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Methods and Usage of Educational Data Mining Tools

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ABSTRACT

Now a day's Educational data mining (EDM) is combining research field, in which data mining (DM) tools used in educational data. Its role to understand student's gaining knowledge and how to improve educational outcomes. Big data come across the different educational systems in various styles. Every educational difficulty cannot be solving with the conventional data mining techniques so the different mining techniques needed. Number of DM tools on hand but not use because they are not related to educational data or less knowledge of DM to learner. By considering these difficulties number of researchers makes availability of data mining tools with different ambitions. In this paper I try to show the EDM tools list which facilitates EDM research scholars as well as classification of data mining tools depends upon the methods and usage.

Keywords: Big data, Data Mining, Educational Data Mining, EDM tools.

1. INTRODUCTION

Now a day's Educational data mining is a buzz word. It is use to solve the research problems of educational data. The researchers focus on field like e-learning, computer science, education, statistics etc to find out good educational results in the world. The Educational data mining technique find out valuable information from the raw data of educational units. The outcome information is used by mentor, syllabus designer, professors and educational applications etc.

I have reviewed the works done on Educational Data Mining Tools to show the list of EDM tools. Educational Data Mining is depends on data mining techniques and works on it as follows:

Romero, C., and Ventura, S. (2007) explained regarding EDM Tool [6], presented a review of twelve tools from 2001 to 2005. By using statistical and visualization techniques these tools were created to analyze and help educators for learning process. C Romero et al. (2008) a review of fourteen EDM tools between 2001 to 2006 by using techniques of pattern mining, learning paths and association rule [4]. Enrique García et al. (2011) a review of forty tools during 2001 to 2010 defined tools depends on association rule mining and filtering for the betterment of courses of e-learning. The information should be shared and scored by experts and instructors of these mining tools [10].

Alejandro Pena-Ayala (2014) shows a relevant contribution and eighteen tools where introduced. The three parts of EDM tools described. The first type collected four tools oriented to extraction, learning support, and feature engineering. The second type shows six visualization tools to support the mining process, the analysis of results, and the interpretation of outcomes. The third type of tools contains eight instances devoted to helping to solve problems, analysis support and other purposes [1]

Cristobal Romero, Sebastian Ventura. (2013) reviewed twenty two tools from 2004 to 2013 and stated that EDM tools help in many ways in computer based educational systems such as generating test, designing the course and producing report and so on. EDM tools are simple to use for educators [5]. In this paper EDM tools list shows to facilitate EDM research scholars as well as classification of data mining tools depends upon the methods and usage.

2. EDM METHODS

Educational data mining methods are come from a variety of different areas such as statistics, computational modeling and information visualization. C. Romero and S. Ventura [6] categorize work in educational data mining into the following categories:

2.1 Statistics and Visualization
2.2 Clustering and Classification
2.3 Association rule mining and sequential pattern mining
2.3 Text mining

2.1 Statistics and Visualization

Statistical Tools in educational data used to provide information about each individual or student or teacher in a form of aggregated data.

- LOCO-Analyst, (Learning Object Context Ontologies) [16] is an educational tool for providing teachers with feedback about the related aspects of the learning process in a web-based learning environment and it is extension of reload content packaging editor.
- Meta Analyzer, [14] is a Web-based environment, for solving a problem by recording and analyzing the student online search behaviors and present statistical results of fourteen quantitative indicators. It is used to assist the teacher to get more learning status.

Visualization tools are used to present the educational data in graphical representation with different visualizing formats.

- GISMO(Graphical Interactive Student Monitoring and Tracking Tool) [20] it track and extracts data from the Moodle and present graphical representation such as chart, histogram to help course instructors to verify the interest of distance students.
- Listen tool [22] is a tracking tool called Reading tutor, which browsers the logs files in the form of SQL (Structured Query Language) queries and present the visual representations to instructor to get understanding of learners.
- DataShop [18] act as data repository and web based tool for storing educational data to help researchers and visualizing and analyzing the secure data.
- LiMS (Learner Interaction Monitoring System) [19] uses 'event capture model' which gathers detailed real time data on learner's behavior by drawing on behavioral research for data demonstrating course materials.
- Meerkat-Ed [24] is social network analysis tool, which visualizes the overall snapshots of number of the participants or students in the discussion forums, and their interactions to analyze online courses.
- EDM Vis Tool [15] analyses the log files to present students performance and behavior using tree structure for better understanding of students.
- eLAT (Exploratory Learning Analytics Tool) [9] is a analytics toolkit which helps the teacher to gather visual representation of students content usage assessment and their behavior.
- SAM (Student Activity Meter) [28] visualizes students or learners actions which will be useful to evaluate them.

2.2 Clustering and Classification

There are some clustering tools are used to group the learners with common behaviours.

- PDinamet [12] is a collaborative student modeling tool to monitor student's interaction to realize and estimate their activities. It uses the clustering.
- AHA! Mining Tool (Adaptive Hypermedia Architecture) [26] Web mining and open source system for personalized links recommendation. It uses three data mining techniques such as clustering, patterns and recommender engine.

There are some classification tools are available to monitor measure and provide advices to users.

- SAMOS (Student Activity Monitoring using Overview Spreadsheets) [17] is a model used for monitoring students and groups activities in e-collaborative scenarios. It automatically generates weekly monitoring report from server log files.
- Measuring Tool [13] is measuring the motivation of online learner based on log files. It uses both clustering and classification techniques.

2.3 Association rule mining and sequential pattern mining

Association rule mining is an important type of the data mining technique to find correlations, frequent patterns from relational databases or different form of data repositories.

- Mining Tool [32] is the oldest EDM tool for educators to apply association rules to discover relationships between learning activities, sequential pattern analysis to find out interesting patterns in the sequences of on-line activities, and clustering to group similar access behaviours that useful for evaluating on-line courses.
- Data Analysis Center [30] is just keep track of places of students and find out the weakness of the students during learning process and helps the teacher to analysis learning patterns and organizes the contents efficiently.
- EPRules (Education Prediction Rules) [27] contains three standard knowledge discovery algorithms which are written in Java, such as ID3, Prism and Apriori to directly use by the teacher or the course developer.
- TADA-Ed, (Tool for Advanced Data Analysis in Education) [21] used to help teachers to visualize and mine relevant patterns of students' on-line exercises.
- Decisional tool [29] helps the teachers in the process of decision making to increase the quality of education in the university to monitor the success rates and failure rates of students.

- E-Learning Web Miner [11] provides knowledge about how to navigate and work in LMS using profiles of students' behavior.

Sequential pattern mining methods have been applied to implement some tools for education data.

- Classroom Sentinel [31] alerting the teachers by delivering the detected sequential patterns.
- CosyLMSAnalytics [25] automatically gathering and analyzing data about learners to get access patterns, learning path of learners to evaluate the progress and produce reports.
- Log Analyzer [2] it uses semantics concept to estimate and evaluate the user characteristics from the user log files.
- Data Miner for Outcomes based Education [8] this tool focus on outcomes of education like performance records and result of their students to provide support to tutors. It uses the feature selection techniques.
- CurriM(Curriculum Mining) [23] main aim of this tool is to mine the curriculum and develop it as interesting curriculum to analyze the students perspectives.

2.4 Text mining

Applying data mining techniques into textual information is known as Text mining. Few tools only use this text mining concept.

- iPDF_Analyzer [3] it processes the multimedia presentations and predicts the interactive properties and present to students.
- Web-log based [7] it uses the log based data to evaluate the pedagogical processes in LMS and students attitudes.

Table 1: List of EDM Tools.

Sr. No.	Tool Name	Algorithm/Mining Task
1	Mining tool	Association, Patterns and Clustering
2	Data Analysis Center	Association and classification
3	GISMO	Visualization
4	EPRules	Association
5	Classroom sentinel	Patterns
6	TADA-ED	Classification, Clustering, Association rule and Visualization
7	LISTEN tool	Visualization
8	iPDF_Analyze	Text mining
9	CoSyLMSAnalytics	Patterns
10	Log Analyzer	Sequential pattern
11	LOCO-Analyst	Statistics
12	Meta Analyzer	Statistics
13	Measuring tool	Classification and Clustering
14	DataShop	Visualization and Analysis
15	Decisional tool	Association Rule
16	SAMOS	Classification
17	PDinamet	Clustering
18	AHA! Mining Tool	Clustering
19	LiMS	Visualization
20	Meerkat-ED	Visualization
21	E-Learning Web Miner	Association rule and Clustering
22	EDM Vis	Visualization
23	Web-log based	Web Usage Mining
24	eLAT	Visualization
25	Data Miner for Outcomes based Education	Patterns
26	CurriM	Patterns and Visualization
27	SAM	Visualization

3. CONCLUSION

Educational data mining is a vital application of data mining techniques to decide the research problem of educational data. In E-Learning process EDM Tools play a major role. Some of the previous survey papers provided tools in different periods. In this survey several EDM Tools are introduced depends upon the methods and usage to help

EDM researchers to solve their problems.

REFERENCES

[1] Alejandro Pena-Ayala (2014). "Educational Data Mining: A Survey and a Data Mining-Based Analysis of Recent Works" Expert Systems with Applications, 41, 1432–1462.
[2] Andrejko, A., Barla, M., Bielikova, M., & Tvarozek, M. (2007). User characteristics acquisition from logs with semantics. International Conference on Information System Implementation and Modeling, Czech Republic, 103-110.
[3] Bari, M., & Benzater, B. (2005). Retrieving data from pdf interactive multimedia productions. In International conference on human system learning: Who is in control?, 321–330.
[4] C Romero, S Ventura, E García. (2008) "Data mining in course management systems: Moodle case study and tutorial" Computers & Education 51 (1), 368-384.
[5] C Romero, S Ventura. (2013), "Data mining in education" Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery. 3(1) 12-27.
[6] C. Romero, S. Ventura. (2007) "Educational Data Mining: A survey from 1995 to 2005" Expert Systems with Applications. Vol. 33, 135-146.
[7] Cohen, A., & Nachmias, R. (2011). What can instructors and policy makers learn about web-supported learning through web-usage mining. The Internet and Higher Education, 14(2), 67–76.
[8] Devine, T., Hossain, M., Harvey, E. & Baur, A. (2011). Improving pedagogy by analyzing relevance and dependency of course learning outcomes. In Proceedings of the KDD 2011 workshop: Knowledge discovery in educational data (pp. 83–90).
[9] Dyckhoff, A. L., Zielke, D., Chatti, M. A., & Schroeder, U. (2011). eLAT: an exploratory learning analytics tool for reflection and iterative improvement of technology enhanced learning. In Proceedings of the 4th international conference on educational data mining (pp. 355–356).
[10] Enrique García, C Romero, S Ventura, Carlos De Castro. (2011). "A collaborative educational association rule mining tool" The Internet and Higher Education, 14(2) 77-88.
[11] García-Saiz, D. & Zorrilla, M. (2011). E-learning web miner: a data mining application to help instructors involved in virtual courses. In Proceedings of the 4th international conference on educational data mining (pp. 323–324).
[12] Gaudioso E, Montero M, Talavera L, Hernandez-del-Olmo F. (2009). Supporting teachers in collaborative student modeling: a framework and an implementation. Expert Syst Appl, 36:2260–2265.
[13] Hershkovitz A, Nachmias R. (2008). Developing a log-based motivation measuring tool. In: First International Conference on Educational Data Mining. Montreal, Canada; 226–233.
[14] Hwang, G. J., Tsai, P. S., Tsai, C. C., & Tseng, J. C. R. (2008). A novel approach for assisting teachers in analyzing student web-searching behaviors. Journal of Computer & Education, 51, 926-938.
[15] Johnson, M. W., Eagle, M. J., Joseph, L., & Barnes, T. (2011). The EDM Vis tool. In Proceedings of the 4th international conference on educational data mining (pp. 349–350).
[16] Jovanovic J, Gasevic D, Brooks C, Devedzic V, Hatala M. (2007). LOCO-Analyist: a tool for raising teacher's awareness in online learning environments. In: European Conference on Technology-Enhanced Learning. Crete,Greece; 112–126.
[17] Juan A, Daradoumis T, Faulin J, Xhafa F. (2009). SAMOS: a model for monitoring students' and groups' activities in collaborative e-learning. Int J Learn Technology, 4:53–72.
[18] Koedinger K, Cunningham K, Skogsholm A, Leber B. (2008). An open repository and analysis tools for finegrained, longitudinal learner data. In: First International Conference on Educational Data Mining. Montreal, Canada; 157–166.
[19] Macfadyen, L. P., & Sorenson, P. (2010). Using LiMS (the learner interaction monitoring system) to track online learner engagement and evaluate course design. In Proceedings of the 3rd international conference on educational data mining (pp. 301–302).
[20] Mazza, R., & Milani, C. (2004). GISMO: a Graphical Interactive Student Monitoring Tool for Course Management Systems. In Technology Enhanced Learning Conference, Milan, 1-8.
[21] Merceron, A., & Yacef, K. (2005). TADA-Ed for educational data mining. Interactive Multimedia Electronic Journal of Computer enhanced Learning, 7(1) 267—287.
[22] Mostow, J., Beck, J., Cen, H., Cuneo, A., Gouvea, E., & Heiner, C. (2005). An educational data mining tool to browse tutor–student interactions: Time will tell! In Proceedings of the workshop on educational data mining, 15–22.
[23] Pechenizkiy, M., Trcka, N., Bra, P. D., & Toledo, P. (2012). CurriM:curriculum mining. In Proceedings of the 5th international conference on educational data mining (pp. 216–217).

[24] Rabbany, R., K., Takaffoli, M. & Zaiane, O. R. (2011). Analyzing participation of students in online courses using social network analysis techniques. In Proceedings of the 4th international conference on educational data mining (pp.21–30).
[25] Retalis, S., Papasalouros, A., Psaromilogkos, Y., Siscos, S., & Kargidis, T. (2006). Towards networked learning analytics—A concept and a tool. Fifth International Conference on Networked Learning, 1-8.
[26] Romero C, Ventura S, Zafra A, De Bra P. (2009). Applying Web usage mining for personalizing hyperlinks in Web-based adaptive educational systems. Comput Edu, 53, 828–840.
[27] Romero, C., Ventura, S., & Bra, P. D. (2004). Knowledge discovery with genetic programming for providing feedback to courseware author. User Modeling and User-Adapted Interaction: The Journal of Personalization Research, 14(5), 425–464.
[28] S. Govaerts K. Verbert E. Duval A. Pardo (2012). The student activity meter for awareness and self-reflection. In CHI Extended Abstracts. -S.l: Technische Universiteit Eindhoven, 2012. - p. 869-884.
[29] Selmoune N, Alimazighi Z. (2008). A decisional tool for quality improvement in higher education. In: International Conference on Information and Communication Technologies. Damascus, Syria; 1–6.
[30] Shen, R., Yang, F., & Han, P. (2002). Data analysis center based on elearning platform. In Proceedings of the 5th international workshop on the internet challenge: Technology and applications, 19–28.
[31] Singley, M. K., & Lam, R. B. (2005). The Classroom Sentinel: Supporting data-driven decision-making in the classroom. 13th World Wide Web Conference, Chiba, Japan, 315-322.
[32] Zarane, O., & Luo, J. (2001). “Web usage mining for a better web based learning environment” In Proceedings of conference on advanced technology for education, Banff, Alberta, 60–64.