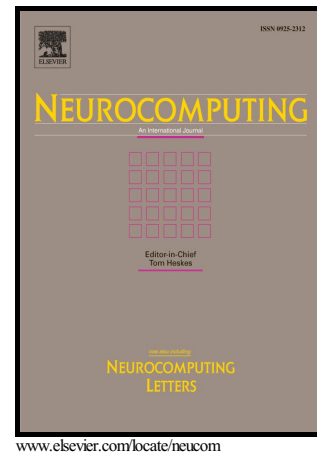


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Customer Churn Prediction in Telecommunication Sector using Rough Set Approach

Adnan Amin^a, Sajid Anwar^{a*}, Awais Adnan^a, Muhammad Nawaz^a, Khalid Alawfi^b, Amir Hussain^c,
Kaizhu Huang^d

^aInstitute of Management Sciences, Peshawar, Pakistan.

^bCollege of Computer Science and Engineering, Taibah University, Saudi Arabia.

^cDepartment of Computing Science and Maths, University of Stirling, Scotland, UK.

^dDepartment of EEE, Xi'an Jiaotong-Liverpool University, Suzhou, China.

*Corresponding author. sajid.anwar@imsciences.edu.pk (Dr. Sajid Anwar)

Abstract

Customer churn is a critical and challenging problem affecting business and industry, in particular, the rapidly growing, highly competitive telecommunication sector. It is of substantial interest to both academic researchers and industrial practitioners, interested in forecasting the behavior of customers in order to differentiate the churn from non-churn customers. The primary motivation is the dire need of businesses to retain existing customers, coupled with the high cost associated with acquiring new ones. A review of the field has revealed a lack of efficient, rule-based Customer Churn Prediction (CCP) approaches in the telecommunication sector. This study proposes an intelligent rule-based decision-making technique, based on rough set theory (RST), to extract important decision rules related to customer churn and non-churn. The proposed approach effectively performs classification of churn from non-churn customers, along with prediction of those customers who will churn or may possibly churn in the near future. Extensive simulation experiments are carried out to evaluate the performance of our proposed RST based CPP approach using four rule-generation mechanisms, namely, the Exhaustive Algorithm (EA), Genetic Algorithm (GA), Covering Algorithm (CA) and the LEM2 algorithm. Empirical results show that RST-GA is the most efficient technique for extracting implicit knowledge in the form of decision rules from the publicly available, benchmark telecom dataset. Further, comparative results demonstrate that our proposed approach offers a globally optimal solution for CCP in the telecom sector, when benchmarked against several state-of-the-art methods. Finally, we show how attribute-level analysis can pave the way for developing a successful customer retention policy that could form an indispensable part of strategic decision making and planning process in the telecom sector.

Keywords: Classification, Churn prediction, Data mining, Feature selection, Rough Set theory

I. INTRODUCTION

Customer churn is one of the mounting issues of today's rapidly growing and competitive telecom sector. The focus of the telecom sector has shifted from acquiring new customers to retaining existing customers due to the associated high cost [1]. The retention of existing customers also leads to improved sales and reduced marketing cost as compared to new customers. These facts have ultimately resulted in customer churn prediction activity to be an indispensable part of telecom sector's strategic decision making and planning process.

Customer retention is one of the main objectives of Customer Relationship Management (CRM) and its importance has led to the development of various tools that support some important tasks in predictive modeling and classification. In recent decades, organizations are increasingly focusing on long-term relationships with their customers and observing a customer's behavior from time to time. They use various applied knowledge discovery in database (KDD) techniques [2]–[5] to extract hidden relationships between different entities and attributes in a flood of data banks. These facts have attracted many companies to invest in CRM to maintain customer information. Customer centric approach is very common, particularly, in telecommunication sector for predicting customers' behavior based on historical data stored in CRM. To handle the mounting issue of customer churn, data maintained in such CRM systems can be converted into meaningful information that will help to identify customer's churn activities before the customers are lost; thereby, increasing customer strength [6]. Customer churn prediction modeling has been widely studied in various domains; such as financial services, social network services, telecommunication, airlines, online gaming, and banking [7].

Researchers have also used various machine learning (ML) techniques (e.g. Random Forest, Balanced Random Forest, Rotation Forest and RotBoost) for dealing with the problem of customer churn prediction, but these ML techniques also lack the required

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