

WEB-BASED DATA MINING TOOLS : PERFORMING FEEDBACK ANALYSIS AND ASSOCIATION RULE MINING

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ABSTRACT

This paper aims to explain the web-enabled tools for educational data mining. The proposed web-based tool developed using Asp.Net framework and php can be helpful for universities or institutions providing the students with elective courses as well improving academic activities based on feedback collected from students. In Asp.Net tool, association rule mining using Apriori algorithm is used whereas in php based Feedback Analytical Tool, feedback related to faculty and institutional infrastructure is collected from students and based on that Feedback it shows performance of faculty and institution. Using that data, it helps management to improve in-house training skills and gains knowledge about educational trends which is to be followed by faculty to improve the effectiveness of the course and teaching skills.

KEYWORDS

Academic, Apriori, Asp.Net, Feedback, Knowledge, Mining, Php

1. INTRODUCTION

With competitive environment prevailing among the educational institutions, the main objective of higher education institutes is to disseminate quality education to its students and to improve the quality of managerial decisions. Quality of education can be improved by gaining knowledge from educational data which facilitate academic planners in higher education institutes to enhance their decision making process, to improve students' academic performance and better understand students' behavior, to assist instructors, to improve teaching and many other benefits and for achieving this data mining plays an important role. Data Mining is the process of applying intelligent methods to extract data patterns. It is a powerful analytical tool that enables educational institutions to better allocate resources and staff, manage student feedback [1].Applying data mining techniques to educational data for knowledge discovery is significant to educational organizations as well as students. Educational data mining is an emerging trend, concerned with developing techniques for exploring, and analyzing the huge data that come from the educational context and using those methods to better understand student interests [2][3]. EDM consists of Web-based data mining software tools which helps in managing knowledge to

gain competitive advantage, information dissemination and knowledge acquisition, analytic capabilities and enhances our understanding of learning process to focus on identifying, extracting and evaluating variables related to the learning process of students[4].The key advantages of these web-based tools is that they are helpful in future analysis, decision-making and feedback based on dynamic data[5].These web-based data mining tools provide management of the institution with information to improve educational trends. The Web-based applications and data-mining environments are becoming important media for collecting, sharing and distributing information [6].There are learning content management system platforms which facilitate information sharing and communication between participants in a course where massive online courses are provided to students where they can opt courses accordingly, give online tests, prepare assignments, engage in discussions, chats etc [7].

2. CLASSIFICATION USING WEB BASED TOOLS

One of the most useful data mining techniques for e-learning is classification. Classification is the processing of finding a set of models which describe and distinguish data classes or concepts. The derived model may be represented in various forms, such as classification (IF-THEN) rules, decision trees, mathematical formulae, or neural networks [8]. We implemented feedback system developed in Php and Apriori application in Asp.Net taking sample of student's data. Using Association Rule Mining, we find association rules with support and confidence for optional and elective courses mostly opted by students. These methods have been applied to web-based educational systems where associations discovered shows which contents students tend to access together, or which combination of subjects they want to opt.

2.1 Web enabled educational ARM tool

In data mining, association rule learning is a method where interesting relations are discovered between variables in large databases [9] and ARM task is to find hidden association relationship between the different item sets in transaction database [10].

Web enabled Association Rule Mining tool proposed in this paper has used an SQL query mechanism for querying the discovered knowledge in the form of association rules.ARM techniques are applied to databases of transactions where each transaction consists of a set of items[11]. The suggested web-based tool, developed using ASP.NET framework, can be helpful for universities or institutions providing the students with elective courses. It can be utilized to:

- Generate the combinations of elective courses most opted on the basis of feedback of students.
- Generate the combinations of elective courses best recommended on the basis of feedback from industry experts.

Then so formed combinations can be adopted by university/institution to provide students with courses which are considered to be both interesting and beneficial.

2.1.1 Framework:

- *Data Selection*

The data is input from the students using a web-form shown in Fig.1

The form is titled "Data Input Form" and contains the following fields:

- Name: Text input field
- Roll No.: Text input field
- CGPI: Text input field
- Department: Dropdown menu (Select...)
- Semester: Dropdown menu (Select...)
- Open Elective 1: Dropdown menu (Select...)
- Open Elective 2: Dropdown menu (Select...)
- Dept. Elective 1: Dropdown menu (Select...)
- Dept. Elective 2: Dropdown menu (Select...)
- Dept. Elective 3: Dropdown menu (Select...)
- Dept. Elective 4: Dropdown menu (Select...)

At the bottom, there are two buttons: "Submit" and "Data Analysis".

Fig 1.Input Form for students to select Open Elective and Department Elective Courses.

- *Database Structure:*

The structure of the database being used to store transactions and derive association rules is shown in Fig.2.

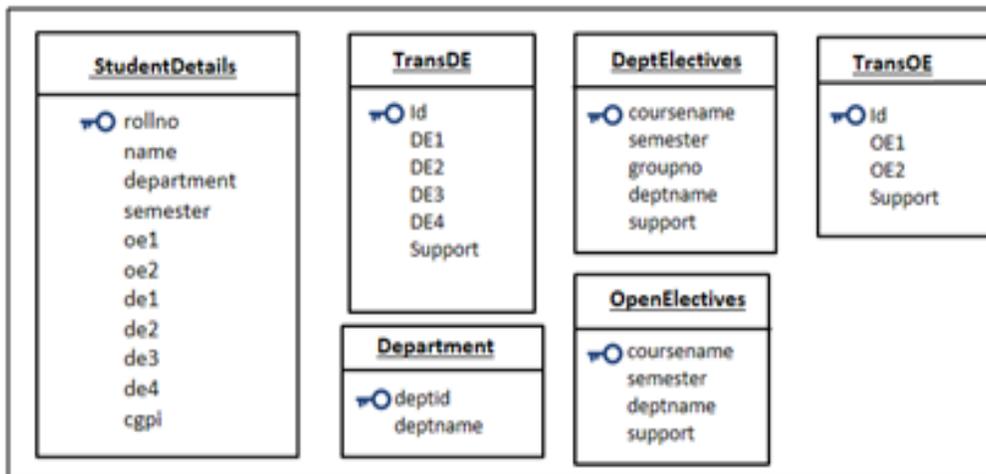


Fig 2. Design of database structure

- *Purpose of Tables:*

Tables used in this tool along with their description are shown in Table 1.

Table 1: Description of tables used in ARM tool

Table Name	Description
Student Details	To store information regarding the students.
DeptElectives	It contains the list of all departmental electives being offered to the students.
OpenElectives	It contains the list of all open electives being offered to the students.
Departments	It contains list of all the departments.
TransOE	It contains all the transactions of open electives which are to be analyzed.
TransDE	It contains all the transactions of departmental electives which are to be analyzed.

- *Sample dataset:*

Sample Dataset containing transactions for implementing Association Rule Mining is shown in Table 2. For generating Association Rules of the data collected, user is prompted to enter the input parameters i.e. Support value and Confidence percentage. Using ARM [12], rules are selected only if they satisfy both a minimum support and a minimum confidence threshold. The sample input parameters shows support=2 and confidence=40% in Fig.3.

Table 2: Sample Dataset showing subjects taken as open elective and departmental elective

Open Elective1	Open Elective 2	Deptt Elective 1	Deptt Elective 2	Deptt Elective 3	Deptt Elective 4
Digital Electronics	Communication	Artificial Intelligence	Mobile DB	Adv.Microprocessor	Embedded Systems
IBE	Industrial Env.	Web Tech.	Distributed Systems	Adv. Microprocessor	Embedded Systems
IBE	Industrial Env.	Web Tech.	Distributed Systems	Parallel Algo.	Adv.Comp.Networks
IBE	Nuclear Phy.	Artificial Intelligence	Mobile DB	Parallel Algo.	Adv.Comp.Network
Digital Electronics	Computer Graphics	Artificial Intelligence	Distributed Systems	Adv.Microprocessor	Embedded Systems
Robotics_1	Neural Networks	Artificial Intelligence	Distributed Systems	Adv.Microprocessor	Embedded Systems
Optimization	Nuclear Phy.	Web Tech.	Mobile DB	Parallel Algo.	Adv.Comp.Network
RDBMS	Robotics_2	Web Tech	Distributed Systems	Parallel Algo	Adv.Comp.Network
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The screenshot shows a user interface for the ARM tool. It features two input fields: 'Min. Support' with the value '2' and 'Min. Confidence (%)' with the value '40'. Below these fields are three buttons: 'Generate Analysis', 'Generate Grammar', and 'Back'.

Fig.3 Support and Confidence are input parameters where threshold values assumed for Min Support is 2 and Confidence is 40%.

3. WEB BASED FEEDBACK ANALYSIS TOOL

Web Based Feedback Analysis tool proposed in this paper developed using php for collecting feedback of faculty and institutional infrastructure from students and that information is helpful in decision-making for Management.

3.1.1 System Framework

- *Data Source:*

Tool suggested in this paper has focused on understanding the various issues related to successful implementation of teaching practices and Institutional infrastructure after acquiring knowledge from student’s feedback analytical tool. Feedback collected from students is taken as sample for this study. Students give feedback in the form of rating i.e. 1-10 and attributes used in database are shown in Table 3 and Table 4.

- *Pre-Processing:*

It consists of filtering and formatting of data. In this tool, constraint based approach is followed for students while filling the feedback form like students can directly select the faculty name from the Dropdown list boxes so as to avoid any missing or false entries. It not helps in proper evaluation of results as well reduce the time consumption. For doing classification, Table 5 shows the features on basis of which students have to rate faculty members and Institution in our Feedback Analytical System and Fig.4 and 5 shows the User Interface for giving the feedback for faculty and institution.

Table 3: Attributes for faculty

Fieldname	Data type
ID	int
Name	varchar(30)
Knowledge	int
Comm.	int
Response	int
Uniformity	int
Exercises	int
Cooperation	int
Adherence	int

Table 4: Attributes for Institute

Fieldname	Data type
Id	int
Contents	int
Planning	int
Material	int
Library	int
Infra	int
cleanliness	int

Table 5: Classification of features on basis of which students will rate faculty and institution

SrNo.	Features for Faculty Rating	Features For Institutional Rating
1	Knowledge	Course Contents
2	Communication and Presentation	Planning of Programme(Course calendar)
3	Response to Queries	Course Material
4	Uniformity in Evaluation	Library Facility
5	Class Room Exercise	Infrastructure(Class Rooms, Practical Labs)
6	Cooperation with students	Cleanliness
7	Adherence to schedule	General Arrangement of work Place

Feedback form				
Student Details				
Name:	<input type="text"/>			
Address:	<input type="text"/>			
CourseCode:	<input type="text"/>			
Module:	<input type="text"/>			
RollNo:	<input type="text"/>			
<p>Note: Rating scale is from 1 to 10, where 1 is poor and 10 is excellent. Please give all the feedback in the range of rating scale.</p>				
Enter The Feedback				
	Theory Faculty 1	Theory faculty 2	Practical faculty 1	Practical faculty 2
Name of faculty	Pratiyush ▾	Pratiyush ▾	Pratiyush ▾	Pratiyush ▾
Knowledge and confidence	select ▾	select ▾	select ▾	select ▾
Communication and presentation	select ▾	select ▾	select ▾	select ▾
Response to queries	select ▾	select ▾	select ▾	select ▾
Uniformity in evaluation	select ▾	select ▾	select ▾	select ▾
Class room exercises	select ▾	select ▾	select ▾	select ▾
Cooperation with	select ▾	select ▾	select ▾	select ▾

Fig.4 Faculty feedback form where students will rate faculty for theory and practical subjects

Institution Feedback		
		Rating Scale(1-10)
1.	Course contents	<input type="text"/>
2.	Planning of Programme(Course Calender)	<input type="text"/>
3.	Course Material	<input type="text"/>
4.	Library facility	<input type="text"/>
5.	Infrastructure(Class Rooms, Practical Labs etc.)	<input type="text"/>
6.	Cleanliness & Gen arrangement of work place	<input type="text"/>

Fig.5 Infrastructure feedback form where rating is done to analyze institution performance

- *Pattern Discovery*

Feedback is collected from students in the form of database and query mechanism is applied on it and results derived in Fig.8 and 9 shows overall performance of Faculty members and improvements required in institutional infrastructure.

4. RESULTS AND DISCUSSIONS

The Association Rules generated for Open and Departmental Electives are shown in Fig. 6 and Fig.7 respectively for the input parameter values supplied in Fig.3. From Fig 6 and 7, we derive that Association Rules for Departmental Elective shows that students who have opted for Web Technologies have also opted for Distributed Systems and with Distributed Systems, Advanced Microprocessor combinations are there. Frequent Item sets shown in Fig 6 shows some open elective courses and support for them. The maximum support is for “Digital Electronics”, “IBE” i.e. Open Elective 1, “CPM_2”, “Neural Networks” i.e. Open Elective 2 and strong rules shown in Fig 6 for OE are Digital Electronics=>CPM_2 and CPM_1=>CG. Similarly, Frequent Item sets shown in Fig 7 shows Departmental Elective Courses and support for them. Maximum Support is 7 for Artificial Intelligence i.e. Departmental Elective 1, Mobile DB i.e. Department Elective 2, Parallel Algorithm i.e. Department Elective 3 and Adv.Computer Networks i.e. Department Elective 4.

A result using Feedback Analytical Tool in Fig 8 and 9 shows the rating for faculty members and institute given by students based on attributes shown in Table 3 and Table 4.

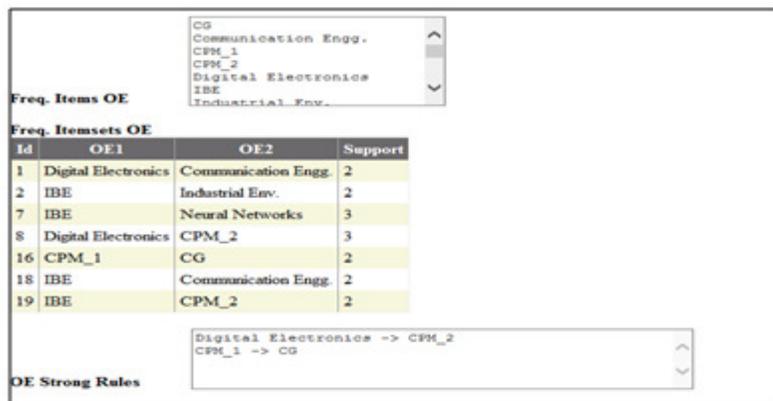


Fig.6 Association rules generated by application for open elective subjects

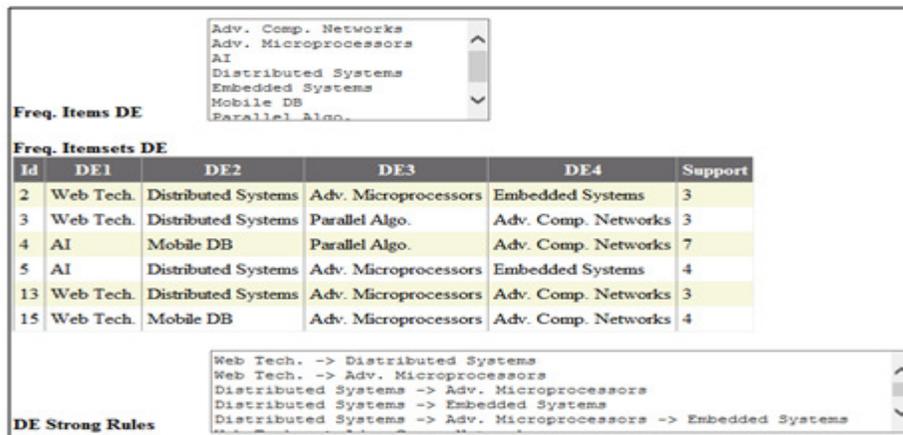


Fig.7 Association rules generated by application for department elective subjects

Hello Admin	
Feedback of Institute	
Topic	Percentage
Course contents	50%
Planning of programme	60%
Course Material	70%
Library Facility	30%
Infrastructure(Class Rooms,Practical Labs etc.)	30%
Cleanliness and gen arrangement of work place	50%

Fig.8 Feedback of institute generated by PHP based application

Fig 8 and 9 shows Feedback Analysis of Institute and Faculty taking Theory and Practical Classes. Results shown not only helps in Faculty Development but also results in improvement of Institutional Infrastructure needs, course curriculum and decision making.

Hello Admin				
Overall Performance of Faculty				
Best performance=88 . Best performer=Pratiyush				
Faculty Name	Amit	Vijay	Pratiyush	Divya
Knowledge	70%	80%	90%	80%
Communication and Presentation	60%	90%	80%	80%
Response to queries	70%	80%	90%	90%
Uniformity in evaluation	80%	90%	100%	90%
Class room exercise	80%	90%	80%	90%
Cooperation with students	90%	80%	90%	70%
Adherence to schedule	70%	90%	90%	90%
Overall Performance	74%	85%	88%	84%

Fig.9 Faculty performance results generated by application for theory and practical subjects

5. CONCLUSION

With the growth in Web-based applications which includes massive open online courses, e-learning, there is significant increase in analyzing educational trends through web-based tools and apply that knowledge to better serve users, students. Web-Based Data mining tools have shown significant results in educational sector, in-depth analysis of data and results generated. Tools proposed in this paper have targeted educational sector and students. It not helps in quality assurance but also leads to effective knowledge management. Web-based data mining tools provide the skill to understand and infer the generated information, managing knowledge which is the source of competitive advantage. We have taken care of simplicity in graphical user interfaces of tools so that students don't face any problems while filling the input data forms. ARM Tool proposed for Classification of Association rules helps the educators, management in

knowledge discovery and students interest towards technologies, composing and recommending new courses. Using these tools, we concluded that visualization results generated are intuitive, meaningful to educators, management for effective decision-making and can be useful in predicting student outcomes. Further in this direction we are working to integrate feedback and results obtained with data mining directly applied to the e-learning environment.

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