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Theoretical Framework In e-Advising Using Association Rule Mining: A Review And Forecast

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ABSTRACT

At present most of the Universities/Colleges maintain the database of the student performance for many years and have terabytes of data. Using these information systems, the student can select the courses based on the approved curriculum. Few Universities also implemented E-advising systems at certain level. These systems lacks proper decision making. If the Universities/Colleges uses the historical data decision making process, it helps the student in preparing effective educational plans. This is the appropriate time for the Universities to apply data mining in their data and retrieve useful knowledge and share it with all the stake holders. This project proposes to conduct research on developing effective and comprehensive association rule mining techniques, which will support for students in using the E-advising system in a more useful way. The database maintained by the Universities / Colleges are used effectively for the decision making process whereby a student is able to design an effective study plan based upon the history and industry expectations. This paper deals about review of current trends in e-Advising models and proposes a theoretical framework to be used in the system. This framework also used association rule mining techniques for better decision making.

Keywords: e-Advising, Association Rule Mining

1. INTRODUCTION

Student advising is one of the key component in the academic field. It helps the student in completing the graduation with a very good study plan. The role of advisors

are very important in this aspect and they need to advise the students with utmost care. Incorporating technology in the advising process reduces the gap between the advisors and students. This topic is in discussion for many years among the researchers. Technology support in the advising process helps the student to sit in a remote location and interact with the system. The student can check the list of courses available and it pre and co-requisites and devise a study plan appropriately. This process is refereed as e-Advising. It provides high-quality advising to the students with more detailed input. As most of the Universities are using the information systems for their operation, introducing e-Advising will be of much challenge to them. It is important that, the University need to facilitate the students by giving the most current information regarding course selection, educational history and as well as current and future educational and career demands. Association rule mining techniques are used with the e-Advising in this proposed model to find out the interesting combination of courses. This paper deals about review of current trends in e-Advising models and proposes a theoretical framework to be used with the help of association rule mining techniques.

2. LITERATURE REVIEW

The review of literature had been carried out in the following aspects

a. Theoretical research carried out in various Universities / Research Institutions
b. Information Systems used by the Universities / Colleges
c. Learning Management Systems
d. e-Portfolio

2.1 Theoretical research carried out in various Universities / Research Institutions

David Williams[1] designed the electronic advising system to promote effective conversations among faculty-students. This system is not the replacement the way faculty do the best advising by engaging students in conversations about the stuff of competencies, the life of the mind, and the direction and disciplines.

Eva Rimbau-Gilabert et al.,[2] describes how to use the online advising in a virtual university setup. This system includes student monitoring and customer help desk modules. The author explains the background of the advising system and its main elements (functions, types, & available tools)

Lamiaa Mostafa and Nermin Khalifa[4] proposes a e-advisory system that uses data mining techniques (semantic networks) which calculates student achievement level. The system converts the individual course into a group of concepts and enables matching of similarities between concepts of different courses. Semantic expansion networks are used in this paper.

Leora Waldner, Dayna McDaniel and Murray Widener[5] explores the concept and need for faculty e-advising. The two basic views of e-Advising namely real-time advising online using instant messaging, chatroom or virtual classrooms; and the virtual advising organization shell is discussed in detail in this article. This article further illustrates on those two views and provides examples of additional

advising strategies that utilize online instructional tools to constitute the online advising toolkit.

Tony Feghali, Imad Zbib and Sophia Hallal[7] attempts to develop and evaluating a web-based decision support tool that helps advisors and students make better use of an existing information system available in the univeristies.

Zuhrieh Shana and Shubair Abdul Karim Abdullah[8] discussed an e-advising tool that collects student data and stores it in a central database. This system collects all the necessary data about a university student's major and also collects the personal information of the advisors in a central database to help students plan what individual courses they need to take.

2.2 Information Systems used by the Universities / Colleges

It is noted from the reviewed literature that the e-Advising systems are mainly used in the Universities / Colleges in United States of America. Some of the familiar models used by few institutions are listed below

In Delta College [9], students will create a plan of their courses and submit them for advisor approval or request that an advisor or counsellor create a plan for them. The features includes course planning wizard, create/add a worksheet, modify a worksheet, program evaluation, registration and E-Mail advisor.

The Coastal Carolina University [10] has two modules in e-Advising namely Student and Faculty. The student module has the features course planning wizard" or create/add to worksheet", register for classes, communicate with your adviser using the E-Mail.

The Union County College[11] e-Advising includes the features such as view worksheet, review planned courses, course planning wizard create/add to worksheet, modify worksheet, elective requirements and track requirements.

Bergen Community College[12] implemented the e-Advising model with various features such as view worksheet, course planning wizard,create/add to worksheet, modify worksheet program evaluation, registration, e-Mail to the advisor and view educational plan approved by the academic counsellor

Cuyahoga Community College [13] e-Advising system is a virtual counsellor. The student will receive a reply from an online counsellor within two business days. This system assist students in developing an educational plan. This systems get the more accurate input regarding student educational history as well as current and future educational and career goals which could be used by the online counsellors to provide with most accurate and appropriate information specific to the student needs.

The College of San Mateo [14], e-Advising is available to answer very basic questions regarding enrolment and attendance at College of San Mateo. This system will not carry out in-depth advising or degree evaluations or career counselling. The students' needs to to schedule an appointment to meet with a counsellor.

The Boise State University [15] has the project which has been established to augment the present faculty and student advising services with a comprehensive electronic advising system. The project also includes key reports, such as a way to find the deviation in the proposed study plan etc.,

Columbia University, Community College Research Center [16] has the project which will assess the effectiveness of the e-Advising tools and help to develop guidelines for their use. The primary goals of the project are to identify barriers to student, faculty, advisor, and administrator use of technology-assisted advising; develop strategies to overcome those barriers; and provide clearer information about the benefits of the system in terms of improving student decision-making.

Texas A&M University[17] e-Advising system allows the student to submit general academic advising queries through the request form to learn more about academic requirements, university policies, campus resources, and to receive answers to general questions.

The other Universities / Colleges (in USA) which uses the e-Advising systems are listed below

Monroe College, Maryland Christian College, Newyork Institute of Technology, Central Ohio Technical College, Texas Weslean University , Washington State University, e-Advising module of Shenandoah University, Hunter College, Southern Arkansas University, Shoreline Community College, Santiago Canyon College, Johnston Community College, California State University , Prince George's Community College, The Society for Academic Emergency Medicine, Wake Forest College

2.3 Learning Management Systems

Many Universities also uses the Learning Management Systems for e-Advising. This is a management system which automates the teaching and learning process. This is much useful to the student and faculty. The largest LMSs in the education sector[18] are

1. Blackboard,
2. Desire2Learn
3. Moodle (open source)
4. Instructure Canvas

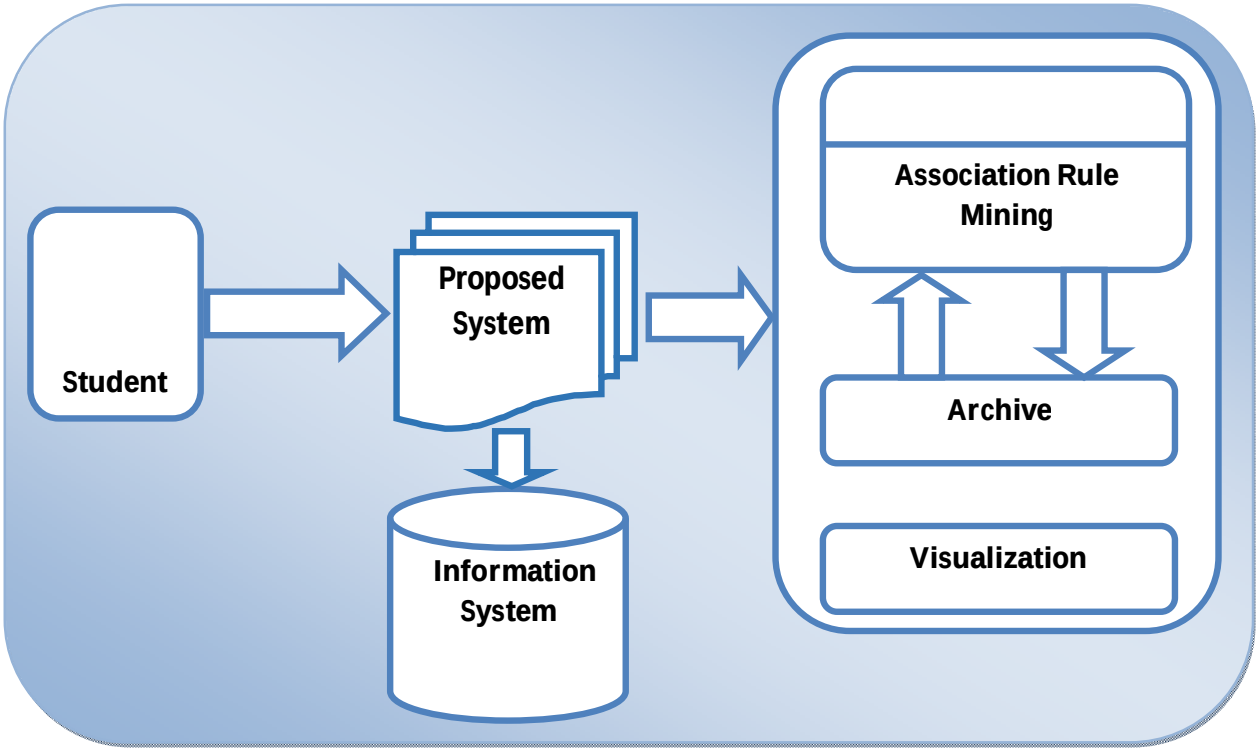
These system has good features such as Online Management of courses, Classroom instruction management, Talent Management, Communication and Collaboration, Content Management, Assessement and Testing, Virtual Classrooms, Reporting and Mobile Learning. These systems were analysed and found that the incorporation of historical databases, management of study plans and use of data mining techniques are missing. This unique and novel feature is considered in the proposed model.

2.4 e-Portfolio

Few Universities also uses e-portfolios in a-Advising process. e-Portfolios can be created by the faculty/student for many activates such as course management, discussions and online examinations. With the increase in usage of cloud computing, the implementation of e-portfolios has become much easy. In the study by Nilgün Tosun, M. Fatih Baris[6], the advantages and disadvantages of using an e-portfolio for the students are mentioned. The benefits of e-Portfolio in the education are discussed

in detail in this paper. Three types of e-portfolios are described in a report published by ELI paper [3]: student e-portfolios, teaching e-portfolios, and institutional e-portfolios. These e-portfolios can support student advisement, career preparation and credential documentation, department and program self studies and institutional and program accreditation process. The e-portfolio paper from KISC[20] uses the best examples from current practice to explore how e-portfolios can add value to personalised and reflective models of learning. This paper illustrates a wide variety of e-portfolio uses across further higher and continuing education. The topics such as e-portfolio-based learning, supporting e-portfolio learners, changing the dynamics of learning and teaching and establishing an e-portfolio culture are discussed in depth in this article

3. PROPOSED FRAMEWORK



The student logs in to the system using the credentials provided by the University. The proposed system retrieves the needed data from the information systems. The following information is available in the information systems

- Student profile
- Curriculum, programme outcomes (Course Profile)
- Internal Assessment Marks
- Final Examination Marks

- Academic Calendar

The systems build a course plan with the help of an association rule mining technique. The association rule mining algorithm also links the data retrieved from the information systems with the data available in Archive. The visualization presents the student with the set of possible outcome.

Need and Role of Association Rule Mining

Association rule mining techniques are used to discover the hidden association between some set of items from the given database. The information systems maintained by the Universities are used as input to these techniques. Association rules mining techniques are used in this research to find out the interesting correlation between two courses. An example of an association rule would be "If a student chose 'Database Administration' course, he is 80% likely to also choose 'Performance Tuning' course"

In the proposed project, association rules are used to build the model capable of machine learning. This machine learning program is more efficient, intelligent and provides better support to the student.

Need and role of archive database

All the Universities are maintaining information system for most of their academic activities. The data generated by these systems are available in huge archives and it is the appropriate time to use these archives for better decision making. The archive maintained by the Universities will be integrated with the proposed approach. These archives contains the history of student educational plan and serves as a good input for making valuable and quality decision making.

Need of the archive database:

The archive database has the complete student's profile of the passed out students. These data can be used to build new course plans. If the decision making is carried out by the referring the history (Archive database), the course plan prepared by the students will have a value in it.

Role of the archive database:

In the proposed project, a student will refer the archive database during the preparation of the course plan. The chosen association rule mining technique will work closely with the archive database and provide the suggestion, which can be used, for better and quality decision making as stated in the previous sessions.

For example

Consider a student from Database Domain and the following are the list of five courses out of which the student has to choose three courses in a given semester

a. Database Administration
b. Performance Tuning
c. Database Architecture

d. Database Security
e. Database Disaster Management

If a student selects 'Database Administration', the association rule mining technique immediately contacts the Archive and present the following suggestions

i. "80% of the passed out students chosen 'Database Administration' in the academic year 2013-2014 have chosen 'Performance Tuning' and 'Database Security' as the other options"
ii. "95% of the passed out students chosen 'Database Administration' in the academic year 2012-2013 have chosen 'Performance Tuning' and 'Database Security' as the other options"
iii. "75% of the passed out students chosen 'Database Administration' in the academic year 2011-2012 have chosen 'Performance Tuning' and 'Database Security' as the other options"
iv. "30% of the passed out students chosen 'Database Administration' in the academic year 2012-2013 have chosen 'Database Architecture' and 'Database Disaster Management' as the other options".
v. 80% of the student chosen 'Database Administration' and 'Disaster Management' in the academic year 2012-2013 have not performed well in the graduation project.

Based on the above suggestions, the student can choose either option i or ii as their choices to prepare the study plan.

4. EXPECTED BENEFITS

Some of the expected benefits of the proposed model are outlined below

a. Better student satisfaction

The student satisfaction is the core objective in any academic institution. The proposed system helps the student in devising a detailed study plan by considering various inputs. This input will help the student for getting a good job and progress in the career. Hence, the student satisfaction benefit is hereby achieved.

b. Benefits the faculty member

The faculty members' places crucial role in any academic advisory system. The proposed system helps the faculty in reducing his role and benefits the faculty by way of adding the expertise into the system. The faculty can add more inputs in the proposed system in the form of association rules and it provides a strong base for devising a study plan.

c. Promotes student academic success

Any academic institution will always be interested in the success of the student academically. The proposed model will help the student in succeeding in their

academic life by way of providing quality advising and thus help the student in being placed in a reputed job place.

d. Enhance efficiency

All the organisations are working in improving efficiency in all the aspects in their activities. The academic institutions are more concentrating in this aspect to improve the efficiency in terms of producing quality and job ready graduates. The proposed system will increase the organisational efficiency, faculty efficiency and student efficiency.

e. Improve overall advising quality

All the accreditation bodies in the academic institutions use the word *quality*. As the institutions are reaching internationally, quality will help them to achieve excellent standard, which could be useful to attract quality student and good talented faculty. Using the proposed system, the quality of the academic institution will be improved by way of using the appropriate technology based e-Advising.

5. CONCLUSION

The detailed results of the proposed framework will be published in detail in the near future after the implementation. As stated in the introduction, the student advising is very important in the academic system and it is the duty of the Universities/Colleges to use the appropriate technologies and providing a system to the student community. This research will help the Universities/Colleges to improve the quality of the e-advising as a supplement tool in addition to their existing e-advising models.

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