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Prediction of Efficient Customer Behaviour Analysis usingLogitBoost&Attribute Selected Classifier Algorithms

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Abstract:

The Data Mining establishes closed consumer relationships and manages interpersonal relationships consumer in today's business world. Data classification has recently become popular in various applications and classification model is an important data mining technique in the industry modern techniques such as predictive analytics have gained a lot of research attraction these days. In the business world, it is important for the business information for the business people using the predictive analytics, it is possible to see what a consumer will buy next. The main goal is to increase the profit earned by a supermarket. In this paper, various consumer data have been conducted for analyzing the purchases of consumer behaviors. Initially, the purchases have been analyzed by classify the purchases gender classification and by analyzing what type service like the customer and buy the more products. The proposed approach focuses on the Prediction of the consumer behavior using two classification Algorithms one is logitboost and second one is attribute selected classifier. In this two algorithm come under Meta classifier in weka tool and in this two algorithm to classify consumer data efficiently.

Keywords: Data mining, Consumer behavior, weka tool, LogitBoost classifier, attributes selected classifier.

1. Introduction:

Data mining techniques is very useful the analyzing consumer behavior and also now days data mining algorithm is very efficient and accuracy. Data mining techniques to compare the data is very efficient and accurate and data mining concept having different techniques and algorithm classification techniques, regressions techniques, clustering techniques, association, correlation, artificial intelligence, machine learning neural networks .In this all algorithm and techniques comes under the two types learning supervised and unsupervised learning.

The classification algorithm to classify the data in data mining. In this technique having the different classification algorithm in the classification algorithm come under the supervised learning. Logistic Regression algorithm, Naive Bayes algorithm, Stochastic Gradient Descent algorithm, K-Nearest Neighbors algorithm, Decision Tree algorithm, Random Forest algorithm, Support Vector Machine algorithm in all algorithms is a classification algorithm. Previous paper compares the two classification algorithm Naive Bayes and Bayes net algorithms using weka tool. In this paper proposed method compare the another two classification algorithm for the Meta classifier. LogitBoost classifier, attributes selected classifier in this two algorithm comes under Meta classifier .Meta classifier is classify the data and create the final result. Weka tool used to implement of this study.

2. Related work

G. D. K. Kishore1, Dr. M. Babu Reddy to analysis the different classification algorithm classifier in different data set in this author to identified in this all classifier algorithm in attribute selected classifier is very suitable to heart-h dataset [1].Aditya Tekur, Prerna Jain, to compare the different classification and predict the Naïve Bayes, Logistic regression and decision trees gives the accurate result [2]. Hemlata Jain, Ajay Khunteta, Sumit Srivastava to compare two classification algorithms Logistic regression, Logit Boost and

predict Logistic regression accuracy is 85.2385% where ever Logit Boost also have accuracy 85.1785%[3]. Michiel C. van Wezel ,Rob Potharst in this two author to compare the different classification algorithm in meta classifier and predict the bagging, boosting and multi-boosting of three method of algorithm is to Improved Customer Choice Predictions[4]. Nazmun Nahar, Vicky Barua, Ferdous Ara, Mohammad Shahadat Hossain, Md. Arif Istiek Neloy, Karl Andersson in all this author to research different classification algorithm to identified AdaBoost, LogitBoost, BeggRep, BeggJ48 and random Forest are applied and compared in measurement of accuracy, RMSE TPR, FPR and ROC LogitBoost algorithm perform wise was well than the other algorithm and the accuracy of the LogitBoost algorithm is 71.53%. In this technique is use to liver disease prediction would improve our people's health[5].T.Sathya Devi, Dr.K.Meenakshi Sundaram in this two author to compare the different classification classifier algorithms to find research work to evaluation of the performances in terms in classification measurement accuracy of different measurement using different classification algorithm and shows the result is highest accuracy is measured in ADTree 92.67% and accuracy 91% found in NBTree , 86%in LogitBoost algorithm and 83.33% in AdaBoost Algorithm[6].G.Michael, A.Kumaravel, A.Chandrasekar in this two author to compare different classification classifier algorithm and predict the Bagging Meta Classifier more accuracy than other algorithms[7].

3. Methods and Materials

Weka tool is useful analyzing the consumer data .Weka tool developed by University of Waikato, New Zealand. It is free software and weka tool right to develop the java coding .java coding data directly apply in weka tool[8]. Weka tool is having different menus like preprocess, classify, cluster, and associate, selected attribute, visualized. Weka tool Classify menu is having important classifiers like Bayes, Function, lazy, Meta, Misc., Rules, Trees inthis used to classify the data [9].

3.1. Classification of Meta classifier algorithms:

Meta classifier having different package classifier likeAdaBoostM1 Class for boosting a nominal class classifier. Additive Regression Meta classifier that expended the improvement of performance of a regression base classifier algorithm. Attribute Selected Classifier Dimensionality reduced the data attribute selection before being passed on to a classifier. Bagging Class algorithm for a classifier to reduce data variance. Classification and Regression Class algorithm for doing classification using regression methods [10].Cost Sensitive Classifier is a Meta classifier that makes its base cost sensitive. CVParameter Selection Class classifier for perform by the parameter selection by cross-validation for any data classifier. For more information, see: R.Filtered Classifier Class algorithm for running an filter Iterative Classifier Optimizer Choosing the best number of data iteration for an Iterative Classifier such as LogitBoost. LogitBoost Class for performing additive logistic regression. Multi Class Classifiers algorithm is a Meta class classifier algorithm for handling multi-class datasets with 2-class data classifiers. Multi Class Classifier Updateable algorithm is a Meta class classifier for handling multi-class datasets with 2-class classifiers [11].Multi Scheme Class algorithm for selecting a classifier from the various using cross validation on the training data or the performance on the training data. Random Committee Class for building an ensemble of random base classifiers. Randomized Filtered Class classifier algorithm for run-up the arbitrary classifier and passed through an arbitrary filter. Random Sub Space algorithm method creating a decision tree based classifier that give the highest accuracy on training data and improves on common accuracy as it develop in complexity. Regression methods are that composed any classifier method on a data that has the class attributes (equal-width). Stacking is the grouped tougher several classifiers using the stacking method [12].Vote Class for combining classifiers. Weighted Instances Handler enable weighted instances support. Uses resample with data weights if the basic classifier is not implementing the Weka tool. Weighted Instances Handler interface and there are instance of weight. In this all algorithms manly focus on two classification classifier algorithms LogitBoost classifier, attributes selected classifier [13].

3.2. Attributes selected classifier:

Now days large set of data set available in database attribute selected classifier used select relevant or irrelevant data. Attribute selected classifier doing two tasks one is dimensionality reduction based on attribute selection, and second one is classification of data.

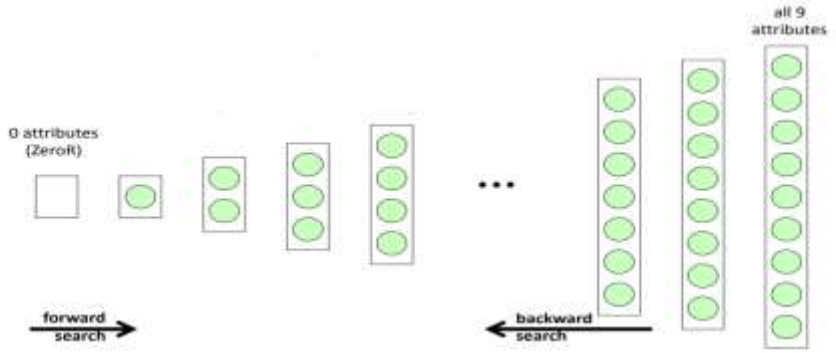


Fig.1: Attribute searching method

3.2.1. Searching method:

Searching method is selecting the subset of data it is used to input of classifier it is tacking two value

- Best first it is searching the space of attribute subsets data by greedy hill-climbing with a backward searching method.
- Greedy methods it performs a greedy forward searching through the space of attribute subsets data[14].

3.3. LogitBoost classifier

It is computational learning theory and machine learning algorithm, LogitBoost is a boosting algorithm developed by the Robert Tibshirani , Jerome Friedman and Trevor Hastie, in this three developers first develop the AdaBoost algorithm into a statistical method of framework. If one considers AdaBoost as a generated add the model and then apply the cost estimation function of logistic regression methods, and it is sane to the LogitBoost algorithm.[15].

Minimizing the cost function of Logit Boost:

Convex optimization of cost function: $f = \Sigma_t \alpha_t h_t$

LogitBoost algorithm minimizes the logistic loss: $\Sigma_t \log (1+e\text{-}yf(x_i))$

The main aim of this study to selecting best classifiers of classification algorithm in Meta classifier. In this paper compare two classifier LogitBoost classifier, attributes selected classifier in that classifier which one is best one [16].

3.4. Work of Flow diagram

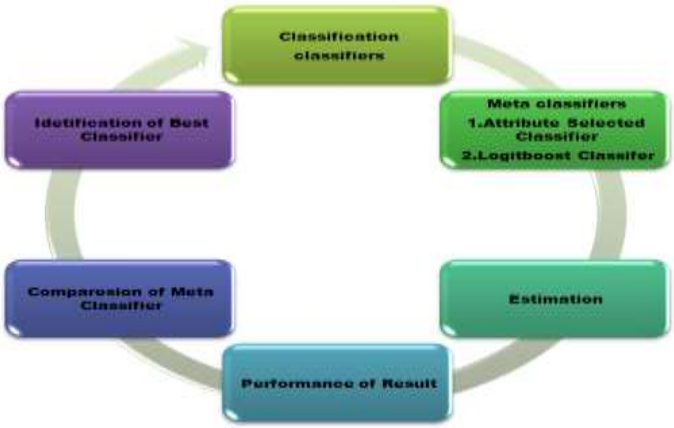


Fig.2: Work of methodology

- The first process selects the classification technique.
- Second process select the Meta classifier of LogitBoost classifier, attributes selected classifier one by one.

- Third process to estimation of two classifiers of LogitBoost classifier attributes selected classifier one by one.
- Fourth process to compare the LogitBoost classifier attributes selected classifier in meta classifier.
- Fifth process to identified the which classifier is best one[17].

4. Experimental Analysis

Experimental methods start on classification algorithm and classification classifier methods to classify the consumer data. Consumer behavior analysis is very useful analysis in market field in now days in research paper to classify the two type data review, gender. Review classification has four types of class that is services, quality, price and others and gender having two types of classes male, female. In the two types of data compare different measurement like Confusion Matrix, Kappa, True Positive, False Positive, Recall Measurement, and Precision Calculation.

4.1. Consumer data preprocessing:

Consumer data preprocessing using the weka tool for the different measurement in the research experiment method in different level of preprocess. In the experimental methods using classification algorithm and for Meta classifier. Meta classifier used to classify the data in the research experiment use the two types of Meta classifier that is LogitBoost classifier, attributes selected classifier and in the research paper analysis the different attribute in consumer data.

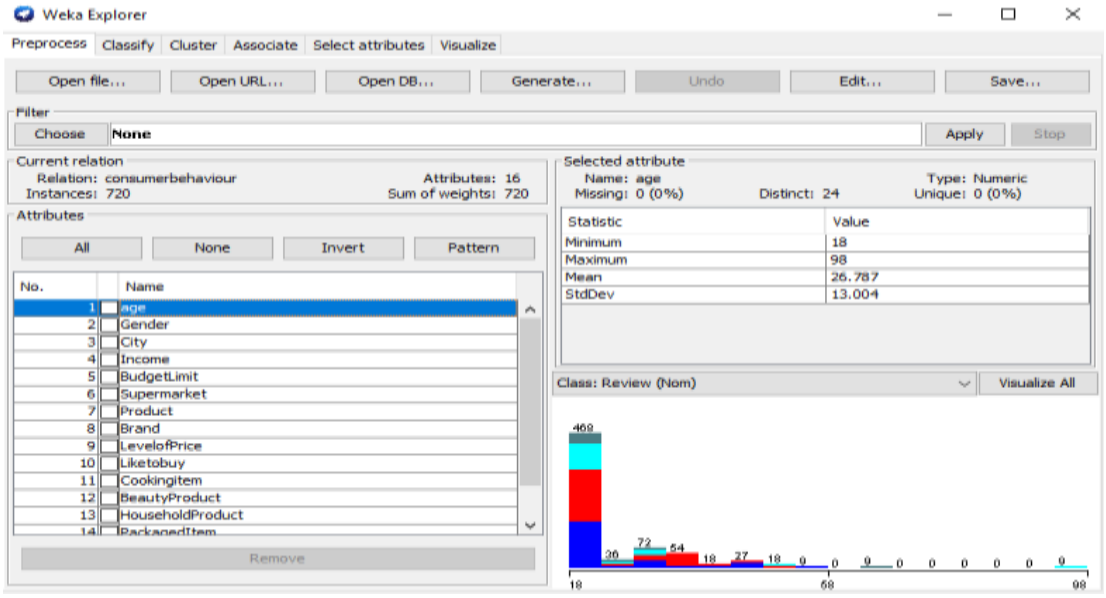


Fig.3: Preprocess of consumer data

4.2. LogitBoost classifier algorithm for gender and review analysis:

In the weka select the classify and different types of categories classifier available in weka tool and select Meta classifier. In the Meta classifier having different algorithm in that algorithm select logitboost classifier algorithm and in the experiment use data gender and this data analysis experiment we use 10 cross validation folds. Cross folds validation if want to change you change it. In the experiment analysis the different measurement should be analysis though weka tool.

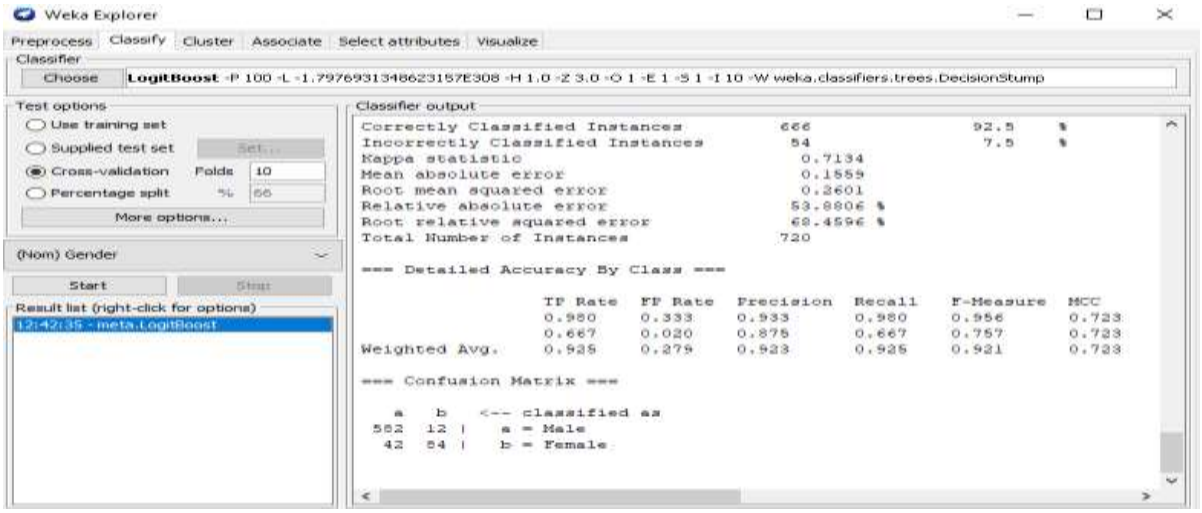


Fig.4: Logit Boost classifier algorithm and result for gender

In the weka select the classify and different types of categories classifier available in weka tool and select Meta classifier. In the Meta classifier having different algorithm in that algorithm select logitboost classifier algorithm and in the experiment use data review and this data analysis experiment we use 10 cross validation folds. Cross folds validation if want to change you change it. In the experiment analysis the different measurement should be analysis though weka tool.

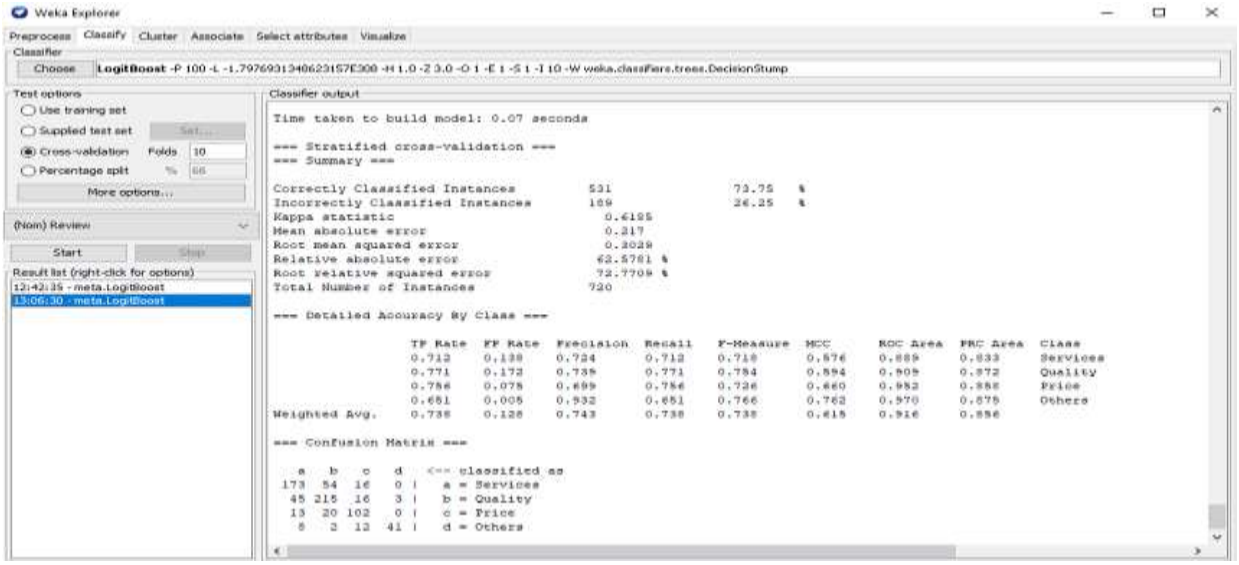


Fig.5: Logitboost classifier algorithm and result for review

4.3. Attributes selected classifier algorithm for gender and review analysis:

In the weka select the classify and different types of categories classifier available in weka tool and select Meta classifier. In the Meta classifier having different algorithm in that algorithm select attribute selected classifier algorithm and in the experiment use data gender and this data analysis experiment we use 10 cross validation folds. Cross folds validation if want to change you change it. In the experiment analysis the different measurement should be analysis though weka tool.

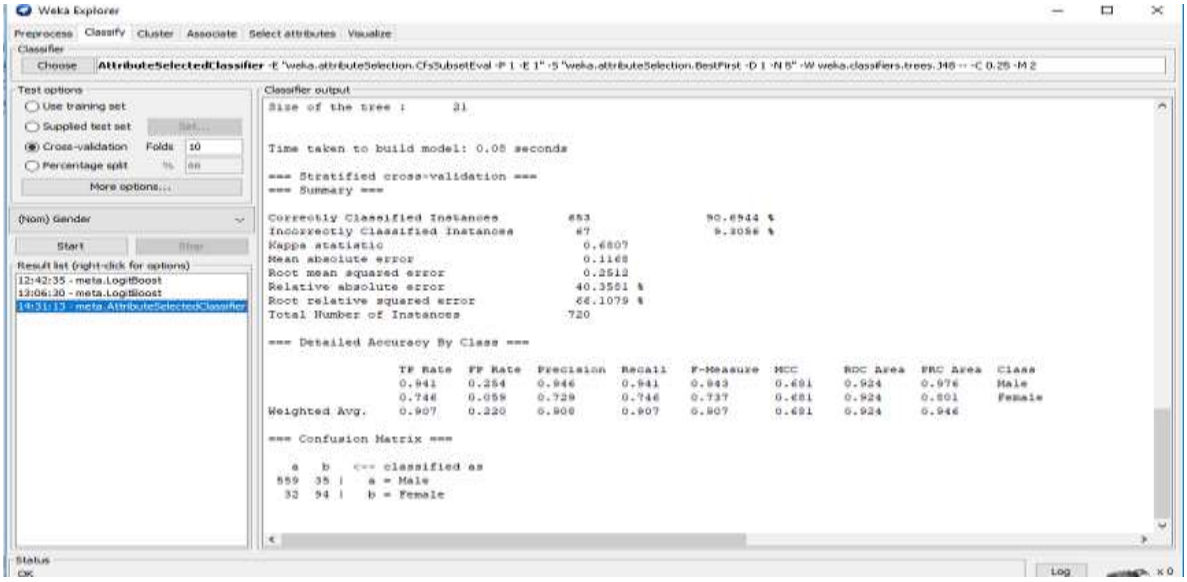


Fig.6: Attributes selected classifier algorithm and result for gender

In the weka select the classify and different types of categories classifier available in weka tool and select Meta classifier. In the Meta classifier having different algorithm in that algorithm select attribute selected classifier algorithm and in the experiment use data review and this data analysis experiment we use 10 cross validation folds. Cross folds validation if want to change you change it. In the experiment analysis the different measurement should be analysis though weka tool.

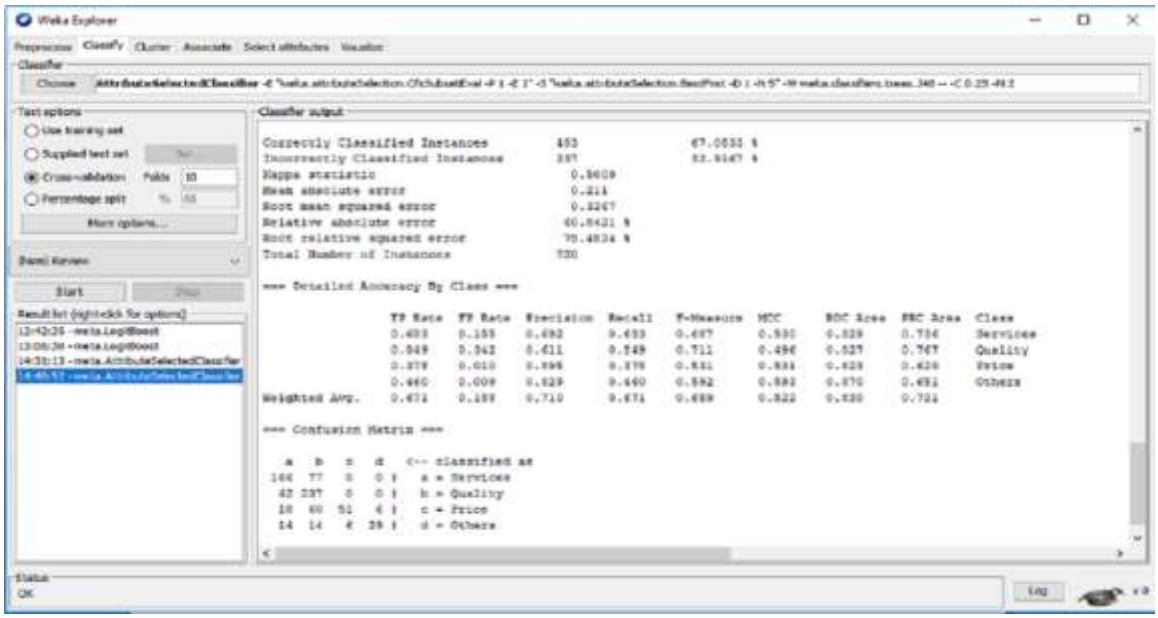


Fig.7: Attributes selected classifier algorithm and result for review

5. Result and Discussion

In this research paper used several data attribute like age, gender, city, income, budget limit**,** supermarket, and product, brand, level of price, like to buy, cooking items, beauty product, house hold product, packed items, payment method ,review. In this all attribute this paper discusses only two attribute gender and review experimental comparison and classification of results and use get the results two algorithms LogitBoost classifier, attributes selected classifier.

5.1. Experimental evaluation method

5.1.1. Different measurements of experimental result and methods:

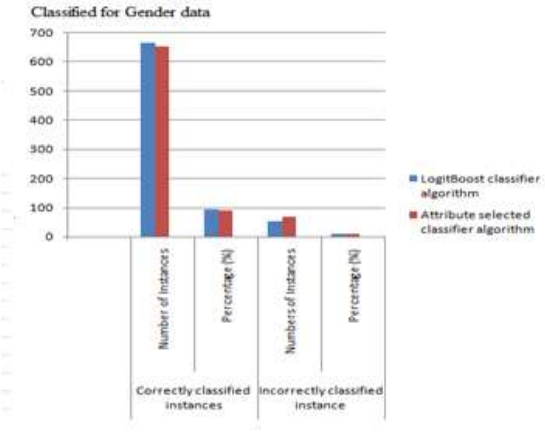
- Measurement of confusion matrix: Matrix used for estimation the classification method and matrix is N number of selected classes. Confusion matrix is NXN matrix, predict the actual select values and compare the matrix calculation of machine learning here our measurement 2x2 and 4x4 matrix.
- Measurement of kappa: Kappa statistic of value is measured and compared to the detection of Accuracy with an assumed value of Accuracy (random variable) the kappa statistic is used multi value classifier and single value classifier, but also to evaluate classifiers amongst themselves.
- Measurement of TP rate: True positive rate measurement is the attribute of the some conduction that is correctly identified in the conductions.
- Measurement of FP rate: True positive rate measurement is the attribute of the some conduction that is incorrectly identified in the conductions.
- Measurement of recall: Recall in one type of matrix it is calculated only positive value and it is evaluated and gives correct value of measurement.
- Measurement of precision: Precision calculation is correct of class divided by classified as positive class.

5.2. Study of measurements:

In this important measurement of comparison of accuracy on Meta classifier classification algorithm and include used classified data is two type gender and review. The table classified intwo type data correctly instance data and incorrectly classified data and also all data instance converted as percentage.

Table.1: Comparison of accuracy for Meta classifier classification algorithms

Name of algorithms	Used for classified data	Correctly classified instances		Incorrectly classified Instances	
		Number of Instances	Percentage (%)	Numbers of Instances	Percentage (%)
LogitBoost classifier algorithm	Gender	666	93	54	8
Attribute selected classifier algorithm	Gender	653	91	67	9
LogitBoost classifier algorithm	Review	581	74	189	26
Attribute selected classifier algorithm	Review	483	67	237	33



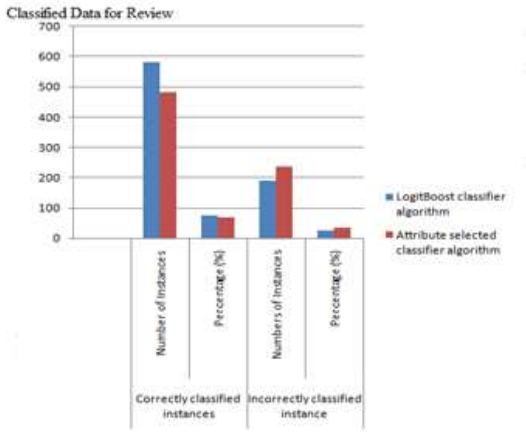


Fig.8: Comparison of accuracy for meta classifier classification algorithms

In this above table and diagram explain the comparison two meta classifier algorithms and in this measurement of prediction the correctly classified instances and also highest percentage of correctly classified instance give the logitboost classifier algorithm ie No of correctly classified instances for gender 666and correctly classified instances for gender percentage 93and No of correctly classified instances for review 581 and correctly classified instances percentage 74 and in the same algorithm is classified incorrectly classified instances is very lowest no of incorrectly instances for gender 54 and incorrectly instance for percentage 8 and no of incorrectly instances for gender 189 and incorrectly instance for percentage 26Attribute selected classifier algorithm measure there No of correctly classified instances for gender 653 and correctly classified instances for gender percentage 91 and No of correctly classified instances for review 483 and correctly classified instances percentage 67 and. In the same algorithm is classified incorrectly classified instances and no of incorrectly instances for gender 67 and incorrectly instance for percentage 9and no of incorrectly instances for gender 237 and 33 incorrectly instance for percentage.

Second important measurement comparison of accuracy on meta classifier classification algorithm and include used classified data is two type gender and review, measurement like TP Rate, FP Rate, Precision, Recall, F- measure, MCC, ROC, PCR.

Table.2: Statistics measurement of Meta classifier classification algorithms

Name of meta classifier classification algorithms	Used for classified data	TP Rate %	FP Rate %	Precision %	Recall %	F-Measure %	MCC %	ROC %	PCR %	CLASSES
LogitBoost classifier algorithm	Gender	98	33	93	98	96	72	94	99	Male
		67	2	88	67	76	72	94	84	Female
	Review	71	14	72	71	72	58	89	83	Services
		77	17	74	77	75	59	91	87	Quality
		76	8	68	76	73	66	95	86	Price
		65	0.5	93	65	77	76	97	88	Others
Attribute selected classifier algorithm	Gender	94	25	95	94	94	68	92	98	Male
		75	6	73	75	74	68	92	80	Female
	Review	68	16	69	68	69	53	83	74	Services
		85	34	61	85	71	50	83	77	Quality
		38	1	90	38	53	53	82	63	Price
		46	1	83	46	59	59	87	66	Others

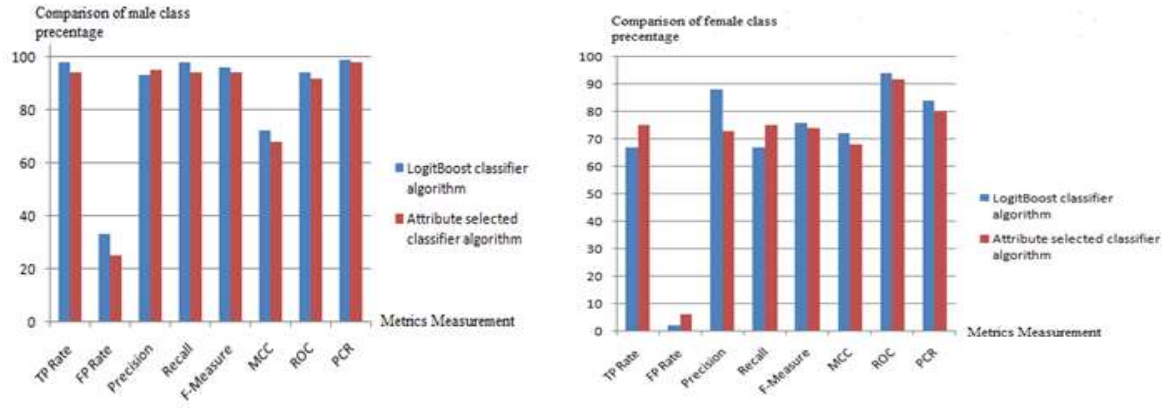


Fig.9: Comparison of statistics Meta classifier classification male and female

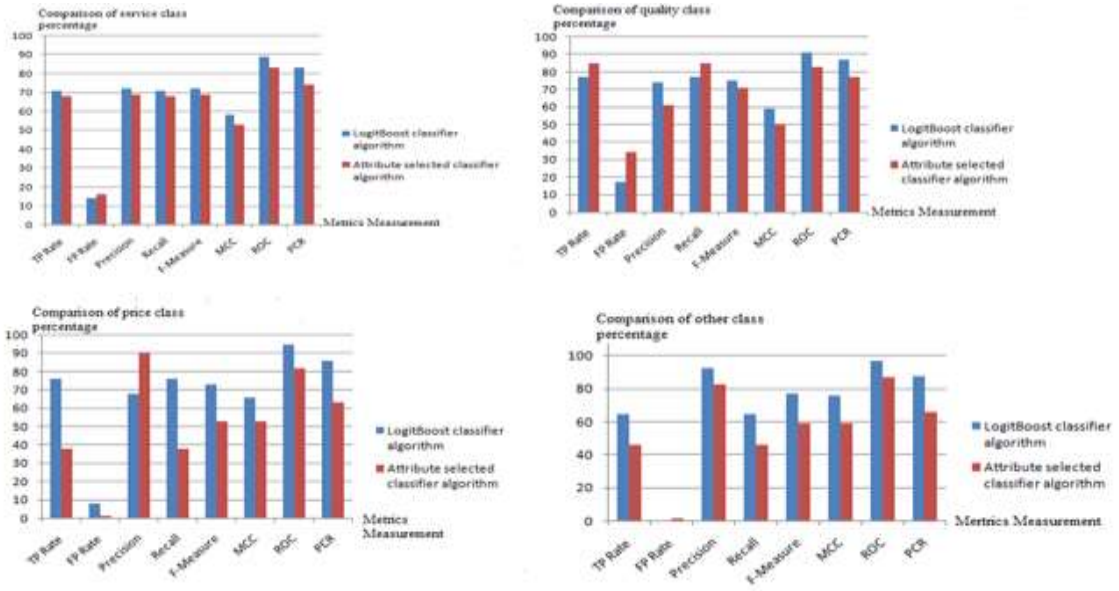


Fig.10: Comparison of statistics meta classifier classification services, quality, price, others.

The above table and diagram explains the different measurement like TP Rate, FP Rate, Precision, Recall, F- measure, MCC, ROC, and PCR. Comparison of meta classifier algorithm give the different measurement in this all measurement in different value is predicted. Gender class having the two sub class one male and female ,and review class having four sub class services, quality price and others comparison of in this two algorithm logitboost classifier algorithm and attribute selected classifier algorithm is give the different value of measurement.

Logitboost algorithm TP Rate percentage for male sub class 98 ,FP Rate percentage 33,precision percentage 93,recall percentage 98 ,F- Measure percentage 96, MCC percentage 72, ROC percentage 94,PCR percentage 99.Attribute selected classifier algorithm TP Rate percentage for female sub class 75 ,FP Rate percentage 6,precision percentage 73,recall percentage 75 ,F- Measure percentage 74, MCC percentage 68, ROC percentage 92,PCR percentage 80, attribute selected classifier algorithm TP Rate percentage for services sub class 68 ,FP Rate percentage 16,precision percentage 69,recall percentage 68 ,F- Measure percentage 69, MCC percentage 53, ROC percentage 83,PCR percentage 74, attribute selected classifier algorithm TP Rate percentage for quality sub class 85 ,FP Rate percentage 34,precision percentage 61,recall percentage 85,F-Measure percentage 71, MCC percentage 50, ROC percentage 83,PCR percentage 77, attribute selected classifier algorithm TP Rate percentage for price sub class 38 ,FP Rate percentage 1,precision percentage 90,recall percentage 38 ,F- Measure percentage 53, MCC percentage 53, ROC percentage 82,PCR percentage 63, attribute selected classifier algorithm TP Rate percentage for others sub class 46 ,FP Rate percentage

1,precision percentage 83,recall percentage 46 ,F- Measure percentage 59, MCC percentage 59, ROC percentage 87,PCR percentage 66.Comparison of in this two algorithm logitboost algorithm is give the maximum highest value of percentage of different measurements.

Another third important measurement of weighted average is predicted in this below table and name of Meta classifier algorithm to measure the different attribute and given the different measurements. In this comparison of two algorithm logitboost classifier algorithm give the highest weighted average.

Table.3: Comparison of weighted average for gender and review

Different Measurements	Name of meta classifier classification algorithms			
	LogitBoost classifier algorithm		Attribute selected classifier algorithm	
	Gender	Review	Gender	Review
TP Rate %	93	74	91	67
FP Rate %	28	13	22	19
Precision %	93	74	91	71
Recall %	93	74	91	67
F-Measure%	92	74	91	66
MCC %	72	62	68	52
ROC %	94	92	92	83
PCR %	96	86	95	72

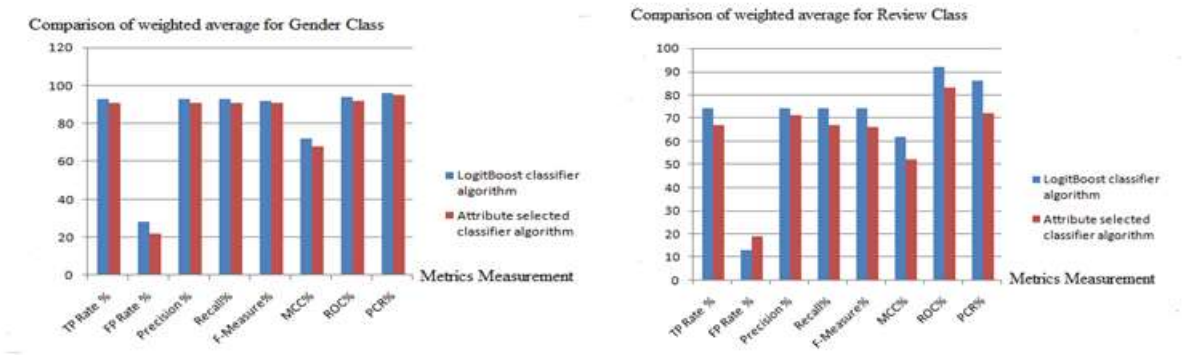


Fig.11: Comparison of weighted Average for Gender and Review

Logitboost classifier algorithm measurement for weighted average percentage inTP Rate percentage for gender class93, FP Rate percentage 28,precision percentage 93,recall percentage 93 ,F- Measure percentage 92, MCC percentage 72, ROC percentage 97,PCR percentage 96, Logitboost classifier algorithm measurement for weighted average percentage in TP Rate percentage for review class 74, FP Rate percentage 13,precision percentage 74,recall percentage 74 ,F- Measure percentage 74, MCC percentage 62, ROC percentage 92,PCR percentage 86. In the same measurement done by the attribute classifier algorithm for weighted average percentage in TP Rate percentage for gender class 91, FP Rate percentage 22,precision percentage 91,recall percentage 91 ,F- Measure percentage 91, MCC percentage 68, ROC percentage 92,PCR percentage 95, attribute classifier algorithm measurement for weighted average percentage in TP Rate percentage for review class 67, FP Rate percentage 19,precision percentage 71,recall percentage 67 ,F-Measure percentage 66, MCC percentage 52, ROC percentage 83,PCR percentage 72.Comparison of

confusion matrix on two Meta classifier algorithms logitboost classifier and attribute selected classifier algorithm.

Table.4: Confusion matrix for gender

Name of meta classifier classification algorithms	**Gender attribute**			**Classified data**
LogitBoost classifier algorithm	**A**	**b**	**variables**	**Male**
	582	**12**	**A**	
	42	**84**	**B**	**Female**
Attribute selected classifier algorithm	**A**	**b**	**variables**	**Classified data**
	559	**35**	**A**	**Male**
	32	**94**	**B**	**Female**

In this above table explain the different algorithms classified data like male, female, in the gender attribute having different value. Comparison of the entire value logitboots algorithm 582, 12 in male attribute and 42, 84 for female. Attribute selected classifier algorithm 559, 35 in male and 32, 94 for female data.

In the below table having different measurement, in the all measurements is confusion matrix value for review attribute.

Table.5: Confusion matrix for review

Name of meta classifier classification algorithms	**Review attribute**					**Classified data**
LogitBoost classifier algorithm	**A**	**B**	**c**	**d**	**variables**	
	173	**54**	**16**	**0**	**a**	Services
	45	**215**	**16**	**3**	**b**	Quality
	13	**20**	**102**	**0**	**c**	Price
	8	**2**	**12**	**41**	**d**	Others
Attribute selected classifier algorithm	**A**	**B**	**c**	**d**	**variables**	**Classified data**
	166	**77**	**0**	**0**	**a**	Services
	42	**237**	**0**	**0**	**b**	Quality

	18	**60**	**51**	**6**	**c**	Price
	14	**14**	**6**	**29**	**d**	Others

In the review attribute having different classified data ie services, quality, price, others, and identified the all values to use two meta classifier classification algorithms one is logitboost classifier and second one is attribute selected classifier algorithm. in this two algorithm having different values logitboost classifier algorithm service 173,54,16,0 and quality having 45,215,16,3 price having 13,20,102,0 and others having 8,2,12,41.likewise attribute selected classifier algorithm services 166,77,0,0 quality having 42,237,0,0 and 18,60,51,6 for price and 14,14,6,29,for others.

6. Conclusion

Classification techniques is very useful for analyzing the data and classification technique having different algorithm it is used to classified the data in this paper explain meta classifier algorithms. Processes of in this analysis comparing the two algorithms logitboost classifier algorithm and attribute selected classifier algorithm and predict comparison analysis logitboost is give the highest level of correctly classified instance and comparing the attribute selected classifier algorithm and in this research explain the comparison two meta classifier algorithms and in this measurement of prediction the highest percentage of correctly classified instance give the logitboost classifier algorithm i.e. gender for 93%and review 74% and in the same algorithm is classified incorrectly classified instances is very low i.e. 8% and 9%. And next research process to implement the classification algorithm in the same data set.

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