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Metaheuristic based Customer Churn Prediction in Telecom

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Abstract - Churn prediction in telecom has turn into a most important requirement due to the increase in the number of telecom supplier. However owing to the immensity sparsity and unnecessary nature of the data, churn prediction in telecom has always been a difficult task. This paper present a metaheuristic base churn prediction technique that performs churn prediction on massive telecom data. Particle Swarm Optimization algorithm is used as the classifier. Experiments were conducted on the Orange dataset. It was experimental that PSO algorithm mechanism best on churn data providing in effect and more rapidly domino effect.
Keywords: Telecom churn prediction, Data inequity, Data Sparsity, Huge Data; PSO

I. INTRODUCTION

Churn is an manifest process in any production. However, though difficult, it is possible to identify the causes of churn using some approaches. This division discuss the recent approaches for churn prediction. A risk prediction method that identify probable consumers for churn be presented by Coussement et al. in [7]. This technique utilizes Generalized Additive Models (GAM). These models relaxes the linearity constraints, hence allowing complex non-linear fits to the data. This method is exhibit to advance marketing decisions by identifying the risky customers and also as long as visualizations of non-linear relations.

A neural network based customer profiling technique that be able to used for churn prediction was existing by Tiwari et al. in [8]. This method be different from the other future techniques from the truth that most of the technique are only able to identify the customers who will instantaneously churn. Still the neural network base churn prediction model proposes to predict customer's future churn behavior, provided that the much essential buffer for the organization to perform prevention activities. A similar neural network base model include [23,25]. The methodology in [23] is base on the 80-20 imperative to organize the key attributes affecting churn, at the same time as that of [25] consist of classify the major countryside of the data to determine churn.

A regression recognized churn prediction model was presented by Awnag et al. in [9]. This method identifies churn by many regressions study. This technique exploits the customer's feature data for analysis and proposes to offer good act.

Class imbalance the display place a most important part in disconcerting the reliability of a classifier. The major problem in progress due to class inequality is that the less significant class is not well symbolized and from now the classifier is undertrained on the another classes. The method future by Zhu et al. in [10] plans to eliminate this issue by using transfer book learning methods. The method accessible in [10] make active by physical activity the classifier using customer linked behavioural data obtained from related areas. This methodology has its most important focus on the banking industry and the results are future to exhibition enhanced routine. Another method that think through the disparity nature of data to carry out churn prediction was obtainable by Xiao et al. in [15]. A evaluation of sampling methods for effectively working on churn data was offered by Amin et al. in [16]. Game theory based churn prediction methods [17] are too on the increase.

The difficult nature of churn behaviour has also enabled several publications on churn prediction using many simulations. A churn prediction model created on cluster analysis and decision tree algorithm was presented by Li et al. in [11]. This technique the whole thing on China's Telecom data. Alternative method using several prediction techniques was proposed by Le et al. in [12]. This method technologically advanced a combination of k-Nearest Neighbor algorithm and sequence arrangement. This technique has its main attention on the of time clear-cut features of the data to predict churn.

Exploiting heuristics for educated guess are on the promotion due to the multifaceted nature of data. A rule generation techniques that services heuristics for customer churn prediction in telecom service area be situated accessible by Huang et al. in [13]. A mishmash of Self Organizing Maps (SOM) and Inherited Programming (GP) to identify and predict churn was presented by Faris et al. in [14]. SOM remains used to cluster the consumers and at that time outliers are rejected to get hold of collections give a picture of customer behaviors. An enhanced grouping tree is put up using GP.

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A boost up algorithm that proposes to increase the prediction accuracy of classifier carbon copy was planned by Lu et al. in [18]. This technique boosts the learning process through using a mixture of grouping and logistic reversion. A similar prediction boosting technique using Genetic Algorithm was proposed by Idris et al. in [19]. This is as well an collective model make use of several methods for the prediction process. Other collaborative based prediction techniques include [20,21,22,24].

II. ANALYSIS AND DRAWBACKS OF EXISTING SYSTEMS

Currently used churn prediction systems utilize machine learning for churn prediction. It considers the customer's lifetime value as the base property for prediction. It operates majorly on cost sensitive classification. It uses a combination of Decision Tree and Logistic Regression. Sampling is used to reduce data size. The major drawbacks of the current system is that machine learning algorithms used in the systems are time consuming, making them very slow. This makes the systems not suitable for huge or sparse data. The major prediction component of the system is to analyse the cost sensitivity. However, this alone cannot predict the customer's future probable profitablility. It uses primitive and combination of algorithms for classification. This leads to natural increase in time consumption. Sampling tends to eliminate data, hence information loss occurs.

III. PROBLEM STATEMENT

Churn is the tendency of a customer to cease doing business with an organization. Churn data is customer based, hence contains all the properties that are related to a customer, both existing and past. Customer churning exists in all product and service related organizations. The following discussion presents the issues related to churn data and problems faced due to the following problems

A. Data Size

Churn data deals with the customer's properties corresponding to an organization. Hence it has representations of all the customers operating with and operated with the organization. Every customer who had an interaction with the organization is represented in this data. Hence churn data is very huge in terms of the number of records especially in service related areas such as telecom and e-commerce, where migration is less complex from all aspects.

B. Attribute Density

Churn data should represent every property of a customer corresponding to the product or service that they utilize. Not all customers opt for the same type of service or product. Hence every property of every product/ service dealt by the organization should be represented in the churn data. As the number of product/ service categories increase, the attributes also tends to increase. This leads to the data structure representing churn containing a large number of attributes. Considering the telecom industry, a mobile service provider can offer several packages dealing with voice calls, data, SMS, social networking based packages, etc. All these properties must contain representations in the data set, even though a customer interested in one package might not be interested in others. Increase in data size in terms of records and attributes will lead to the final data structure becoming very huge and eventually Big Data.

C. Sparse Data/ Missing Values

As discussed in section 3.2, churn data contains a large number of attributes. Practically, not all customers will be related to all the products/ services offered by the organization. Hence only the properties corresponding to the customer's interests will be filled in with appropriate values, while all the other properties contain null values. Hence churn data contains very sparse data with large number of missing values. But eliminating these properties is not possible, as the columns with missing values corresponding to one customer will contain valid entries for another customer. Hence eliminating the levels of data sparsity or missing values is not possible. The prominence of this section is observable in the telecom data sets. For example, a customer totally inclined towards voice call will have null entries in the data section. This process will automatically create an attribute irrelevancy scenario, where an attribute is totally irrelevant to a customer, but it is still present as a part of the customer's properties.

D. Privacy Vs. Abstraction

Data privacy tends to be one of the major requirements due to the increased information associations in the form to data fusion. Maintaining abstraction in the customer data when utilizing it for analysis has become mandatory for an organization. However, this process tends to reduce the usability of the data. As the level of abstraction increases, user privacy increases, but usability of the data starts to reduce. Similarly reduced abstractions will provide an information rich data, but user privacy would be at risk. It is

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mandatory to maintain a balance between the level of abstraction applied on the data and the usability of the data.

IV. SCOPE OF THE RESEARCH

Due to the increase in the amount of data generated, the efficiency of the statistical techniques are now being overshadowed by the huge amount of time taken by them to produce solutions. Hence the need for metaheuristic algorithms have been realized. The small error that occurs as an intrinsic part of the solutions provided by metaheuristics has become acceptable in most applications whose major requirements is to provide faster results. The need for online processing has motivated the use of metaheuristics to a large extent. Increased processing capacity from the hardware aspect has also enabled better and more effective processing, in turn increasing the accuracy of these optimization techniques.

V. AIM AND OBJECTIVES

Customer retention is one of the major requirements of any organization to gain competitive advantage. Accurately predicting the customer's status can help organizations reduce and prevent churns. Digitization has brought about a huge revolution in the knowledge mining industry by providing overwhelming amounts of data. Hence customer's behavioral data is readily available for mining. However problems still persist due to inability of the processing techniques to operate effectively on the data. The major objective of this paper is to identify and predict churn effectively.

VI. PROPOSED METHODOLOGY

Particle Swarm Optimization (PSO) is a computational procedure that optimizes a problem by iteratively demanding to increase a candidate solution through regard to a certain measure called its fitness. PSO being a swarm created metaheuristic method explains the problem by using a set of candidate solutions called particles. These particles are stimulated in a search space by consuming a velocity section. This development is iteratively performed to identify the greatest result in the search space. This methodology develops PSO for the process of churn prediction.

This approach presents a technique to predict churn faster and with higher accuracy.This approach uses Particle Swarm Optimization (PSO) for churn prediction.PSO is metaheuristic and can easily operate on huge data.There is no need for sampling. Particle Swarm Optimization (PSO) is a computational method that improves a problem by iteratively trying to increase a candidate solution with concern to a certain measure called its fitness. PSO being a swarm based metaheuristic method solves the problem by consuming a set of candidate solutions called particles.

VII. CONCLUSION AND FUTURE WORK

Churn prediction is one of the major requirements of the current competitive environment. This paper deals with identifying and predicting churn in telecom data using SParticle Swarm Optimization. This paper deals with identifying and predicting churn in telecom data using Particle Swarm Optimization. Analysis of the algorithms was carried out on the basis of ROC and PR Curves. Future directions will include incorporation of schemes or modifications to reduce the False Positive rates. Further, analysis in terms of imbalance levels and data sparsity will also be carried out. Incorporation of Game theory in the decision making process will also help improve the accuracy levels and in the identification of churn.

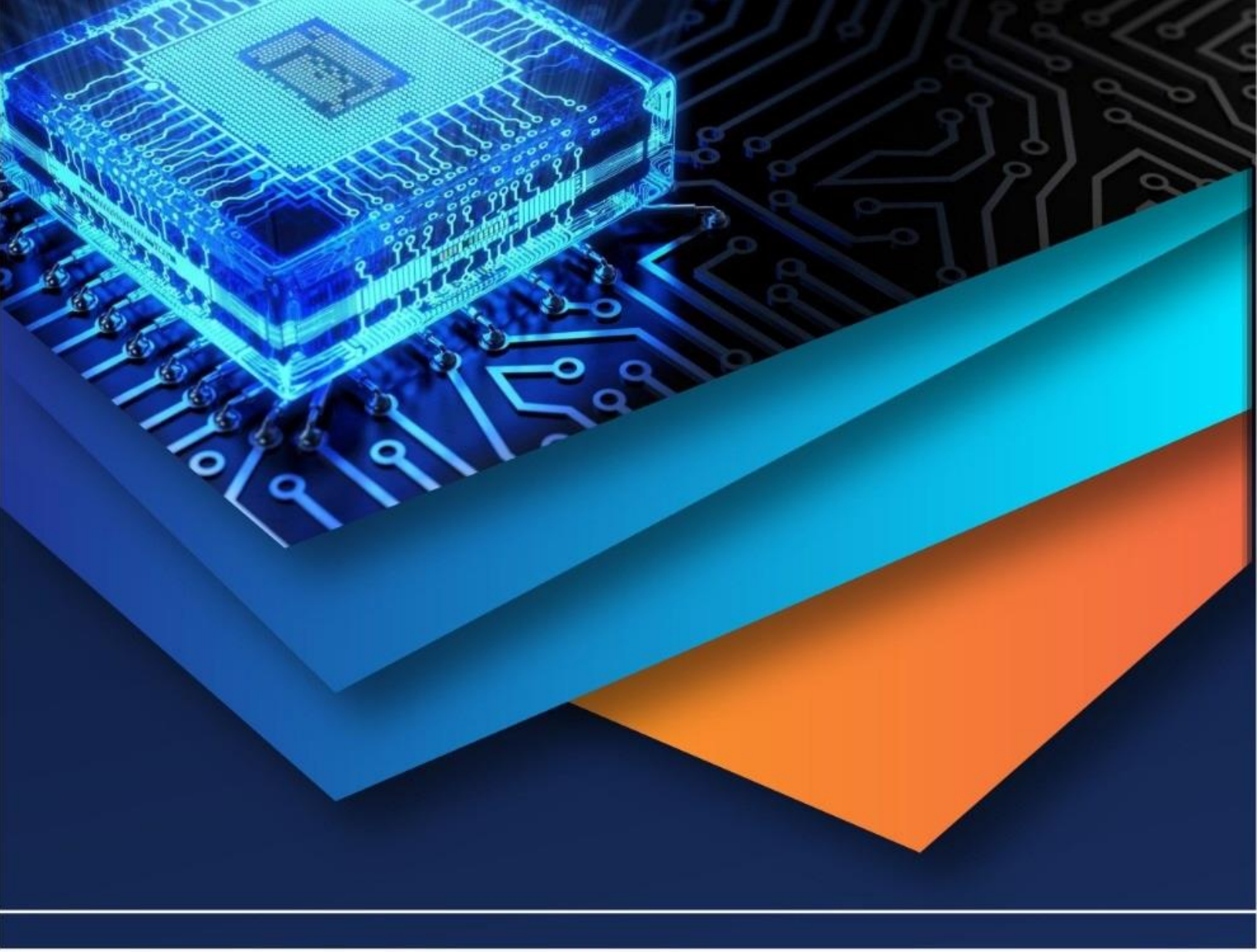
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