An Innovative Optimized Model to Anticipate Clients about Immigration in Telecom Industry

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***Abstract*—this article proposed an innovative model to predict churning and non churning of clients in the telecom industry. Now-a-days, telecom customers are frequently migrating from one network to the other due to various constraints, policies and standards in public and private sectors. Usually in current industry the cost to retain the existing clients is smaller than getting a pioneering customer. To survive in the current competitive world, there is a need to design an optimal prediction model for churning and non churning of telecom clients. The proposed model has been outperformed with an accuracy level of 99.61% than existing models and techniques. Earlier authors have achieved 94.03 % of accuracy using machine learning techniques to predict churning of customers.**

Keywords—Prediction of Churn Customer; Optimized Decision Tree; Optimized Random Forest Model, Jio customer dataset; Rapid Miner;

I. INTRODUCTION

Due to the speedy growth in the communication network, a vast amount of data is available about the customers. In this context, it is essential to analyze this vast amount of data to identify the root causes of migrating a customer from one network to another network. Although banks [1], telecom industry [2], oil industry [3], online game players [4], automotive industry [5] are frequently using churn prediction analysis to anticipate the percentage of customers likely to be churned from one network to another network in telecom domain. Currently, a customer of a network can opt any service provider based on offers provided by another service provider. In this context, the difference in prices, customer satisfaction problem, billing manipulations, problems with network signals, lack of technology support are the aspects which causes for customer churn.

In this article, we proposed a novel optimized prediction model using decision tree to predict customer churn in the telecom domain. An employed dataset collected from Reliance Jio with 1 lakh sample records.

The rest of the article is arranged in the below manner. In Section II, concise information about literature survey is gathered. Section III discusses about proposed model such as optimized decision tree machine learning algorithm by comparing CPNN, J48, CART, and FuzzyARTMAP machine learning techniques. Section IV talks about a proposed methodology and algorithm for predicting churn customers. Section V discusses about the obtained results and presents comparison of earlier techniques. Lastly, Section VI presents about the conclusion of this article.

II. LITERATURE SURVEY

As of late, Customer stir turns into a central worry in Indian media transmission advertises because of the immersed markets and focused business condition. The client agitate is not restricted to simply media transmission, keeping money and monetary ventures additionally common in other administration, enterprises, for instance, portable telecom, TV viewership and so forth. We introduce a concise diagram of the writing, including client beat forecast in various spaces and additionally the uses of FuzzyARTMAP and counter proliferation neural system (CPNN) in differing ranges of science and innovation. A portion of the works evaluated talk about different models created for the issue, though some different examines the administrative ramifications of beat issue. The Author [6] utilized information mining by transformative learning on Credit Card Database and their exploratory outcomes demonstrated that the progressive learning is a hearty approach to foresee the churn.

The Author [7] built up an outfit display comprising of Bayesian system, neural system and choice tree on outsider information, division documents and instalment database. He found that group show predicts preferable exactness over an independent strategy for stir expectation. The author [8] utilized European budgetary administrations firm dataset by utilizing irregular backwoods and straight relapse. From their reproduced consider, they found that Random woodland gave preferred exactness over direct relapse. The author [9] re-enacted the neural systems joined with a GA-based run disclosure technique to anticipate the client agitate with high precision. The author [10] utilized ANFISSubtractive (subtractive grouping based fluffy induction framework (FIS)) and ANFIS-FCM (fluffy C-implies (FCM) based FIS) models to investigate the execution as far as precision, specificity and affectability of agitate forecast applications. The author [11] proposed a conduct based telecom client agitate expectation framework which utilizes just client benefit utilization data to anticipate client stir utilizing a SOM bunching calculation. The author [12] utilized unsupervised learning method called Rule-based figuring out how to anticipate whether a client will stir soon or not utilizing charging information of a telecom organization. The author [13] utilized the expectation models that are fabricated utilizing machine learning calculations.

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They utilize a client informational index of a Chinese portable media transmission. Three machine-learning techniques are received, including strategic relapse (LR), choice tree (DT) and neural system (NN). The device utilized in preparing the models was SAS Enterprise Miner and they quantified the impacts of system characteristics on forecast exactness. The author [14] proposed Telecom Social Network Analysis (TSNA) for distinguishing basic and behavioral examples in frameworks in light of the relations between clients. They have mined churning and non-churning groups by utilizing a regular proportionality calculation for multi-social telecom organize. The author [15] employed CPNN, FuzzyARTMAP, CART and J48 on Telecom dataset with best accuracy of 91.67% using FuzzyARTMAP followed by CART machine learning algorithm.

Therefore, this article precisely addressing optimal decision tree algorithm to anticipate churning customers in telecom domain.

III. Summary of Employed Techniques

A. Optimized Decision Tree

It produces a decision tree in order of both ostensible and numerical information. A decision tree a like a chart or model. It is more similar to a reversed tree since it has its root at the top and it develops downwards. This portrayal of the information has the preferred standpoint contrasted and different methodologies of being important and simple to decipher. The objective is to make an order model that predicts the estimation of an objective property in light of a few information qualities of the example set. Choice trees are produced by the recursive dividing. Recursive parceling implies over and over the part on the estimations of properties. In each recursion the calculation takes after the accompanying strides.

An attribute A is chosen to part on. Settling on a decent decision of the attribute to a part of each stage is significant to the era of a helpful tree. The quality is chosen relying on a determination standard, which can chose by the model parameter. Examples in the example set are sorted into subsets, one for each estimation of the quality if there should arise an occurrence of an ostensible trait. If there should be an occurrence of numerical characteristics. Subsets are shaped for disjoint scopes of property estimations. A tree is come back with one branch for each subset. Every limb has a relation sub-tree delivered by applying a similar calculation recursively. There are not as much as a specific number of occurrences or cases in the present sub tree. This can be balanced by utilizing the insignificant size of the split parameter. No characteristic achieves a specific edge. This can be balanced by utilizing the base pick up parameter. The maximal profundity is come to. This can be balanced by utilizing the maximal profundity parameter.

B. Optimized Random Forest Model

Random forest model generates a collection of a specified number of random trees which means it produces random forest. The resulting model is a voting model of all of the trees. The representation of the information on the type of a tree has the favorable position contrasted and different methodologies of being important and simple to translate. The objective is to make an order model that predicts the estimation of an objective quality (frequently called class or name) in light of a few information properties of the Exampleset. Every interior node of the tree compares to one of the information attributes. The quantity of edges of an ostensible inside hub is equivalent to the quantity of conceivable estimations of the relating input quality. Active edges of numerical qualities are named with disjoint reaches. Each leaf hub speaks to an estimation of the name property given the estimations of the info attributes spoken to by the way from the root to the leaf.

Pruning is a strategy in which leaf nodes that don't add to the discriminative energy of the tree are expelled. This is done to change over an over-particular or over-fitted tree to a more broad shape with a specific end goal to improve its prescient power on inconspicuous datasets. Pre-pruning is a sort of pruning performed parallel to the tree creation handle. Post-pruning, then again, is done after the tree creation prepare is finished**.**

Apart from Optimization (Grid) process will pick best parameters to demonstrate beat comes about. In this way, The Optimize Parameters (Grid) administrator has a sub procedure in it. It executes the sub procedure for all mixes of chose estimations of the parameters and after that conveys the ideal parameter esteems through the parameter port. The execution vector for ideal estimations of parameters is conveyed through the execution port. Any extra consequences of the sub procedure are conveyed through the outcome ports. For instance, in the event that you select 3 parameters and 25 stages for every parameter then the aggregate number of combinations would be over 390625 (i.e. 25 x 25 x 25). The sub procedure is executed for every single conceivable blend. This administrator returns ideal parameter set which can likewise be composed to a record with the Write Parameters administrator. This parameter set can be perused in another procedure utilizing the Read Parameters administrator.

IV. Methodology

In this article, we gathered employed dataset by the reliance Jio telecommunication network. The dataset posses 100000 samples with five attributes.

In Fig.1 general streamlined model has been intended to suspect bosom disease utilizing machine learning methods. This area bargains about strategy, how a test happens for forecast prepare. The general procedure depicts into three stages.

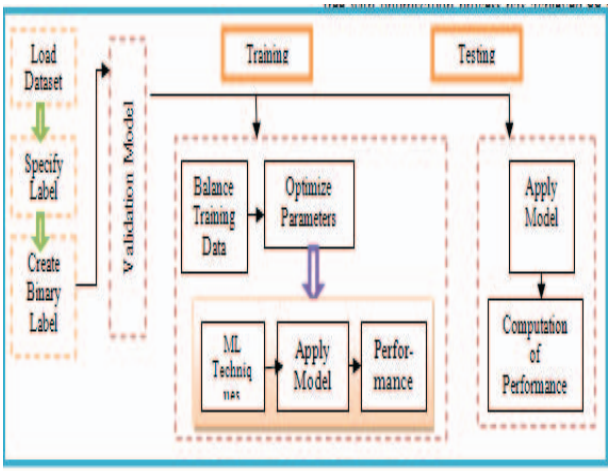

Fig.1 Proposed Machine Learning Model for Anticipate churning customers

A. *Step1*

During this progression, dataset is loaded by including respective attribute information and label to actualize directed learning. The rest of the phases come under validation model.

B. *Step2*

During this phase, data preprocessing tasks take place such as extraction, transformation and learning after which mark the target label attribute.

C. *Step3*

During this progression, cross validation splits the dataset for preparing and afterward free testing. This part is done, various circumstances to show signs of improvement execution evaluate. In this manner, preparing information would be adjusted keeping in mind the end goal to take on our model as per the normal conduct and rebalance the information to concentrate looking into the issue we are keen on.

Rather than simply including a model arranged by hand, it ought to be advanced. In view of the "insight of the crowd" we connected choice tree and streamline the maximal profundity in the range from 20 to 29. The tree arrangement with an ideal exactness for the preparation set will be picked and passed on to the testing stage.

The model prepared for the preparation information is connected to the free test informational index and the model execution is ascertained. The execution esteems gotten on the distinctive folds of the cross approval are at long last arrived at the midpoint of to create a normal execution measure of it scatters, which gives a gauge of the model soundness when connected to various information tests.

In this article, dataset possess different attributes such as customer dissatisfaction which means that the factors influences call drop rates, more number of complaints and call failure rates, service usage attribute deals with how effectively customer using a concerned network like number of minutes, frequency of use, number of customers contacted to a subscriber, switching costs are related to constraints and loyalty imposed by the service provider.

V. Results and Discussions

In this current approach, employed optimal decision tree and random forest model for prediction of churning customers. The employed, experiments uses 10 cross- validations by making use of the linear sampling method. In this sampling method, divides the exampleset into segments without changing the order of the examples such as subsets with successive examples are formed. Table I shown confusion matrix through which evaluation of a classifier is computed. In this experiment, authors used jio-dataset with 100000 sample records.

TABLE I. CONFUSION MATRIX

		Predicted Class	
		Yes	No
Actual Class	Yes	(True-Positive)	(False-Negative)
	No	(False-Positive)	(True-Negative)

Table II listed out parameters and respective values defined to perform these experiments for appropriate machine learning techniques such as optimal decision tree and optimal random forest model. All these parameters applied on the same dataset with 10 cross validations.

TABLE II. PARAMETERS USED IN EMPLOYED TECHNIQUES

Parameter	**Value**	**Parameter**	**Value**
Decision Tree		**Random Forest**	
Criterion	Gain_ratio	**Criterion**	accuracy
Max_Depth	29	**Max_Depth**	100
Pruning	Yes	**Pruning**	Yes
Confidence	0.25	**Confidence**	0.25
Max_gain	0.1	**Max_gain**	0.1
Minimal leaf size	2	**Minimal leaf size**	2
-	-	**No. of Trees**	100
-	-	**Voting strategy**	Confidence Vote

In Table III, the accuracy of the optimal random forest model have been outperformed by 99.63% subsequently optimal decision tree has got 99.50% of accuracy. Although, when compare with accuracies of classifiers such as CPNN, J48, FuzzyARTMAP, the CART has performed well with 94.03%. Therefore, the proposed method is the optimal novel model to predict churn and non-churn of telecom customers.

TABLE III. ACCURACY OF MACHINE LEARNING TECHNIQUES

	Precision	Recall	Accuracy
CART	77.05	86.95	94.03
Optimal Decision Tree	99.97	88.33	**99.50**
Random Tree	99.98	86.11	**99.68**

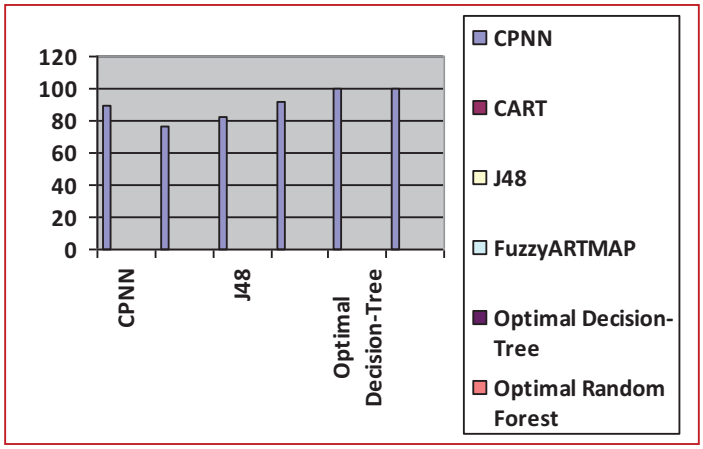

Fig. 2. Accuracy levels of machine learning techniques on telecome dataset

In "Fig.2" firstly optimal random forest model has around 99.63% of the accuracy shown in the bar chart and secondly optimal decision tree have been achieved 99. 50% of accuracy and finally the rest of the techniques applied by [15] compared with proposed approach accuracies.

VI. Conclusion and Future Scope

In this article, we employed, optimal decision tree machine learning algorithm to predict the churning and non-churning of clients in the telecom domain with the help of **Jio reliance dataset** with one Lakh records. From experimental results, we observed that our innovative model has outperformed with 99.51 % accuracy compared with the rest of the machine learning techniques employed by various authors. Therefore, for future scope, our innovative model is most productive in other domains such as banking, automobile, Gas industry, and hospital domain for predicting customers for churning and non-churning. Although, Evolutionary computing and deep learning techniques can be employed to enhance certain metrics by considering distinguish constraints and attributes.

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