International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-2, July 2019

Recommender System for Stimulating the Learning Skill of Slow Learner in Higher Educational Institution using EDM.

S. JothiLakshmi , M.Thangaraj

Abstract Educational data mining is a prominent area to predict the student learning behaviour. A regular analysis of student learning behaviour is used to improve the quality of the academic institution. This paper focuses on the identification of slow learner in the higher educational institution and showing it by educational data mining model. The student performance data from higher educational institution is taken and applied on the classification algorithm using WEKA tool. A recommender system is developed in this research work to stimulate the learning skills of slow learner.

Key words- Data mining, classification, Slow learner, Recommender, EDM.

I. INTRODUCTION

Data mining has fascinated interest from researcher in many different field including design of the database, statistical analysis, pattern recognition technique, machine learning technique and data visualization. Knowledge discovery process is the method of analyzing the information from diverse points of view and summarizing the result as valuable data. Educational data mining combined the three major areas such as as computer science, education and statistics EDM is the primary utility of the data mining techniques.

The EDM process begins with gathering the various kinds of data from the educational environment. The collected raw educational data required to pre-process the data. Once the data is pre processed, the corresponding EDM alogrithm is applied. Educational Data mining research work involved in the variety of areas, including Student modelling, Course modelling, Decision support system, generating recommendation.EDM methods applied in improvement of student models. Its application is used to predict slow learner, dropout student, under performer etc.

Various kind of research work involved to improve the overall higher educational system. There are group of factors which affects the education system like the student performances, infrastructures, teacher, teaching methodology, basic amenities, transport facilities etc. The EDM techniques are performed on these factors and find out the factors which improve the higher educational system.

Revised Manuscript Received on 30 July 2019.

***** Correspondence Author

S.Jothi Lakshmi*, Asst.Professor,Mannar Thirumalai Naicker College, Madurai, India

Dr.M Thangaraj, Professor & Head, Department Of Computer Science, School Of Information Technology, Madurai Kamaraj University, Madurai, India

The purpose of the research work is to categorize the various factors associated with student performance of higher educational institutional institution and develop the quality by identifying the slow learner.

In this research work, classification technique is used to analyze the student performance, identification of slow Lerner and design a recommender system to stimulate the learning skills of slow learner which is used to get better performance in the higher educational institution.

II. RELATED WORK

This section provides the detailed study of previous research work on student performance.

Han and Kamber describes data mining process is a knowledge discovery in Databases. Educational data mining is the one of the major application of data mining. Educational data mining is an emerging field in the educational environment which can be applied in various areas like sports, accounts transport etc.[12] This paper reviews the CHAID prediction model to predict the student performance of school. [12]

Amajad ,Abu applied ID3,C4.5 classification algorithm to construct a tree which is used to predict the student academic performance in the educational institution[5].Nauyen designed a model to improve the student result. They analyzed class imbalance problem by three methods and achieved satisfactory results.

Brijesh Kumar designed a EDM model using the classification technique to extract knowledge from student database that describes the student performance in the end semester exams [8]. Dorina Kabakchieva used clustering and classification technique to design a model to analyze the student overall performance in learning management system [10].FP tree mining was applied by Arockiam et al to study the performance of rural and urban students programming skills. This study shows that urban student skills were good compared to rural students.

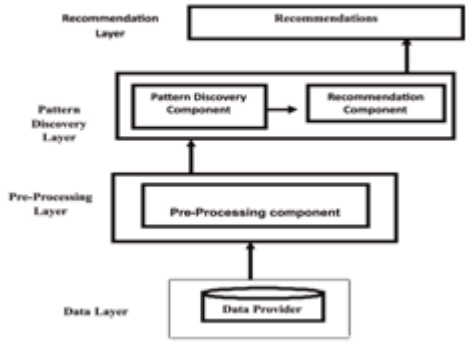
Parneet Kaur conducted a study on classification algorithms to predict slow learner in the educational institution. They used various classification algorithms in their study such as Multilayer perception.Navie Bayes, SMO,J48.REP Tree applied on 152 student records. It was reported that Multilayer algorithm had the highest predictive accuracy of 75%, compare to the other classification algorithm. These various research works motivates to design a recommender system to stimulate the learning skills of slow learner as a proposed system.[19]

III. PROPOSED FRAME WORK

This section gives the detailed description of the proposed system Slow Learner Recommender-Educational Data Mining (SLR-EDM) is given with important components. The proposed system is composed of three main layers named as l data layer, Pre-process Layer Pattern discovery layer, and Recommendation layer. The system comprises two separate phases i) Construction of Decision tree ii) generation of recommendation. The result of the recommendations will be used to stimulate the learning skill of slow learner in the higher educational institution. For this work, higher educational student performance data is idendified from higher educational institution. The function of this architecture is explained as follows.

A. Data Layer

The Data layer collects and stores the student result data from various higher educational institutions. Here data layer integrates various data bases in the area of various educational institutions.



a.SLRM - EDM Architecture

B. Pre-processor Layer

The Pre-processor Layer involves Data pre-processing work. Data is originated from different databases. It is susceptible to noise, missing value and inconsistency. Pre-processing technique is used to get better quality of the data and get correct mining result. So the data needs to be pre-processed by using certain pre-processing component.

C. Pattern Discovery Layer

The Pattern Discovery layer generates patterns using the C4.5 decision tree algorithm. It uses the training data (pre-processing and filtering prepares the training data) as input data for generating the decision tree. This tree is used by pattern discovery component to generate rules for recommendations.

Procedure:C4.5(V)

begin
N=Tree;
N=empty; /* Tree Node initiallyempty*/
S_{best}=empty; / *Attribute for storing max.Information gain*/
If V is "pure" OR other stopping criteria met then terminate
end if
for all attribute s £ V **do** /* calculate information criteria*/
Calculate information-gain if we split on s.
end for
S_{best}=attribute with MAX_INFO gain;
X=MIN_INFO gain;
If(S_{best}>X) then
N= S_{best} ; /* create S_{best} as root node * /
V_t=Induced sub-datasets from V based on S_{best}
/ * partitioning the data set * /
for all V_t **do**
N_t=C4.5.(V_t)
Attach N_t to the corresponding branch of N
end for
return N
end

C. Recommendation Layer

The main function of Recommendation layer is to generate recommendation rules and provides the possible solution to stimulate the learning skills of slow learner in the higher education institution.

IV. EXPERIMENTAL SETTINGS

SLR-EDM has been implemented with JAVA language using Net Bean version 7.3 as JAVA environment. The Experiments were done Intel core i3 2.10GH 4GB RAM, running on windows 8.The student result data have been collected from The experimental evaluation aims analysing whether the recommendation module of the SLR-EDM model is useful to the higher educational institution. The student result data of various distances learning study centre are used in this model. Table I shows the Attribute set selected by SLR-EDM system and which is used to create a Decision tree.

Fig a shows the student result data set and Fig,b show the decision tree

Table I. Higher educational Student related variable

VariableName	Description of the variable	Domain of the variable
Gender	Studnet's sex	{Male,Female}
Area of the school	Area of the school	{urban,Rural}
Fa_Income	Father Income	{high.low,medium}
Pat_Edu	Parent Education	{yes.No}
HSC _class	Hihger Secondary Result	{First,Second}
HSC_ Medium	Higher Secondary Medium	{Tamil,English}
HSC _School	Higehr Secondary School Type	{Govt,Private}
HSC_Brd	Higher Secondary Board	{State,CBSE,ICSE}
Int_ASS	Internet Access	{yes,No}
Class Att	Class Attendance	{Poor,Avg,Good}
IQ level of the student	Student IQ level	{poor,good}
Writting_Skill	Student Writting Skill	{Poor,Good}

Int_Test Grade	Internal Test Grade	{Pass,Fail}
Class	Wheather pass or fail	{pass,fail}

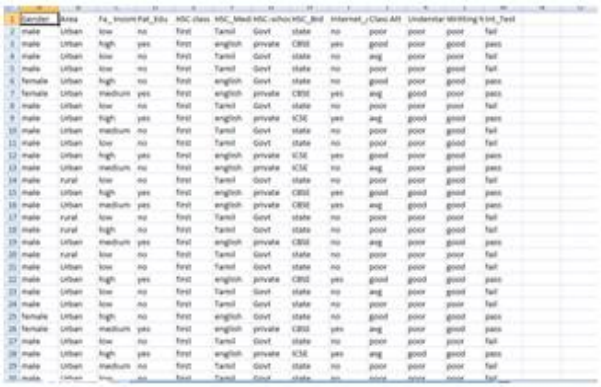


Fig b. Student Result Data Set

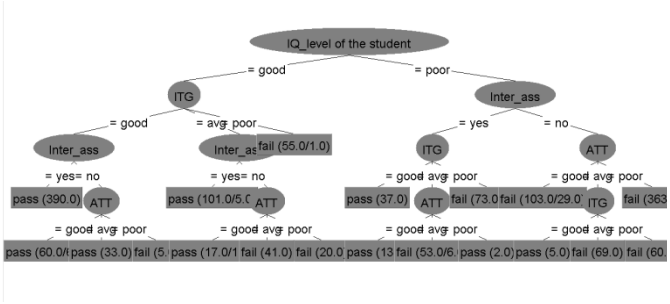


Fig c. Slow Learner Decision Tree

A. Recommendation rules

Production rules are generated from the Decision trees that are used by recommendation agent to provide the recommendation.

1. If IQ level of the student=good then ITG=good then result=pass
2. If IQ level of the student =poor and int_Ass=no and ITG= poor result=fail
3. If Att=poor then result =fail
4. if Int_ass =no and Att= poor then result=fail
5. If att=good result=pass
6. If ITG=”AVG” then Atten=AVG result=fail
7. If att=”avg” and ITG=”AVG” then result fail
8. If att= avg and ITG=”poor” then result=fail

V. EXPERIMENTAL EVALUATION

The feature of a recommender system can be assessing using various kinds of dimension. Accuracy is the fraction of correct recommendations out of total possible recommendations The proposed system is assessed with Decision support accuracy that are popularly used are Precision, Recall and F-measure. These metrics help the user in selecting items that are very high quality out of the available set of items. The evaluation has been done by the measuring of the parameters Precision, Recall and F-measures.

A. Experiment 1: Precision Measure

Fig 5.1 summarizes the student result data versus precision for SLR-EDM and SLRM. X-axis denotes the various size of result data set and Y-axis denotes the corresponding Precision value. From the graph it is proven that that the precision value of proposed SLR-EDM system is improved by 17% compared to the existing system. This result shows that the SLR-EDM precision is better than SLR.

Table 1.Precesion Measure

Result Data set	500	1000	1500	2000
SLRM(Precision)	0.761	0.768	0.775	0.782
SLR-EDM(Precision)	0.898	0.954	0.958	0.975

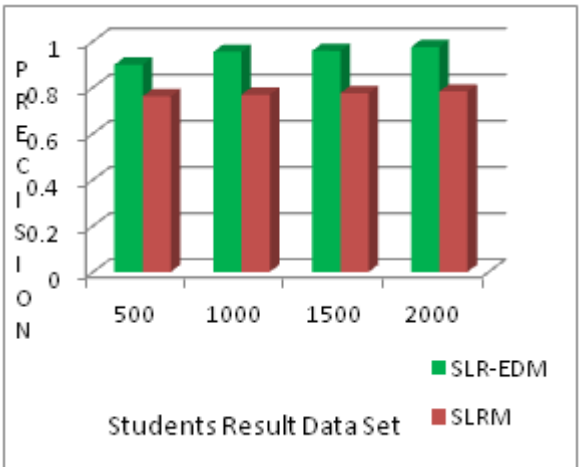


Fig d. Precision

B .Experiment 2:Recall Measure

The recall refers to the percentage of total relevant result correctly classifed . The Fig 5.2 summarizes the student result data set versus recall values for SLR-EDM system. The student result data is shown in X-axis and corresponding recall value in Y-axis. The highest recall value is obtained with the data set of 2000. Fig 4.6 shows the comparison of Recall and mean Recall value The Recall value is increased by 11% in SLR-EDM system.

Table 2:Recall Measure

Result Data set	500	1000	1500	2000
SLRM(Recall)	0.819	0.824	0.829	0.835
SLR-EDM(Recall)	0.938	0.926	0.905	0.934

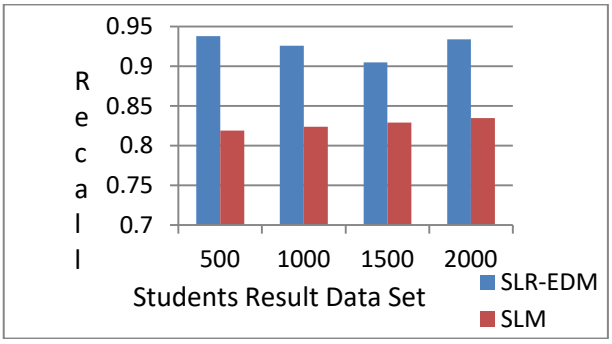


Fig e. Recall

C.Experiment 3.F-measure

F-Measure is a single measure that trades off precision versus recall, which is the weighted harmonic mean of precision and recall. Fig 5.3 summarizes the student result data and corresponding F- measure value. The X-axis consists of student result data and Y-axis consists of F-measure value .The system achieved improvement by way of 14% in F-Measure.

Table 3:F- Measure

Result Data set	500	1000	1500	2000
SLRM (F-Measure)	0.789	0.794	0.801	0.807
SLR-EDM (F-Measure)	0.918	0.94	0.93	0.954

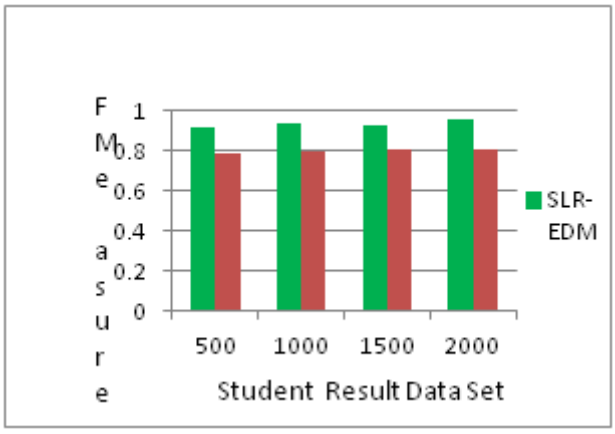


Fig f. F-measure

DISCUSSION

The primary goal of this work has been architecting a SLR-EDM frame work which is a recommender system that uses educational data mining technique to stimulate the learning skills of slow learner in the higher educational institution. The Decision tree classification mining techniques is implemented by the SLR-EDM systems. The experimental results are observed for various size of result data set showing different level of performance of the proposed system. The evaluation of the result has been done for the precision, recall and F-measure which compare the precision values of the test data and it is observed the precision value of proposed system is improved by 13% compare to the existing system. The recall value is increased by 11% and improvement of F-measure value is 14% compare to the existing system. The experimental result shows that the SLR-EDM outperforms the existing system and it provides recommendation rules to improve the learning skills of slow learner in the higher educational institution. The followings factors are recommended by the SLR-EDM model to improve learning skills of the slow learners in the higher education institution.

1. Teachers should be made aware of the importance of reading.
2. Teachers guide the students to the important points of lessons and internal test.
3. Teachers give class lessons on study skills.
4. Teachers use audio and video aids for teaching the subjects
5. Teachers give more assignments on the important lessons.

CONCLUSION

The purpose of this research work is to stimulate the learning skills of slow learner in higher educational institution. In this paper classification technique is used to design a model for prediction on the result data of2000 students to predict the slow learners. This research work is used to identify slow learners in the higher educational institution and provides the recommendation to improve the skills of slow learners. A model performance chart is plotted.Integration of educational data mining techniques on the different data set is the future work.

REFERENCES

1. AbeerBadr El Din Ahmed and Ibrahim Sayed Elaraby, "Data Mining: A prediction for Student's Performance Using Classification Method", *World Journal of Computer Application and Technology*, pp. 43-47, 2014.
2. B. E. D Ahemad and I.S AElarby, "Prediction for student'sperformace using classification Method World Journal of Computer Application and Technology,pp. 43-47 2014.
3. M. A. Al-Barrak and M. Al-Razgan, "Predicting Students Final GPA Using Decision Trees: A Case Study," *Int. J. Inf. Educ. Technol.*, Vol. 6, no. 7, pp. 528–533, 2016.
4. Amirah Mohamed Sahariri, WahidahHusian and Nurainiabdul Rashid, "A Review on predicting student's performance using Data mining Techniques",Elesevier,The Third Information Systems International Conference,pp. 414-422 (2015)
5. Amajad Abu Saa,"Educational Data Mining and Student's Performance Prediction", *International Journal of Advanced Computer Science and Applications*, Vol. 7 No.5, pp. 201624.
6. G. Arumugam, and S. Suguna, "Predictive Prefetching Framework Based on New Preprocessing Algorithms Towards Latency Reduction", *Asian Journal of Information Technology*, Medwell Journals.ISSN: 1682 -3915,2008.
7. C. Anuradha1 and T. Velmurugan, "A Comparative Analysis on the Evaluation of Classification Algorithms in the Prediction of Students Performance".
8. Brijesh Kumar and Saurabh, *Indian Journal of Science and Technology*,Vol. 8, No. 15,2015.
9. Brijesh Kumar, Saurabh, Pal, "Mining Educational Data to Analyze student's performance", *International Journal of Advanced Computer Science and Application*,Vol. 2,No.6,2011.
10. Dorina Kabakchieva, "Student performance by using Data mining Classification Algorithms", *International journal of Computer Science and Management Research*, Vol. 1, 2012.
11. Ellenita Red, T. Tesaionica,Briags"Classification of Students performance in a Learning Management System Using their eLearning Readiness Attributes", *Research Gate*,2015.

12. Han and M. Kamber, "Data mining concepts and Technologies", Morgan Kaufmann, 2000.
13. Home, *International Educational Data Mining Society*. [Online]. Available: http://www.educationaldatamining.org/.
14. S.Jothilakshmi,Dr.M.Thangaraj, "Design and Development of Recommender System for Target Marketing of Higher Education Institution Using EDM", *International Journal of Applied Engineering Research* ISSN 0973-4562, Vol.13, 2018.
15. Kalpesdh Adhatrao and AdityaGaykar, "Predicting Studnet's Performance using ID3 and C4.5 classification Algorithms", *International Journal of Data mining &knowledge Management process*, Vol. 3, 2013.
16. T. Mishra, D. Kumar, and Sangeeta Gupta, "Students' Employability Prediction Model through Data Mining," *International Journal of Applied Engineering Research*, Vol. 11, No. 4, pp. 2275-2282, 2016.
17. B. Minaei-Bidgoli, D. A. Kashy, G. Kortemeyer, and W. F. Punch, "Predicting student performance: an application of data mining methods with an educational Web-based system," in *33rd Annual Frontiers in Education (FIE 2003)*, Westminster, CO, 2003.
18. O. K. Oyedotun, S.N. Tackie, and Ebenezer O. Olaniyi, "Data Mining of Student'sPerformance: Turkish Students as a Case Study," *International Journal of Intelligent Systems and Applications*, Vol. 7, No. 9, pp. 20-27, 2015.
19. ParneetKaur, Manpreetsingh and GurpreetsinghJosan,"Classification and Prediction based data mining algorithms to predict slow learnears in education sector",Elsevier,Procedia Computer Science, pp. 500-508,2015.
20. M. Ramaswami and R. Bhaskaran, "A CHAID based performance prediction model in educational data mining," *International Journal of Computer Science*, Vol. 7, No. 1, pp. 10-18, 2010.
21. C. Romero and S. Ventura, "Educational data mining: A survey from 1995 to 2005," *Expert systems with applications*, Vol. 33, No. 1, pp. 135-146, 2007.
22. S. Slater, S. Joksimovic´, V. Kovanovic, R. S. Baker, and D. Gasevic, "Tools for Educational Data Mining: A Review," *Journal of Educational and Behavioral Statistics*, 2016.
23. P. Strecht, L. Cruz, C. Soares, J. Mendes-Moreira, and R. Abreu, "A Comparative Study of Classification and Regression Algorithms for Modelling Students' Academic Performance," in *International Educational Data Mining Society*, pp. 392-395, 2015.
24. P. Sharma, D. Singh, and A. Singh, "Classification Algorithms on a Large Continuous Random Dataset Using Rapid," *IeeeSpons. 2Nd Int. Conf. Electron. Commun. Syst.*, no. Icecs, pp. 704–709, 2015.
25. G.Sujatha, Sindhu,"Predicting student performance using personalized analytics", International Journal of Pure and Applied Mathematics, Vol. 119, No. 12, pp. 229-238,2018.
26. E.Venkatesan, S.Selvaragini,"A Study on the result based analysis of student performance using Data mining",*International Journal of Pure and Applied Mathematics*, Vol. 116, No. 16,pp. 375-379.2017.
27. S.K YadavBBharadwaj, and S. Pal, "A comparative study for predicting student's performance", *International Journal of Innovative Technology &Creative Engineering*, Vol. 1, No 12,2012.
28. S.K.Yadav and S Pal, "A Prediction for Performance improvement of engineering students using classification", *World of Computer Science and Information Technology*, Vol. 2, No. 2, pp. 51-56,2012.
29. B. J. Zimmerman and A. Kitsantas, "Comparing student's self-discipline and self-regulation measures and their prediction of academic achievement", *Contemporary Educational Psychology*, Vol. 39, No. 2, pp. 145-155, 2014.

AUTHOR PROFILE

S.Jothi Lakshmi working as assistant professor in the Department of computerscience Mannar Tirumalai Naicker College,Madurai She recived the Master degree in compuer science from R.V.S college of Engineering,Dindigul& M.Phil(CS) from Annamalai University.Her interest include,Data Mining,Bigdata Analytics,wireless sensor networks,She has published more than 20 papers in journals and conference proceedings.She can be reached at jothi2008@gmail.com

Dr.M Thangaraj, Professor & Head, Department of Computer Science, School of Information Technology, Madurai Kamaraj University, India.M Thangaraj received his post-graduate degree in Computer Science fromAlagappa University, Karaikudi, M.Tech. degree in Computer Sciencefrom Pondicherry University and Ph.D. degree in Computer Science fromMadurai Kamaraj University, Madurai, TN, South India in 2006. He isnow the Head of Computer Science Department atM.K.University. He is an active researcher in Big Data Analytics, SocialMedia Analytics ,Wireless Sensor Networks and has published more than100 papers in Journals and Conference Proceedings