TRACER STUDY ON AIMST UNIVERSITY STUDENTS USING DATA MINING

A project submitted to the Faculty of Information Technology in partial fulfillment of the requirement for the degree Master of Science (Information Technology)

Universiti Utara Malaysia

by

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ABSTRAK (BAHASA MALAYSIA)

Kajian pengesanan graduan merupakan salah satu pendekatan yang digunakan secara meluas di pelbagai bidang pengurusan terutamanya dalam bidang pengajian tinggi. Sedemikian, kajian seumpama adalah yang terkini serta amat efektif dalam kalangan para penyelidik untuk mendapatkan satu reka model yang menyimpulkan keberkesananan institusi pengajian tinggi dalam usaha melahirkan graduan-graduan yang berkualiti tinggi dan diterima masyarakat. Selain itu, kajian ini turut meramal bilangan graduan yang akan dilahirkan oleh sesebuah institusi pengajian tinggi berdasarkan data-data statistik yang sedia ada. Maka dengan cara yang sama, kajian pengesanan graduan untuk Universiti AIMST turut dijalankan dengan menganalisis datadata yang telah yang diperoleh dari bahagian kemasukan pelajar, Universiti AIMST untuk meramal bilangan siswazah yang akan menamatkan pengajian pada tahun-tahun akan datang berdasarkan bilangan para siswazah dari tahun-tahun sebelumnya. Set data yang diperolehi dari bahagian kemasukan pelajar Universiti AIMST merupakan set data mentah iaitu ianya mengandungi data – data yang hilang yang harus diperbaiki dahulu. Maka set data tersebut harus melalui pelbagai fasa dalam kaedah CRISP untuk memperbaiki data yang hilang dan seterusnya membolehkan ianya dapat digunakan dalam pelombongan data. Walaubagaimanapun, data tersebut harus melalui pra pemprosesan dalam fasa persediaan data dalam kaedah CRISP untuk menjadikan set data yang berkualiti serta boleh digunakan dalam pelombongan data.

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CHAPTER ONE

INTRODUCTION

Education has become an essential part of everyone's life in which it gives added values to each individual, in particular, those who excel in their studies. There are several reputable education providers namely that are playing a vital role in producing high performance graduates. Regardless of whether the institution is a public or a private institution, students' performance always is the major concern.

A small number of students are performing well in their institutions despite numerous efforts given by the education provider and the government. Only handfuls of students are able to obtain excellent results and awarded with Deans' List as well as other recognitions. According to Emmanuel (2007), students' performance can be influenced by factors such as gender, family background, attitudes, previous academic background, location as well as the type of the course they enrolled. This study investigates the relationship between these factors (attributes) against students' performance in tertiary education.

The contents of the thesis is for internal user only

6. REFERENCES

- Al-Radaideh, Q. A., Al-Shawakfa, E. M. & Al-Najjar M. I. (2006). *Mining Student Data Using Decision Trees*, 1-5. International Arab Conference on Information Technology.
- Blood, D. (2010). Tracer Study Report: Winrock Moldova Entrepreneurship Grant and Training Programs. Retrieved from http://www.winrock.org.md/wp-content/uploads/2011/04/Moldova-Tracer-Study-Final-Report-FINAL-2.pdf
- Bolaane, B., Chuma, J. M. & Toteng, B. & Molwane, O. B. (2010). *Tracer Study on the Employment Outcomes of the Vocational Training Graduate*. Retrieved from http://www.botswanalmo.org.bw/docs/Documents/BQTA.pdf
- Cristian, M. M. (2010). Building Personalizes Interfaces by Data Mining Integration, 729-734. Proceedings of the International Multiconference on Computer Science and Information Technology.
- Devalari, N., Beikzadeh, M.R. & Phon-Amnuaisuk, S. (2005). Application of Enhanced Analysis Model for Data Mining Processes in Higher Educational System, F4B/1 F4B/6. 6th Annual International Conference: ITEHT, Juan Dolio, Dominican Republic.
- Ermeling, B. A., (2010). Tracing the Effects of Teacher Inquiry on Classroom Practice.

 Teaching and Teacher Education, 26, 377 388. University of California, Los Angeles, CA.
- Freitas, A. A. (2007). A Survey of Evolutionary Algorithms for Data Mining and Knowledge Discovery, 61 93. Postgraduate Programmes in Computer Science, Pontificia Universidade, Brazil.

- Gargano, M. L., Raggad, B. G. (1999). Data Mining A Powerful Information Creating Tool, 15, 81 90. Pace University, New York City, New York, USA.
- Hao, X. & Li, M. (2008). Application of Improved Algorithm of Data Reduction to Knowledge Discovery of Information Security Management, 5, 526 530. Fifth International Conference on Fuzzy Systems and Knowledge Discovery.
- Harrell, F. E. Jr. (2001). Regression Modeling Strategies: With Applications to Linear Models, Logistic Regression and Survival Analysis. New York, NY: Springer-Verlag.
- He, C. & Chen, Q. (2010). The Method for Data Reduction Based on Evaluation of Attributes Significance, 1 4. Second International Workshop on Intelligent Systems and Applications (ISA).
- Hluchy, L., Habala, O., Ciglan, M. & Tran, V.D. (2008). *Mining and Integration of Environmental Data*, 247 252. IEEE International Conference on Computational Cybernetics.
- Huang, Y. (2009). Study of College Human Resources Data Mining Based on the SOM Algorithm, 1, 324 327. Asia Pacific Conference on Information Processing.
- Hyysalo, S. (2009). Learning for Learning Economy and Social Learning, 38, 726 73.

 Research Policy.
- Ibrahim, Z. & Rusli, D. (2007). Predicting Students' Academic Performance: comparing Artificial Neural Network, Decision Tree and Linear Regression, 1 6. 21st Annual SAS Malaysia Forum.
- Irawati, I. & Bastaman, B. (2011). Tracer study: Capturing the soft skills competency of FMUI'S medical graduates. Medicine & Health, 6 (1 Supplement). p. 100. ISSN 1823-2140.

- Jackson, J. (2002). Data Mining: A Conceptual Overview. Communications of the Association for Information System, 8, 267-296. Management Science Department, University of South Carolina.
- Jirapanthong, W. (2009). Classification Model for Selecting Undergraduate Programs, 89 95. Eighth International Symposium on Natural Language Processing.
- Jamir, A. (2008). The IDRC Tracer Study on NEPED 'Empowering Through Knowledge'. Retrieved from http://idlbnc.idrc.ca/dspace/bitstream/10625/40618/1/128922.pdf
- Kadzamira, E. C. (2003). Where has All the Education Gone in Malawi? Retrieved from http://www.queensu.ca/samp/migrationresources/Documents/MALAWI_COMPLETE.pdf
- Kishor, P. (2007). Tracer Study on Training Graduates of Media Centre Programme.

 Panos South Asia. Retrieved from

 http://www.bcoalliance.org/system/files/PSA+Media+Centre+Programme+Tracer+Study+Report-6+Feb+'07.pdf
- Khemphila, A. & Boonjing, V. (2010). Comparing Performances of Logistics Regression, Decision Trees and Neural Networks for Classifying Heart Disease Patients, 193 198. International Conference on Computer Information Systems and Industrial Management Applications (CISIM).
- Kovacevic, A., Devedzic, V. & Pocajt, V. (2010). Using Data Mining to Improve Digital Library Services, 28, 829-843. The Electronic Library.
- Laokietkul, J., Utakrit, N. & Meesad, P. (2009). A Forecasting Model to Evaluate a Freshman's Ability to Succeed by Using Particular Full Scaled Class Association Rules (PFSCAR), 40 44. International Association of Computer Science and Information Technology Spring Conference.

- Latif, L. A. & Baharom, R. (2010). *OUM's Tracer Study: A Testimony to a Quality Open and Distance Education*, 2, No.1. ASEAN Journal of Open and Distance Learning. Centre for Student Management, OUM Malaysia.
- Li, L. & Zhang, K. (2009). A Privacy Preserving Clustering Technique Using Hybrid

 Data Transformation Method, 1502 1506. IEEE International Conference on

 Grey Systems and Intelligent Services. Nanjing, China.
- Mabila, T.E., Malatje, S.E., Bediako, A.A, Kazeni, M.M.M. & Mathabatha, S.S. (2006).

 The Role of Foundation Programmes in Science Education: The UNIFY

 Programme at the University of Limpopo, South Africa, 26, 295 304.

 International Journal of Education Development.
- Mayanja, K. M. (2002). Graduate Employment: Investing In The service Mandate of The African University. Symposium on the African Universities in the 21st Century. Retrieved from http://www.codesria.org/IMG/article_PDF/article_a580.pdf
- Mohamed, F. (2003). Interim Report on Alumni Tracer Study Programme, 1 5.

 Retrieved from
 http://www.mche.edu.mv/assets/images/fmc/articles_online/tracer_fazna.pdf
- Millington, C. The Use of Tracer Studies for Enhancing Relevance and Marketability in Online and Distance Education. Barbados Community College. Retrieved from http://wikieducator.org/images/e/e1/PID 424.pdf
- Minaei Bidgoli, B. (2004). Data Mining for A Web Based Educational System, PhD

 Thesis Report, Department of Computer Science and Engineering, Michigan State
 University.
- Nadali, A., Kakhky, E. N. & Nosratabadi, H. E. (2011). Evaluating the Success Level of Data Mining Projects Based on CRISP DM Methodology by a Fuzzy Expert System, 6, 161 165. Department of Information Technology Management, Science and Research Branch, Islamic Azad University, Tehran, Iran.

- Nghe, N. T., Janecek, P. & Haddawy, P. (2007). A Comparative Analysis of Techniques for Predicting Academic Performance, T2G-7 T2G-12. 37th ASEE/IEEE Frontiers in Education Conference.
- Norris, D.(2005). Bloor Research. Clementine Data Mining Workbench. Retrieved from http://www.spss.ch/upload./1114004551_Clementine%209%20BloorReport%20LR.pdf
- Ogor, E. N. (2007). Student Academic Performance Monitoring and Evaluation Using Data Mining Techniques, 354 35. 4th Congress of Electronics, Robotics and Automotive Mechanics.
- Ooi, M. P. L., Chan, C., Lee, S.-L, Mohanan, A. A., Goh, L.Y. & Kuang, Y. C. (2009).

 Towards Identification of Latent Defects: Yield Mining Using Defect

 Characteristic Model and Clustering, 194 199. Monash University, Bandar

 Sunway, Petaling Jaya, Selangor.
- Parco, G. F. & Kanzler, A. (2005). Engineered Reed Bed Treatment System as a Low Cost Sanitation Option for the Philippines. Hands on Workshop on Sanitation and Wastewater Management.
- Rai, D., Gong, Y. & Beck, J. E. (2009). Using Dirichlet Priors to Improve Model Parameter Plausibility, 141 150. EDM Proceeding (2009).
- Rao, S. J. (2003). Regression Modeling Strategies: With Applications to Linear Models, Logistic Regression and Survival Analysis, 98(461), 257 258. Journal of American Statistical Association.
- Regmi, P. P., Mohanty, B. & Bista, S. (2006). *Tracer Study: Urban Environmental Management Graduates* 1998 2005. CIDA AIT Partnership Project. Urban Environment Management (UEM) Field of Study.

- Richardson, B. D., Davis, K. C. & Beach, M. D. (2008). Introducing Data Mining Techniques and Software Engineering to High School Science Students, F2D 1 F2D 6. 38th ASEE/IEEE Frontiers in Education Conference.
- Sapaat, M. A., Musthapha, A., Ahmad, J., Chamili, K. & Muhamad, R. (2011). A Data Mining Approach to Construct Graduates Employability Model in Malaysia, 1111

 1124. International Journal on New Computer Architectures and Their Applications. University Putra Malaysia, Malaysia.
- Servaas, V.D.B. (2008). How Effective are Poor Schools? Poverty and Educational Outcomes in South Africa, 34, 145 154. Studies in Educational Evaluation.
- Shongwe, M. & Ocholla, D. (2011). A Tracer Study of LIS graduates at the University of Zululand, 2000 2009, 1 14. Retrieved from http://uzulu.academia.edu/MzwandileShongwe/Papers/731208/A_tracer_study_of_LIS_graduates_at_the_University_of_Zululand_2000-2009
- Shrestha, B. Chapter XIII: Tracer Study of School Leavers. Study on Student Performance in SLC. SLC study Team.
- Siraj, F. & Abdoulha, M. A. (2009). Uncovering Hidden Information within University's Student Enrolment Data Using Data Mining, 413 418. 3rd Asia International Conference on Modelling & Simulation.
- Siraj, F. & Abdoulha, M. A. (2011). Mining Enrolment Data Using Descriptive and Predictive Approaches, Knowledge Oriented Applications in Data Mining, Kimito Funatsu (Ed.), ISBN: 978-953-307-154-1,53 72.
- Tovar, E. & Soto, O. (2010). The Use of Competences Assessment to Predict the Performance of First Year Students, F3J-1 F3J-4. 40th ASEE/IEEE Frontiers in Education Conference.

- Ugwuonah, G. E. & Omeje, K. C. (1998). Higher Education and the Demands of Manpower Development in the Nigerian Manufacturing Sector; An Empirical Study of Enugu and Anambra States. Institute of Development Studies, University of Nigeria, Enugu Campus, Nigeria.
- Vandamme, J. P., Meskens, N. & Superby, J. F (2007). *Predicting Academic Performance by Data Mining Methods*, 15, 405 419. Education Economics.
- Vlaardingerbroek, B., Dallal, K., Rizkallah, G. & Rabah, J. (2007). A Tracer Study of Lebanese Upper Secondary School Students, 27, 564 571. International Journal of Education Development.
- Wook, M., Yahaya, Y. H., Wahab, N., Isa, M. R. M., Awang, N. F. & Seong H. Y. (2009). Predicting NDUM Students' Academic Performance Using Data Mining Techniques, 357 361. Department of Computer Science, Faculty of Computer Science and Defence Technology, National Defence University of Malaysia, Malaysia, 2009.
- Yahya, M. & Siraj, F. (2011). Effect of Data Normalization Techniques on Data Mining.

 Applied Science Division, CAS, UUM.
- Zhang, N. & Lu, W. F. (2007). An Efficient Data Preprocessing Method for Mining Customer Survey Data, 573 578. Fifth IEEE International Conference on Industrial Informatics.