Abstract

In this era of computerization, education has also revamped itself and is not limited to old lecture method. The regular quest is on to find out new ways to make it more effective and efficient for students. Nowadays, lots of data is collected in educational databases, but it remains unutilized. In order to get required benefits from such a big data, powerful tools are required. Data mining is an emerging powerful tool for analysis and prediction. It is successfully applied in the area of fraud detection, advertising, marketing, loan assessment and prediction. But, it is in nascent stage in the field of education. Considerable amount of work is done in this direction, but still there are many untouched areas. Moreover, there is no unified approach among these researches. This paper presents a comprehensive survey, a travelogue (2002-2014) towards educational data mining and its scope in future.

References

- Pool, Lorraine Dacre, Pamela Qualter, and Peter J. Sewell. "Exploring the factor structure
of the CareerEDGE employability development profile." Education+ Training 56.4 (2014): 303-313.
- Saranya, S., R. Ayyappan, and N. Kumar. "Student Progress Analysis and Educational Institutional Growth Prognosis Using Data Mining." International Journal Of Engineering Sciences & Research Technology, 2014
- Hicheur Cairns, Awatef, et al. "Towards Custom-Designed Professional Training Contents and Curriculums through Educational Process Mining." IMMM 2014, The Fourth International Conference on Advances in Information Mining and Management. 2014.
- Archer, Elizabeth, Yuraisha Bianca Chetty, and Paul Prinsloo. "Benchmarking the habits and behaviors of successful students: A case study of academic-business collaboration." The International Review of Research in Open and Distance Learning 15.1 (2014).
- Arora, Rakesh Kumar, and Dharmendra Badal. "Mining Association Rules to Improve Academic Performance." (2014).
- Peña-Ayala, Alejandro. "Educational data mining: A survey and a data mining-based analysis of recent works." Expert systems with applications 41.4 (2014): 1432-1462.
- Vanhercke, Dorien, Nele De Cuyper, Ellen Peeters, and Hans De Witte. "Defining perceived employability: a psychological approach." Personnel Review 43, no. 4 (2014): 592-605.
- Potgieter, Ingrid, and Melinde Coetzee. "Employability attributes and personality preferences of postgraduate business management students." SA Journal of Industrial Psychology 39.1 (2013): 01-10.
- Jantawan, Bangsuk, and Cheng-Fa Tsai. "The Application of Data Mining to Build Classification Model for Predicting Graduate Employment." International Journal Of Computer Science And Information Security (2013).
- Bakar, Noor Aieda Abu, Aida Mustapha, and Kamariah Md Nasir. "Clustering Analysis for Empowering Skills in Graduate Employability Model." Australian Journal of Basic and Applied Sciences 7.14 (2013): 21-28.
- Singh, Samrat, and Vikesh Kumar. "Performance Analysis of Engineering Students for Recruitment Using Classification Data Mining Techniques." International Journal of Computer Science & Engineering Technology. (2013).
- Finch, David J., Leah K. Hamilton, Riley Baldwin, and Mark Zehner. "An exploratory study of factors affecting undergraduate employability." Education+ Training 55, no. 7 (2013): 681-704.
- Jackson, Denise, and Elaine Chapman. "Non-technical skill gaps in Australian business graduates." Education+ Training 54.2/3 (2012): 95-113.
- Dejaeger, Karel, et al. "Gaining insight into student satisfaction using comprehensible data mining techniques." European Journal of Operational Research 218.2 (2012): 548-562.
- Padhy, Neelamadhab, Dr Mishra, and Rasmita Panigrahi. "The survey of data mining applications and feature scope." Asian Journal Of Computer Science And Information Technology (2012).
- Osmanbegovic, Edin, and Mirza Suljic. "Data mining approach for predicting student performance." Economic Review 10.1 (2012).
- Sen, Baha, Emine Uçar, and Dursun Delen. "Predicting and analyzing secondary education placement-test scores: A data mining approach." Expert Systems with Applications 39.10 (2012): 9468-9476.
- Agrewal, S., G. Pandey, and M. Tiwari. "Data mining in education: data classification and
decision tree approach." International Journal of e-Education, e-Business, e-Management and e-Learning, 2 (2) (2012): 140-144.

- Pandey, Umesh Kumar, and Brijesh Kumar Bhardwaj. "Data Mining as a Torch Bearer in Education Sector." Technical Journal of LBSIMDS (2012).
- Srimani, P. K., and Malini M. Patil. "A Classification Model for Edu-Mining." PSRC-ICICS Conference Proceedings. 2012.
- Sukanya, M., S. Biruntha, Dr S. Karthik, and T. Kalaikumaran. "Data mining: Performance improvement in education sector using classification and clustering algorithm." In International conference on computing and control engineering, (ICCCE 2012), vol. 12. 2012.
- Yadav, Surjeet Kumar, and Saurabh Pal. "Data Mining Application in Enrollment Management: A Case Study." International Journal of Computer Applications (IJCA) 41.5 (2012): 1-6.
- Torenbeek, M., E. P. W. A. Jansen, and W. H. A. Hofman. "Predicting first-year achievement by pedagogy and skill development in the first weeks at university." Teaching in Higher Education 16.6 (2011): 655-668.
- Gokuladas, V. K. "Predictors of Employability of Engineering Graduates in Campus Recruitment Drives of Indian Software Services Companies." International Journal of Selection and Assessment 19.3 (2011): 313-319.
- Yongqiang, He, and Zhang Shunli. "Application of Data Mining on Students' Quality Evaluation." Intelligent Systems and Applications (ISA), 2011 3rd International Workshop on. IEEE, 2011.
- Sakurai, Yoshitaka, Setsuo Tsuruta, and Rainer Knauf. "Success Chances Estimation of University Curricula Based on Educational History, Self-Estimated Intellectual Traits and Vocational Ambitions." Advanced Learning Technologies (ICALT), 2011 11th IEEE International Conference on. IEEE, 2011.
- Pandey, Umesh Kumar, and Saurabh Pal. "A Data mining view on class room teaching language." International Journal Of Computer Science Issues (2011).
- Arjariya, Tripti, et al. "Data Mining and It's Approaches towards Higher Education Solutions." International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307.
- Aher, Sunita B., and L. M. R. J. Lobo. "Data mining in educational system using Weka." IJCA Proceedings on International Conference on Emerging Technology Trends (ICETT). Vol. 3. 2011.
- Suthan, G. Paul, and S. Baboo. "Hybrid chaid a key for mustas framework in educational data mining." IJCSI International Journal of Computer Science Issues 8 (2011): 356-360.
- Kumar, Varun, and Anupama Chadha. "An empirical study of the applications of data mining techniques in higher education." International Journal of Advanced Computer Science and Applications 2.3 (2011).
- Sharma, Mamta, and Monali Mavani. "Accuracy Comparison of Predictive Algorithms of Data Mining: Application in Education Sector." Advances in Computing, Communication and Control. Springer Berlin Heidelberg, 2011. 189-194.
- Gokuladas, V. K. "Technical and non-technical education and the employability of engineering graduates: an Indian case study." International Journal of Training and Development 14.2 (2010): 130-143.
- Ayesha, Shaeela, Tasleem Mustafa, Ahsan Raza Sattar, and M. Inayat Khan. "Data mining model for higher education system." Europen Journal of Scientific Research 43, no. 1
(2010): 24-29.

- Kovacic, Zlatko. "Early prediction of student success: Mining students' enrolment data." (2010).
- Al-shargabi, Asma A., and Ali N. Nusari. "Discovering vital patterns from UST students data by applying data mining techniques." Computer and Automation Engineering (ICCAE), 2010 The 2nd International Conference on. Vol. 2. IEEE, 2010.
- Yan, Zhi-min, Qing Shen, and Bin Shao. "The analysis of student's grade based on Rough Sets." Ubi-media Computing (U-Media), 2010 3rd IEEE International Conference on. IEEE, 2010.
- Ningning, Gao. "Proposing Data Warehouse and Data Mining in Teaching Management Research." Information Technology and Applications (IFITA), 2010 International Forum on. Vol. 1. IEEE, 2010.
- Knauf, Rainer, Yoshitaka Sakurai, Setsuo Tsuruta, and Kouhei Takada. "Empirical evaluation of a data mining method for success chance estimation of university curricula." In Systems Man and Cybernetics (SMC), 2010 IEEE International Conference on, pp. 1127-1133. IEEE, 2010.
- Wu, X., Zhang, H., & Zhang, H. (2010, October). Study of comprehensive evaluation method of undergraduates based on data mining. In Intelligent Computing and Integrated Systems (ICISS), 2010 International Conference on(pp. 541-543). IEEE.
- Youping, Bian Xiangjuan Gong. "The application of data mining technology in analysis of college student's performance." Information Science (2010).
- Liu, Zhiwu, and Xiuzhi Zhang. "Prediction and Analysis for Students' Marks Based on Decision Tree Algorithm." Intelligent Networks and Intelligent Systems (ICINIS), 2010 3rd International Conference on. IEEE, 2010.
- Balakrishnan, Julie M. David. "Significance of Classification Techniques In Prediction Of Learning Disabilities." International Journal Of Artificial Intelligence & Applications (2010).
- Ranjan, Jayanthi, and Raju Ranjan. "Application of data mining techniques in higher education in India." Journal of Knowledge Management Practice 11.1 (2010): 1-9
- Romero, Cristóbal, and Sebastián Ventura. "Educational data mining: a review of the state of the art." Systems, Man, and Cybernetics, Part C: Applications and Reviews, IEEE Transactions on 40, no. 6 (2010): 601-618.
- Baker, Ryan SJD, and Kalina Yacef. "The state of educational data mining in 2009: A review and future visions." JEDM-Journal of Educational Data Mining1.1 (2009): 3-17.
- Siraj, Fadzilah, and Mansour Ali Abdoulha. "Uncovering hidden information within university's student enrollment data using data mining." Modelling & Simulation, 2009. AMS'09. Third Asia International Conference on. IEEE, 2009.
- Zhu, Li, Yanli Li, and Xiang Li. "Research on Early-Warning Model of Students' Academic Records Based on Association Rules." Computer Science and Information Engineering, 2009 WRI World Congress on. Vol. 4. IEEE, 2009.
- Linjie, Qu, and Lou Lanfang. "Data mining and application of teaching evaluation based on association rules." Computer Science & Education, 2009. ICCSE’09. 4th International Conference on. IEEE, 2009.
- Ahmed, Almahdi Mohammed, Norita Md Norwawi, and Wan Hussain Wan Ishak. "Identifying student and organization matching pattern using Apriori algorithm for practicum placement." Electrical Engineering and Informatics, 2009. ICEEI'09. International Conference on. Vol. 1. IEEE, 2009.
- Nayak, Amar, Jitendra Agarwal, Vinod Kumar Yadav, and Shadab Pasha. "Enterprise architecture for semantic web mining in education." In Computer and Electrical Engineering, 2009. ICCEE'09. Second International Conference on, vol. 2, pp. 23-26. IEEE, 2009.
- Wook, Muslihah, Yuhanim Hani Yahaya, Norshahrirah Wahab, Mohd Rizal Mohd Isa, Nor Fatimah Awang, and Hoo Yann Seong. "Predicting NDUM Student's Academic Performance Using Data Mining Techniques." In Computer and Electrical Engineering, 2009. ICCEE'09. Second International Conference on, vol. 2, pp. 357-361. IEEE, 2009.
- Wang, Pei-ji, Lin Shi, Jin-niu Bai, and Yu-lin Zhao. "Mining Association Rules Based on Apriori Algorithm and Application." In Computer Science-Technology and Applications, 2009. IFCSTA'09. International Forum on, vol. 1, pp. 141-143. IEEE, 2009.
- Ramasubramanian, P., K. Iyakutti, and P. Thangavelu. "Enhanced data mining analysis in higher educational system using rough set theory." African Journal of Mathematics and Computer Science Research 2, no. 9 (2009): 184-188.
- Selmoune, Nazih, and Zaia Alimazighi. "A decisional tool for quality improvement in higher education." Information and Communication Technologies: From Theory to Applications, 2008. ICTTA 2008. 3rd International Conference on. IEEE, 2008.
- Shangping, Dai, and Zhang Ping. "A data mining algorithm in distance learning." Computer Supported Cooperative Work in Design, 2008. CSCWD 2008. 12th International Conference on. IEEE, 2008.
- Bresfelean, Vasile Paul, Mihaela Bresfelean, Nicolae Ghisoiu, and C-A. Comes. "Determining students' academic failure profile founded on data mining methods." In Information Technology Interfaces, 2008. ITI 2008. 30th International Conference on, pp. 317-322. IEEE, 2008.
- Dimokas, Nikolaos, Nikolaos Mittas, Alexandros Nanopoulos, and Lefteris Angelis. "A prototype system for educational data warehousing and mining." InInformatics, 2008. PCI'08. Panhellenic Conference on, pp. 199-203. IEEE, 2008.
- Zhang, Xiaolong, and Guirong Liu. "Score Data Analysis for Pre-Warning Students in University." Wireless Communications, Networking and Mobile Computing, 2008. WiCOM'08. 4th International Conference on. IEEE, 2008.
- Zhao, Hua-long. "Application of OLAP to the analysis of the curriculum chosen by students." Anti-counterfeiting, Security and Identification, 2008. ASID 2008. 2nd International Conference on. IEEE, 2008.
- Villalon, Jorge J., and Rafael A. Calvo. "Concept Map Mining: A definition and a framework for its evaluation." Web Intelligence and Intelligent Agent Technology, 2008. WI-IAT’08. IEEE/WIC/ACM International Conference on. Vol. 3. IEEE, 2008.
- Pumpuang, Pathom, Anongnart Srivihok, and Prasong Praneetpolgrang. "Comparisons of classifier algorithms: Bayesian network, C4. 5, decision forest and NBTree for Course Registration Planning model of undergraduate students." Systems, Man and Cybernetics, 2008. SMC 2008. IEEE International Conference on. IEEE, 2008.
- Ranjan, Jayanthi, and Saani Khalil. "Conceptual framework of data mining process in management education in India: an institutional perspective."Information Technology Journal 7.1 (2008): 16-23.
- Romero, Cristóbal, Sebastián Ventura, Pedro G. Espejo, and César Hervás. "Data Mining Algorithms to Classify Students." In EDM, pp. 8-17. 2008.
- Ogor, Emmanuel N. "Student academic performance monitoring and evaluation using data mining techniques." Electronics, Robotics and Automotive Mechanics Conference, 2007.
Performance Analysis and Prediction in Educational Data Mining: A Research Travelogue

CERMA 2007. IEEE, 2007.
- Hien, Nguyen Thi Ngoc, and Peter Haddawy. "A decision support system for evaluating international student applications." Frontiers In Education Conference-Global Engineering: Knowledge Without Borders, Opportunities Without Passports, 2007. FIE'07. 37th Annual. IEEE, 2007.
- Bresfelean, Vasile Paul. "Analysis and predictions on students' behavior using decision trees in Weka environment." Information Technology Interfaces, 2007. ITI 2007. 29th International Conference on. IEEE, 2007.
- Nghe, Nguyen Thai, Paul Janecek, and Peter Haddawy. "A comparative analysis of techniques for predicting academic performance." Frontiers In Education Conference-Global Engineering: Knowledge Without Borders, Opportunities Without Passports, 2007. FIE'07. 37th Annual. IEEE, 2007.
- Romero, Cristóbal, and Sebastian Ventura. "Educational data mining: A survey from 1995 to 2005." Expert systems with applications 33.1 (2007): 135-146.
- Al-Radaideh, Qasem A., Emad M. Al-Shawkaf, and Mustafa I. Al-Najjar. "Mining student data using decision trees." In International Arab Conference on Information Technology (ACIT'2006), Yarmouk University, Jordan. 2006.
- Aksenova, Svetlana S., Du Zhang, and Meiliu Lu. "Enrollment prediction through data mining." Information Reuse and Integration, 2006 IEEE International Conference on. IEEE, 2006.
- Rasmani, Khairul A., and Qiang Shen. "Subsethood-based fuzzy rule models and their application to student performance classification." Fuzzy Systems, 2005. FUZZ'05. The 14th IEEE International Conference on. IEEE, 2005.
- Delavari, Naeimeh, Mohammad Reza Beikzadeh, and Somnuk Phon-Amnuaisuk. "Application of enhanced analysis model for data mining processes in higher educational system." Information Technology Based Higher Education and Training, 2005. ITHET 2005. 6th International Conference on. IEEE, 2005.
- Talavera, Luis, and Elena Gaudioso. "Mining student data to characterize similar behavior groups in unstructured collaboration spaces." Workshop on artificial intelligence in CSCL. 16th European conference on artificial intelligence. 2004.
- Salazar, A., J. Gosalbez, I. Bosch, R. Miralles, and L. Vergara. "A case study of knowledge discovery on academic achievement, student desertion and student retention." In Information Technology: Research and Education, 2004. ITRE 2004. 2nd International Conference on, pp. 150-154. IEEE, 2004.
- Minaei-Bidgoli, Behrouz, and William F. Punch. "Using genetic algorithms for data mining optimization in an educational web-based system." Genetic and Evolutionary Computation—GECCO 2003. Springer Berlin Heidelberg, 2003.
- Kotsiantis, S., C. Pierrakeas, and P. Pintelas. "Efficiency of Machine Learning Techniques in Predicting Students' Performance in Distance Learning Systems." Educational Software Development Laboratory Department of Mathematics, University of Patras, Greece (2002).

Index Terms

Computer Science

Information Sciences
Keywords
Educational Data Mining (EDM)