Lecture Notes in Networks and Systems 74

H. S. Saini
Rishi Sayal
Aliseri Govardhan
Rajkumar Buyya *Editors*

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Preface

This volume contains 68 papers that were presented in the Sixth International Conference on Innovations in Computer Science and Engineering (ICICSE 2018) held during August 17 and 18, 2018, at Guru Nanak Institutions (GNI) in association with Computer Society of India (CSI) and funding from Defense Research and Development Organization (DRDO).

The aim of ICICSE 2018 was to provide a platform for researchers, scientists, technocrats, academicians, and engineers to exchange their innovative ideas and new research findings in the fields of computer science and engineering till the end of 2018. The conference will boost excellent innovations in terms of day-to-day life and academics.

This conference received a vast number of research publications from different fields of computer science and engineering. All papers were peer-reviewed with the help of our core committee members and external reviewers. The final acceptance of 71 papers came through with an acceptance ratio of 0.28.

ICICSE 2018 was inaugurated and attended by top dignitaries such as Mr. K. Mohan Raidu, Chairman, CSI Hyderabad; Lt. Col. Khairol Amali bin Ahmad, Dean of the Engineering Faculty, Malaysia; K. Suchendar, Scientist 'G', Director, DSTARS, DRDL; and Dr. C. Krishna Mohan, Department of Computer Science and Engineering, IIT Hyderabad. The conference was chaired by international and national personalities: Dr. K. M. Sharavana Raju, Professor, Department of Computer Science and Engineering, College of Computer Science and Information Systems, Jazan University, Jazan, Saudi Arabia; Dr. Anitha Thangasamy, Associate Professor, Department of Computer Science and Engineering, Wollega University, Nekemte, Ethiopia; Dr. P. Natrajan, Associate Professor, SCOPE, VITU, Vellore, Tamil Nadu; and Dr. S. Krishna Mohan Rao, Professor, Principal, GIFT, Bhubaneswar, Odisha. Further conference keynote speakers were Dr. P. Krishna Reddy, Data Sciences and Analytics Center (DSAC), International Institute of Information Technology Hyderabad (IIITH), and Mr. Bala Prasad, Chairman, Hyderabad Section of IEEE, Member Managing Committee of CSI Hyderabad, and Faculty TCS.

The organizing committee of ICICSE 2018 takes an opportunity to thank the keynote speakers, session chairs, and reviewers for their excellent support in making ICICSE 2018 a grand success.

The quality of all these research papers is a courtesy from respective authors and reviewers to come up to the desired level of excellence. We are indebted to the program committee members and external reviewers in producing the best-quality research papers in a short span of time. We also thank CSI delegates, DRDO, toward their valuable suggestions and funding in making this event a grand success.

Hyderabad, India — H. S. Saini
Hyderabad, India — Rishi Sayal
Hyderabad, India — Aliseri Govardhan
Melbourne, Australia — Rajkumar Buyya

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Prediction of Employee Attrition Using GWO and PSO Optimised Models of C5.0 Used with Association Rules and Analysis of Optimisers

Krishna Sehgal, Harlieen Bindra, Anish Batra and Rachna Jain

Abstract Prediction of employee attrition based on five selected attributes which are Gender, Distance from Home, Environment Satisfaction, Work–Life Balance and Education Field out of 36 variables present in the data-set. Application of Grey Wolf Optimisation (GWO) Algorithm and Particle Swarm Optimisation (PSO) on the model of Decision Tree Algorithm "C5.0" which is fed in the inputs of Associated Rules, using this optimised algorithm for the prediction of employee attrition using IBM Watson Human Resource Employee Attrition Data. After comparing the efficiency of GWO and PSO, we have come to a conclusion that time to predict an employee attrition and consumption of RAM have been optimised with GWO. Employee Attrition is one of the major problems faced by companies nowadays. Sometimes, when the long-term working employees leave the company, it affects the relationship of the company with the client and in turn affects the revenue of the company if the person replacing the old employee is not able manage a good rapport with the client. The paper can be used to frame better work policies which will help both the employer and employee. It can be seen as a mirror to the working conditions of the employees.

Keywords Apriori algorithm · Association technique · C5.0 · Data mining · Decision tree · Employee attrition · Entropy · IBM Watson HR · Information gain · Grey Wolf Optimization · Particle swarm optimisation

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1 Introduction

Employee Attrition is one of the major problems faced by companies nowadays. Loss of employees from a company is actually the loss of all the training and efforts put in by the company in the employee. Sometimes, when the long term working employees leave the company, it affects the relationship of the company with the client and, in turn, affects the revenue of the company if the person replacing the old employee is not able to manage a good rapport with the client. Also, finding an immediate replacement for the leaving employee is difficult and the company has to put in the time and efforts in hiring new people leading to loss of valuable time and resources. Determining the attrition rate helps a company compare it with the industry average and work towards reducing the attrition rate. It helps the company in knowing the reasons for the attrition of employees so that they can improve as a company and keep its employees satisfied and content. Here comes the role of Data Analytics that helps us use various factors like Work–Life Balance, Environment Satisfaction, and other factors to predict the attrition of an employee. In our Research Work, we have used Data Mining techniques to predict the attrition of an employee using a model which is optimised with the help of Grey Wolf Algorithm.

2 Literature Review

In 2015, Seyedali Mirjalili [1] with other research scholars proposed a new technique inspired by grey wolves called Grey Wolf Optimizer hereby shortened to GWO. This algorithm is inspired by the hunting methodology of grey wolves and their way of leadership in nature. For the purpose of simulation, alpha, beta, omega, and delta type of grey wolves are taken. Also the three steps, that is, searching, encircling, and attacking the prey, utilised for the purpose of hunting by wolves are implemented in the algorithm. After that, benchmarking was done against 29 test functions. In 2015, Dr. Sudhir Sharma [2] with other research scholars presented a new way to provide a solution for economic load–dispatch problem (convex). This was done by using a Grey Wolf inspired metaheuristic known as Grey Wolf optimization. In 2011 [3], Dian Palupi Rini, Siti Mariyam Shamsuddin, and Siti Sophiyati Yuhaniz studied about Particle swarm optimisation or PSO in short is an optimisation and computational search method which draws its inspiration from biology. Its development took place in 1995. It was developed by Eberhart and Kennedy. The social behaviours of fish schooling and birds flocking formed its basis. The algorithm draws inspiration from the behaviour of those animals who do not have any leader in their swarm or group, such as fish schooling or bird flocking. The reason behind that lies in the fact that such flocks with no leaders find food at random and then will follow an animal of the group that is nearest to the source of food, i.e. a solution (potential).

3 Materials and Methods

We have analysed IBM Watson Human Resource Employee Attrition Data (source—Kaggle) [4] set to predict the employee attrition based on 5 selected bases classes, which are Gender, Distance from Home, Environment Satisfaction, Work–Life Balance, and Education Field variables out of the set of 36 variables.

Tools used are Microsoft Visual Studio [5] and Microsoft SQL Server [6] on core i7, and 7th Generation processor with 16 GB RAM.

4 Proposed Research Scheme

The dataset used has been acquired from Kaggle. After acquiring the dataset, we selected base classes for the employee attrition which are: Gender, Distance from Home, Environment Satisfaction, Work–Life Balance, and Education Field. Then, we have cleaned and transformed the dataset according to the selected attributes. During cleaning, we have removed entries that contain redundant values and incomplete tuples. Then to use our new approach that is C5.0 with association [7, 8], we have applied association rule mining using Apriori [9] algorithm to form association rules using selected attributes. Then, using these association rules we have trained the C5.0 decision tree [10]. Using this model, we have then predicted the attrition of employee and then matched the predicted results with the actual attrition to evaluate the efficiency of the proposed algorithm on this dataset. Now, to further optimise our model, we have used Grey Wolf Optimiser. Then using this optimised algorithm, we have again predicted the attrition of employee and then matched the predicted results with the actual attrition to evaluate the efficiency of the optimised model on this dataset. To compare Grey Wolf Optimiser with another optimisation algorithm, we have also used Particle Swarm Optimisation and again predicted the attrition of employee.

5 Performance Comparison

After acquiring the dataset from Kaggle, we are using GWO and PSO to optimise further C5.0 with association algorithm. We have observed that the time and memory consumption is least with GWO, then with PSO and then finally with Association Rules in comparison to traditional C5.0. Therefore, Grey Wolf Optimised C5.0 with association algorithm is more efficient in time and memory consumption as compared to others techniques with C5.0 [11] as shown in Table 1.