	Yes	Engineer	Masters	UpperMiddle	apple
Elder	Yes	Engineer	Masters	High	apple
Elder	Yes	Engineer	Other	Low	apple
Elder	Yes	Engineer	Other	Middle	apple
Elder	Yes	Engineer	Other	UpperMiddle	apple
Elder	Yes	Engineer	Other	High	apple
Elder	Yes	Teacher	Bachelors	Low	apple
Elder	Yes	Teacher	Bachelors	Middle	apple
Elder	Yes	Teacher	Bachelors	UpperMiddle	apple
Elder	Yes	Teacher	Bachelors	High	apple
Elder	Yes	Teacher	Masters	Low	samsung
Elder	Yes	Teacher	Masters	Middle	samsung
Elder	Yes	Teacher	Masters	UpperMiddle	samsung

Elder	Yes	Teacher	Masters	High	samsung
Elder	Yes	Teacher	Other	Low	samsung
Elder	Yes	Teacher	Other	Middle	samsung
Elder	Yes	Teacher	Other	UpperMiddle	samsung
Elder	Yes	Teacher	Other	High	samsung
Elder	Yes	Other	Bachelors	Low	samsung
Elder	Yes	Other	Bachelors	Middle	samsung
Elder	Yes	Other	Bachelors	UpperMiddle	samsung
Elder	Yes	Other	Bachelors	High	samsung
Elder	Yes	Other	Masters	Low	samsung
Elder	Yes	Other	Masters	Middle	samsung
Elder	Yes	Other	Masters	UpperMiddle	samsung
Elder	Yes	Other	Masters	High	samsung
Elder	Yes	Other	Other	Low	samsung
Elder	Yes	Other	Other	Middle	samsung
Elder	Yes	Other	Other	UpperMiddle	samsung
Elder	Yes	Other	Other	High	samsung
Elder	No	Doctor	Bachelors	Low	apple
Elder	No	Doctor	Bachelors	Middle	apple
Elder	No	Doctor	Bachelors	UpperMiddle	apple
Elder	No	Doctor	Bachelors	High	apple
Elder	No	Doctor	Masters	Low	apple
Elder	No	Doctor	Masters	Middle	apple
Elder	No	Doctor	Masters	UpperMiddle	apple
Elder	No	Doctor	Masters	High	apple
Elder	No	Doctor	Other	Low	apple
Elder	No	Doctor	Other	Middle	apple
Elder	No	Doctor	Other	UpperMiddle	apple
Elder	No	Doctor	Other	High	apple
Elder	No	Engineer	Bachelors	Low	samsung
Elder	No	Engineer	Bachelors	Middle	samsung
Elder	No	Engineer	Bachelors	UpperMiddle	samsung
Elder	No	Engineer	Bachelors	High	samsung
Elder	No	Engineer	Masters	Low	samsung
Elder	No	Engineer	Masters	Middle	samsung
Elder	No	Engineer	Masters	UpperMiddle	samsung
Elder	No	Engineer	Masters	High	samsung
Elder	No	Engineer	Other	Low	samsung
Elder	No	Engineer	Other	Middle	samsung
Elder	No	Engineer	Other	UpperMiddle	samsung
Elder	No	Engineer	Other	High	samsung
Elder	No	Teacher	Bachelors	Low	samsung
Elder	No	Teacher	Bachelors	Middle	samsung
Elder	No	Teacher	Bachelors	UpperMiddle	samsung

Elder	No	Teacher	Bachelors	High	samsung
Elder	No	Teacher	Masters	Low	samsung
Elder	No	Teacher	Masters	Middle	samsung
Elder	No	Teacher	Masters	UpperMiddle	samsung
Elder	No	Teacher	Masters	High	samsung
Elder	No	Teacher	Other	Low	samsung
Elder	No	Teacher	Other	Middle	samsung
Elder	No	Teacher	Other	UpperMiddle	samsung
Elder	No	Teacher	Other	High	samsung
Elder	No	Other	Bachelors	Low	samsung
Elder	No	Other	Bachelors	Middle	samsung
Elder	No	Other	Bachelors	UpperMiddle	samsung
Elder	No	Other	Bachelors	High	samsung
Elder	No	Other	Masters	Low	samsung
Elder	No	Other	Masters	Middle	samsung
Elder	No	Other	Masters	UpperMiddle	samsung
Elder	No	Other	Masters	High	samsung
Elder	No	Other	Other	Low	samsung
Elder	No	Other	Other	Middle	samsung
Elder	No	Other	Other	UpperMiddle	samsung
Elder	No	Other	Other	High	samsung

Appendix D

Test Date set – 01

@relation equipment-weka.filters.unsupervised.instance.Resample-S1-Z60.0-no-replacement

@attribute Age {Youth Middle Elder}
@attribute Child {Yes No}
@attribute Profession {Doctor Engineer Teacher Other}
@attribute Education {Masters Bachelors Other}
@attribute Salary {Low Middle upperMiddle High}
@attribute Brand {Apple Samsung Laptop HTC}

@data

Middle	No	Engineer	Masters	Middle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	Yes	Other	Other	Middle	HTC
Elder	No	Engineer	Masters	upperMiddle	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Elder	Yes	Doctor	Bachelors	High	Samsung
Middle	No	Teacher	Bachelors	Low	Laptop
Middle	Yes	Other	Bachelors	upperMiddle	Apple
Elder	Yes	Other	Other	upperMiddle	Samsung
Elder	No	Doctor	Masters	Middle	Samsung
Middle	No	Other	Other	Middle	Laptop
Middle	No	Engineer	Masters	Middle	Laptop
Middle	No	Other	Bachelors	upperMiddle	Laptop
Elder	Yes	Doctor	Masters	High	Apple
Elder	Yes	Other	Masters	upperMiddle	Laptop
Youth	No	Other	Bachelors	Low	Samsung
Youth	No	Engineer	Bachelors	upperMiddle	Apple
Middle	No	Other	Other	Middle	Laptop
Middle	No	Engineer	Bachelors	High	Samsung
Elder	Yes	Other	Bachelors	Middle	Apple
Elder	Yes	Other	Bachelors	High	Samsung
Elder	No	Other	Masters	High	Apple
Middle	No	Other	Bachelors	upperMiddle	Samsung
Middle	No	Other	Masters	Middle	Samsung
Middle	No	Other	Bachelors	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Other	Bachelors	Middle	HTC
Middle	No	Other	Bachelors	High	Samsung
Youth	No	Other	Other	upperMiddle	Laptop

Youth	No	Other	Other	Low	Samsung
Middle	Yes	Other	Masters	Middle	Apple
Middle	No	Engineer	Masters	Middle	HTC
Youth	No	Other	Other	upperMiddle	Samsung
Elder	No	Engineer	Masters	Low	Apple
Middle	No	Other	Other	Middle	Laptop
Middle	Yes	Other	Bachelors	upperMiddle	Samsung
Elder	Yes	Other	Bachelors	Low	HTC
Middle	No	Other	Bachelors	Low	Laptop
Youth	Yes	Other	Bachelors	Low	HTC
Elder	Yes	Engineer	Masters	High	Laptop
Elder	Yes	Other	Other	Low	Samsung
Youth	No	Engineer	Bachelors	upperMiddle	Apple
Youth	No	Other	Other	Low	Samsung
Elder	Yes	Other	Masters	High	HTC
Middle	Yes	Engineer	Bachelors	upperMiddle	Apple
Elder	Yes	Engineer	Masters	High	Apple
Middle	Yes	Other	Other	Middle	HTC
Elder	No	Doctor	Masters	High	HTC
Middle	Yes	Other	Bachelors	upperMiddle	Apple
Middle	No	Other	Other	Middle	Apple
Youth	No	Other	Other	upperMiddle	HTC
Youth	Yes	Other	Bachelors	Middle	Laptop
Middle	No	Engineer	Masters	Middle	Samsung
Elder	Yes	Other	Masters	High	HTC
Elder	No	Engineer	Masters	upperMiddle	Apple
Elder	Yes	Teacher	Other	Low	Laptop
Middle	Yes	Other	Bachelors	Low	Apple
Elder	Yes	Other	Other	Middle	HTC
Youth	No	Other	Other	upperMiddle	HTC
Middle	No	Engineer	Masters	High	HTC
Middle	No	Doctor	Bachelors	upperMiddle	Apple
Middle	No	Other	Other	Middle	Samsung
Middle	No	Teacher	Bachelors	Middle	Samsung
Middle	No	Other	Other	Middle	Samsung
Youth	No	Other	Other	Low	HTC
Youth	No	Other	Other	upperMiddle	HTC
Middle	No	Other	Masters	upperMiddle	HTC
Middle	No	Other	Bachelors	Middle	Laptop
Middle	Yes	Engineer	Masters	High	Apple
Middle	No	Other	Bachelors	upperMiddle	Laptop
Middle	Yes	Other	Bachelors	Low	Samsung
Middle	Yes	Doctor	Bachelors	Middle	Laptop
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Doctor	Bachelors	Middle	Samsung

Middle	Yes	Other	Bachelors	upperMiddle	Samsung
Middle	No	Teacher	Other	Low	Samsung
Middle	No	Other	Other	Middle	Samsung
Elder	No	Doctor	Masters	upperMiddle	Apple
Middle	No	Engineer	Masters	upperMiddle	Apple
Middle	No	Engineer	Masters	High	Apple
Middle	No	Engineer	Masters	High	Apple
Middle	No	Engineer	Masters	High	Apple
Youth	No	Other	Masters	upperMiddle	Apple
Youth	No	Other	Other	Low	Laptop
Elder	Yes	Other	Bachelors	upperMiddle	Samsung
Middle	No	Other	Bachelors	Low	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Other	Other	Low	Samsung
Middle	No	Engineer	Masters	Middle	Samsung
Middle	No	Other	Bachelors	High	Apple
Middle	No	Doctor	Bachelors	Middle	Samsung
Youth	No	Teacher	Other	Low	Samsung
Middle	Yes	Engineer	Masters	High	Apple
Middle	Yes	Other	Other	upperMiddle	Apple
Middle	No	Other	Masters	High	Apple
Middle	No	Other	Bachelors	Middle	Apple
Middle	Yes	Other	Masters	Middle	Samsung
Middle	Yes	Engineer	Bachelors	upperMiddle	Laptop
Youth	Yes	Other	Other	Low	Apple
Middle	Yes	Other	Bachelors	Middle	Samsung
Youth	No	Other	Other	upperMiddle	Apple
Middle	Yes	Other	Other	upperMiddle	Apple
Youth	No	Other	Other	upperMiddle	Samsung
Youth	No	Other	Other	upperMiddle	Samsung
Youth	No	Other	Other	Low	HTC
Youth	No	Other	Other	Middle	Laptop
Middle	No	Engineer	Bachelors	Middle	Laptop
Middle	No	Other	Bachelors	upperMiddle	Apple
Youth	No	Other	Masters	Low	Apple
Elder	Yes	Doctor	Masters	High	Apple
Elder	Yes	Other	Masters	High	Apple
Elder	Yes	Doctor	Masters	High	Samsung
Middle	No	Other	Other	Low	Samsung
Elder	Yes	Other	Masters	High	Samsung
Youth	No	Teacher	Bachelors	Middle	HTC
Middle	No	Other	Bachelors	Middle	Samsung
Youth	No	Teacher	Other	Low	HTC
Youth	Yes	Other	Other	Low	HTC
Elder	No	Doctor	Bachelors	Middle	Samsung

Elder	Yes	Doctor	Masters	High	Samsung
Elder	Yes	Other	Bachelors	Middle	Apple
Middle	Yes	Other	Masters	High	Samsung
Elder	No	Doctor	Masters	High	Apple
Youth	No	Other	Other	Low	HTC
Elder	No	Teacher	Bachelors	upperMiddle	HTC
Elder	Yes	Other	Masters	upperMiddle	HTC
Elder	Yes	Other	Masters	High	HTC
Youth	No	Engineer	Bachelors	upperMiddle	Samsung
Youth	No	Other	Other	Middle	Apple
Middle	No	Engineer	Masters	Middle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	Yes	Other	Other	Low	Apple
Middle	Yes	Other	Other	Low	Apple
Elder	Yes	Engineer	Masters	High	Samsung
Elder	No	Engineer	Masters	upperMiddle	Samsung
Middle	No	Other	Bachelors	Middle	Samsung
Middle	No	Teacher	Bachelors	Low	Laptop
Youth	No	Other	Bachelors	Middle	Apple
Middle	Yes	Other	Masters	upperMiddle	Samsung
Middle	Yes	Other	Bachelors	upperMiddle	Apple
Youth	No	Other	Bachelors	upperMiddle	Samsung
Middle	No	Other	Bachelors	upperMiddle	Apple
Youth	No	Other	Other	Low	Samsung
Middle	No	Other	Other	Middle	Laptop
Middle	No	Engineer	Masters	Middle	Laptop
Middle	No	Other	Bachelors	upperMiddle	Laptop
Elder	Yes	Other	Masters	upperMiddle	Laptop
Elder	No	Doctor	Bachelors	upperMiddle	Apple

Test Data set -02

@relation equipment-weka.filters.unsupervised.instance.Resample-S1-Z60.0-no-replacement-weka.filters.u

@attribute Age {Teens,Middle,Elder,Youth}
@attribute Gender {Female,Male}
@attribute Status {Single,Married}
@attribute Profession {Doctor,Engineer,Teacher,Other}
@attribute Salary {Lowest,Middle,uMiddle,High,Other}
@attribute Brand {Apple,Samsung,Other}
@data

Youth	Male	Single	Other	Middle	Apple
Middle	Male	Married	Other	High	Apple
Youth	Male	Single	Other	Other	Other

Middle	Male	Single	Other	Middle	Samsung
Middle	Male	Single	Engineer	uMiddle	Samsung
Middle	Female	Single	Other	High	Samsung
Middle	Female	Single	Engineer	High	Apple
Middle	Female	Married	Other	Other	Samsung
Middle	Female	Single	Other	High	Samsung
Youth	Male	Single	Other	Lowest	Samsung
Elder	Male	Married	Other	Middle	Samsung
Middle	Female	Single	Other	Middle	Other
Teens	Female	Single	Other	Other	Other
Elder	Female	Married	Other	Lowest	Other
Middle	Female	Single	Other	Lowest	Other
Elder	Male	Married	Other	Other	Other
Middle	Female	Married	Engineer	High	Apple
Youth	Female	Single	Other	Lowest	Samsung
Middle	Female	Married	Other	Other	Apple
Youth	Male	Married	Other	uMiddle	Other
Elder	Male	Single	Engineer	High	Apple
Elder	Male	Married	Other	uMiddle	Other
Middle	Female	Single	Other	uMiddle	Other
Youth	Male	Single	Other	Lowest	Samsung
Middle	Female	Married	Teacher	Middle	Samsung
Middle	Male	Married	Engineer	Other	Apple
Teens	Male	Single	Other	High	Samsung
Middle	Male	Married	Doctor	uMiddle	Samsung
Middle	Male	Married	Other	Middle	Samsung
Middle	Male	Married	Other	High	Samsung
Middle	Female	Single	Teacher	Lowest	Samsung
Middle	Female	Married	Engineer	Other	Samsung
Middle	Female	Single	Other	Lowest	Apple
Middle	Male	Single	Other	Lowest	Samsung
Middle	Female	Single	Engineer	Middle	Samsung
Middle	Female	Married	Engineer	High	Samsung
Middle	Male	Single	Other	Other	Apple
Middle	Male	Married	Doctor	Other	Apple
Youth	Female	Single	Other	Lowest	Other
Middle	Female	Single	Other	Middle	Samsung
Middle	Male	Single	Engineer	High	Samsung
Youth	Male	Single	Other	Other	Samsung
Youth	Female	Single	Other	Lowest	Other
Youth	Male	Single	Other	Other	Samsung
Elder	Female	Married	Other	Other	Apple
Elder	Male	Married	Engineer	Other	Samsung
Teens	Male	Single	Other	Lowest	Other
Teens	Female	Single	Teacher	Lowest	Samsung

Youth	Female	Married	Other	Lowest	Samsung
Elder	Female	Single	Other	Lowest	Other
Elder	Female	Married	Other	High	Samsung
Youth	Male	Single	Other	Middle	Samsung
Middle	Male	Married	Other	High	Samsung
Youth	Female	Single	Other	Lowest	Other
Middle	Female	Single	Other	Middle	Samsung
Middle	Male	Single	Engineer	High	Samsung
Youth	Male	Single	Other	Other	Samsung
Youth	Female	Single	Other	Lowest	Other
Youth	Male	Single	Other	Other	Samsung
Elder	Female	Married	Other	Other	Apple

Test Data set -03

@relation equipment-weka.filters.unsupervised.instance.Resample-S1-Z60.0-no-replacement-weka.filters.unsupervised.instance.Resample-S1-Z60.0-no-replacement-V-weka.filters.unsupervised.instance.Resample-S1-Z50.0-no-replacement-V

@attribute Age {Youth Middle Elder}
@attribute Child {Yes No}
@attribute Profession {Doctor Engineer Teacher Other}
@attribute Education {Masters Bachelors Other}
@attribute Salary {Low Middle upperMiddle High}
@attribute Brand {Apple Samsung Laptop HTC}

@data

Elder	No	Doctor	Masters	Middle	Samsung
Middle	No	Engineer	Masters	Middle	Laptop
Middle	No	Engineer	Bachelors	High	Samsung
Middle	No	Other	Bachelors	Middle	HTC
Middle	No	Other	Other	Middle	Laptop
Elder	Yes	Other	Bachelors	Low	HTC
Middle	No	Other	Bachelors	Low	Laptop

Elder	Yes	Other	Other	Low	Samsung
Middle	No	Other	Other	Middle	Apple
Elder	Yes	Other	Masters	High	HTC
Elder	No	Engineer	Masters	upperMiddle	Apple
Middle	No	Engineer	Masters	High	Apple
Middle	No	Other	Bachelors	Middle	Samsung
Middle	Yes	Other	Other	upperMiddle	Apple
Middle	Yes	Engineer	Bachelors	upperMiddle	Laptop
Youth	Yes	Other	Other	Low	Apple
Youth	No	Other	Other	upperMiddle	Samsung
Youth	No	Other	Other	Low	HTC
Middle	No	Engineer	Bachelors	Middle	Laptop
Elder	Yes	Other	Masters	High	Samsung
Youth	No	Teacher	Other	Low	HTC
Elder	Yes	Doctor	Masters	High	Samsung
Elder	No	Doctor	Masters	High	Apple
Youth	No	Engineer	Bachelors	upperMiddle	Samsung
Middle	No	Other	Other	upperMiddle	Samsung
Middle	Yes	Other	Other	Low	Apple
Middle	Yes	Other	Bachelors	upperMiddle	Apple
Middle	No	Other	Bachelors	upperMiddle	Laptop
Elder	Yes	Other	Masters	upperMiddle	Laptop
Elder	No	Doctor	Bachelors	upperMiddle	Apple