Chapter 5
Academics Mining for Information Analytics as a Method in Improving Student Performance Through Effective Learning Strategies

Froilan De Guzman
University of the East-Caloocan, Philippines

Vince Benito
University of the East-Caloocan, Philippines

Sheila Abaya
University of the East-Caloocan, Philippines

Irish Mae Chua
University of the East-Caloocan, Philippines

ABSTRACT

Academic analytics in Higher Education Institutions (HEIs) through the promising technology of Data Mining (DM) is considered as the fastest method of generating knowledge discovery in the voluminous student digital data. Applying DM in the area of education will improve the performance of student and with the mined results; it can help educators to devise better teaching strategies for effective student learning. Knowledge discovery in student data can generate possible model for academic planners and educators for the institutional systemic change by improving the teaching, learning, and decision making strategy. Insights and predictive models can also be derived in identifying student performance and success rate. Several DM techniques can be listed and used in higher education such as clustering, classification, visualization, and association analysis. However, the research has emphasis on the technique of clustering using the modified K-Means Algorithm. The silhouette coefficient was incorporated in the K-Means algorithm for automatic direct cluster determination. The result showed that modification of the simple K-Means clustering algorithm through the use of silhouette coefficient achieved the same result in identifying the number of cluster with fewer burdens in the user subjective determination of cluster.

INTRODUCTION

Education is an essential requirement for a modernized world where people need to adapt to these changes through the current means of learning strategies. To be able to interact with the changes in technology, there must be a continuous method of identifying the applicable teaching technique to be applied to a specific group of learners. The teaching method of the educators affects the student performance, thus, in order to address the issue of identifying the applicable teaching methodology, educators should know and analyze students' learning performance indicators level. The implementation of statistical computations in education data mining will aid the educators to classify students from fast-learner students to slow- learner students and derives an analysis whether the strategy used is effective or not.

An area of data mining technology is known as Education Data Mining (EDM) which plays an important part in researches that are being conducted in the modernized world as well as with the development and implementation of software applications which greatly improve various areas in Science, Technology, Engineering and Mathematics (Baker, 2009). EDM researchers covers a variety of education areas, some of which includes educational software used for individual learning, computer supported collaborative learning, computer-adaptive testing and the variables that are associated with student failure or non-retention in courses. One key application of EDM has been in the area of student models improvement. These models were used to represent information about the characteristics of student such as the current level of knowledge, motivation, meta-cognition, and attitudes which affects the learning capacity and capability of student. The use of clustering method for EDM has been the focused of the research project since it is a method of batching students and separating them into similar or different groups. Grouping students with homogenous abilities and skills will enable the educator to construct learning activities based on the characteristics of the clustered students. Investigating these groups of student will determine the relevant factors that made them similar or different and consequently, a lot of learning from the student data analysis can be derived which can help educators and academic planners in evaluating the student academic behavior. The research came up with a software project named ACADEMIA which is a student analytical tool for professors to identify and group students in a class according to their similar or different academic performance level. Student performance indicators such as student age and grade point average were used to measure the academic capability and learning capacity of students which were the appropriate benchmark variables of monitoring students' progression. The modified K-Means clustering algorithm used in ACADEMIA automatically grouped student data according to their category using fixed variables. With the educational institutions' drive to produce competitive students and with ACADEMIA's visual representation of student clustering, the educators and so as with the academic planners will be able to identify the effective learning delivery methods to be applied in a class depending on the student academic behavior.

BACKGROUND

For better learning and academic performance of students, the academic standing and behavior of the students must be known so that educators can identify and apply the appropriate teaching strategy suited to a specific type of student in a class and this can be done through academic mining. Discovering new insights and correlating data from voluminous databases in the university will assist educators to formulate academic solutions that will improve student learning. In the field of pedagogy, there are a lot of things

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