Recommender Systems for Course Re-Registration

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Abstract: In Flexible Course Registration System, students may be given a chance to Re-Register any course for their grade improvement. In this paper, recommender systems evaluate and guides user for take up courses of re-register if needed. It connects users with courses to 'RE-REGISTER' by associating the content of recommended courses or with the academic history of user's performance and grading in the courses. Firstly, academic history details from all the students are collected and stored in the database including registration numbers. Ranking for each of their registered course from each student is collected for each course according their interest and their performance in that particular course. Ratings are considered along with their grades and credits for those courses to suggest the course which is appropriate to the student. For example, a student of any branch who expresses an interest in re-registering a course – through viewing the grades, credits and the rating each student has given to all the courses and finding the major difference in the CGPA if the course is re-registered – will likely receive recommendation.

Keywords: Recommender Systems, Ranking, Flexible Course Registration, Re-Registration.

1. INTRODUCTION

In Educational Data Mining and Information Systems, Recommendation Systems has a vital role [1]. Most of the students will likely to increase their CGPA to qualify in certain companies for placements. To increase their CGPA, students have an option to re-register from grade improvement. Student having more number of lower grades like *c*, *d*, *e* will be confused with the courses they want to register. Due to any circumstance, student may not get good grades in his interested courses. In this case, there will be confusion which course the student must re-register so that it will be a major difference to the CGPA. Information Filtering can be otherwise specified as Recommender Systems which identifies the user's preferences or rating of any item or product and recommends the same when the information are overloaded [2]. Recommender Systems are deployed in many applications like products, research articles, learning materials, music, movies, books, jokes, etc,. The types of recommendation system are categorized based on three methods [2] as follows:

1.1. Collaborative Filtering

Collaborative filtering [2] methods constitute collection and analysis of large amount of information on user's preferences and predicting or behaviors, activities what users will like common with others.

1.2. Content-based filtering

Content-based filtering [2] methods are constructed on an item description and user preferences based on their profile information. Keywords are used for item description and a user profile is built to indicate the item preferences in a content-based recommender system. These algorithms try to recommend items based on the users past preferences.

1.3. Hybrid recommender systems

This type of recommender system is constructed with the combination of content-based filtering and collaboration-based filtering methods [1]. Studies have given more accurate results while evaluating hybrid based recommendation with the collaborative and content-based methods. These methods help in eliminating the evident recommender systems problems like sparsity problems and cold start problems.

Several researches has identified the applications of Data Mining used in recommender systems [3], predictions related to course selections [4,5], improving the performance of a student on a particular course [6,7], course sequence recommendations [8] and recommending relevant learning recourses [9].

The rest of the paper is organized as follows: In Section II, we have discussed the proposed methods and architecture. In Section III, we have discussed the performance analysis of the proposed work. In Section IV, we have discussed the Results. In Section V we have concluded the paper.
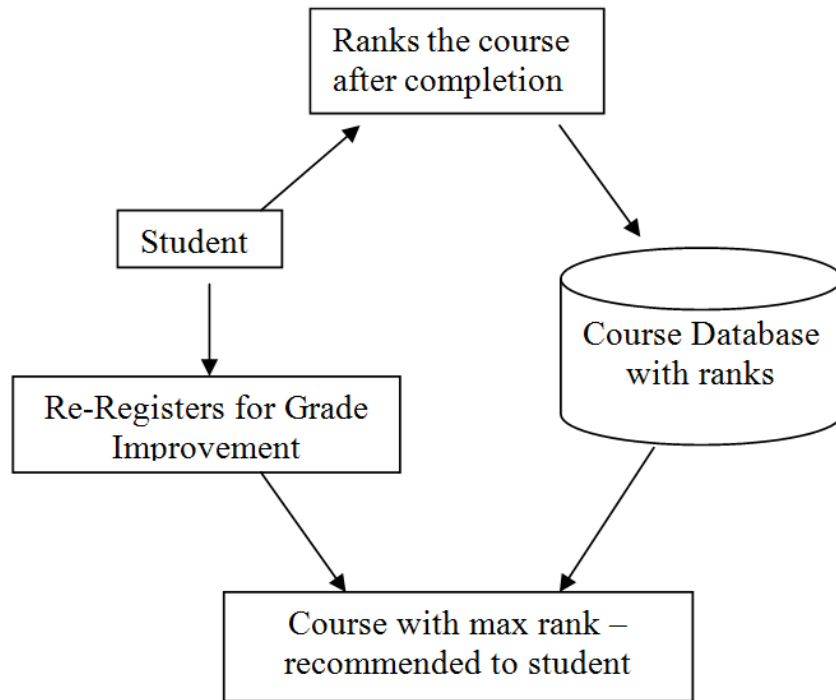
2. MATERIALS AND METHODS

Figure 1: Proposed Architecture

Students will not be satisfied with their grades and will like to re-register the courses for grade improvement. If they have multiple number grades which have low grading, then it will be difficult for the student to decide the course he/she has to register. Therefore, to make the work simple, this proposed work is developed to recommend which course can be re-registered according to the student's interest in that particular course by collecting the rating for each course from the students who have already completed the courses.

The proposed method has the following steps:

Step 1: During the completion of a course, students provides their feedback by ranking the course based on their liking from 1-5 [Likert Scale].

Step 2: Course Database with have the course details along with the rankings given by the students.

Step 3: If a student needs to re-register a course for grade improvement, a list of courses with high rankings will be recommended to the student in which the student has scored fewer grades so that the recommendation helps them to increase their academic performance through GPA.

Figure 1 describes the purpose of the proposed work which is used to reduce the student work and confusion in selecting a course for re-registration. In case the student wants to re-register a course to improve his/her CGPA and confused with the course which he has to re-register it, this portal will be useful for the student. The proposed system is explained in details as follows:

2.1. Data Collection

Data is collected from the academic history. Courses and grades for each course will be stored in the database. Data will be collected. Data consists of Student's academic history, course name, course title, credits, and grades. Following is the sample data of the student's details

Table 1
Data collection example

ID	Reg. Number	Course Name	Course Code	Credit	Grade
1	12mse1006	Engineering Chemistry	CHY101	4	A
2	12mse1006	Environmental Studies	CHY104	3	B
3	12mse1006	Basic Electrical and Electronics Engineering	EEE101	4	A
4	12mse1006	English for Engineers – I	ENG101	3	B
5	12mse1006	English for Engineers – II	ENG102	3	A

Table 1 shows only the details of one student. In this way, all the student details are collected and stored it in the database.

2.2. Categorization

The grades and credits which are collected from the database are categorized based on the credits + grades in the descending order. Considering the above table, the student has 2 B grades of 3 credits and 3 A grades of 3 and 4 credits. Table 2 illustrates the categorization of data in descending order.

Table 2
Categorization example

| ID	Reg. Number	Course Name	Course Code	Credit	Grade
2	12mse1006	Environmental Studies	CHY104	3	B
4	12mse1006	English for Engineers - I	ENG101	3	B
1	12mse1006	Engineering Chemistry	CHY101	4	A
3	12mse1006	Basic Electrical and Electronics Engineering	EEE101	4	A
5	12mse1006	English for Engineers - II	ENG102	3	A

2.3. Collection of rating

Rating for each course from the domain experts and the students is collected based on the complexity of the course from their point of view. Following is the sample of data collected for rating. Rating is taken from 1 to 5. Rating the courses from 1 to 5 based on the complexity from the student's point of view. For example, if the student has selected the option 5, it means that you are good at this course and he/she can perform. 0 means the student didn't register that particular course.

Table 3
Rating example

Reg. Number	Engineering Chemistry	Environmental Studies	Basic Electrical and Electronics Engineering	English for Engineers - I	English for Engineers - II
12mse1035	3	3	4	4	4
12mse1006	4	3	3	4	4
12mse1023	3	3	3	3	3
12mse1087	2	2	2	2	2
12mse1043	2	2	3	3	2

engineering chemistry (12 responses)
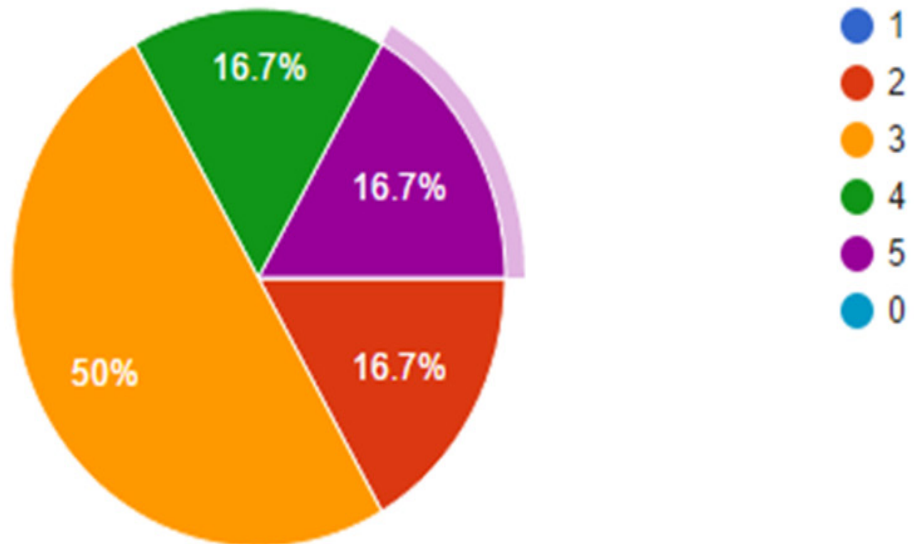
(*a*) **Ranking for Engineering Chemistry**

Environmental Studies (12 responses)

Legend:
- 1
- 2
- 3
- 4
- 5
- 0
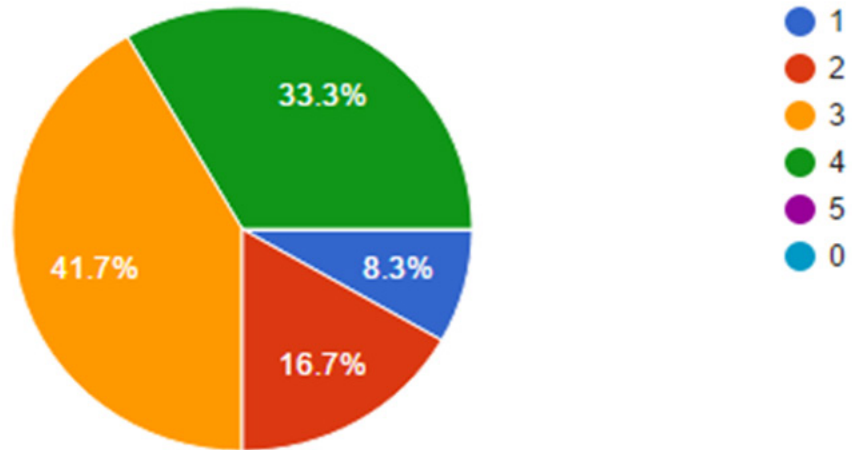
(*b*) Ranking for Environmental Studies

Figure 2: Rankings provided by the students

Figure 3 illustrates the rankings given as feedback by the students for the courses undergone by them. The sample chart is illustrated for the subjects (*a*) Engineering Chemistry and (*b*) Environmental Studies

2.4. Recommendation

The data which is categorized in the second module is viewed. First the course with highest rating is selected and grade for the course is viewed. If the student can perform better in that particular course, the student will be recommended to re-register the course again. Therefore, according to the highest rating in a course, the course with least grade and the highest credit will be recommended to the student to re-register for the improvement in the CGPA.

3. PERFORMANCE ANALYSIS

Analyzing the performance of this project, it is divided into 4 modules. Firstly, the data is collected from various academic histories and stored in the database. Secondly, data is categorized. The result of the categorization is based on the credits and respective grades. From all the grades, least grade is selected and respective credit is checked. If the credit is more for the least grade course, then that data will be rearranged and moved that particular course in the first place. Similarly, remaining courses are rearranged according to the credits and grades. For example, consider the data taken in chapter 4(modules and its algorithm), the data of '12mse1006' student is considered and her 5 courses are listed. Among all those grades, the least grade is B. So B grade courses should be taken into consideration and check with the credits. Both the courses which have B grade are 3 credits courses. So they are can be arranged in any way. After B grade, the next least grade is A grade. Now by checking A grade with their credits, the highest credit course is 4 and the least is 3. 4 credit courses with A grade are 2 in this case. So they can be arranged in any way. And the last course is 3 credit courses with A grade. Thirdly, rating for all the course from all the students is collected and stored it in the database. Now the system can suggest the student both the courses with B grade. But considering the rating, both the B grade courses have the rating as 4 and 3. Similarly, both A grade courses, have different rating for two credit courses.

Considering one course at a time, calculating the average for both the courses with two B grades, the course with highest average value is considered. Lastly, the course with highest average value is recommended to re-register for the improvement of the CGPA. If suppose, the student have C grade, then that will be considered in the first place. C grade course will verify with the credits that particular course have and according to the ranking, the course is suggested to re-register. If there are multiple C grades, the similar calculation is done like it is done in the above example. If suppose, C grade course will be having less credits and B grade course will be having more credits, then in this case rating will be taken into consideration and the course will be recommended appropriately.

Therefore, keeping all the possible situations in mind, this system is developed for the students to make the work easy, who will be confused to re-register a course for the improvement of the CGPA.

4. RESULTS AND DISCUSSIONS

Every student will have an Academic history stored in the institutional database which holds the courses registered by the students with course credit details and course grades as specified in Table 4.

Table 4
Student's Academic History

ID	Reg no	Course-name	Course-code	Course-code	Credit	Grade
1	12mse1025	Engineering Chemistry	CHY101	Theory Lab	4	B
2	12mse1025	Environmental Studies	CHY104	Theory	3	B
3	12mse1025	Basic Electrical and Electronics Engineering	EEE101	Theory Lab	4	A
4	12mse1025	English for Engineers–I	ENG101	Theory Lab	3	B
5	12mse1025	English for Engineers–II	ENG102	Theory Lab	3	B
6	12mse1025	Event Managers' Club	EXC147	Lab	2	S
7	12mse1025	Basic French	PRE101	Theory	2	A
8	12mse1025	Ethics and Values	HUM121	Theory Lab	3	A
9	12mse1025	Problem Solving Using C	ITE101	Theory Lab	3	B
10	12mse1025	Data Structures and Algorithms	ITE103	Theory	4	B
11	12mse1025	Data Structures and Algorithms Lab	ITE104	Lab	2	A
12	12mse1025	Digital Electronics and Microprocessors	ITE205	Theory	3	B
13	12mse1025	Digital Electronics and Microprocessors Lab	ITE206	Lab	2	A
14	12mse1025	Multivariable Calculus and Differential Equation	MAT101	Theory	4	E
15	12mse1025	Multivariable Calculus and Differential Equation	MAT101	Theory	4	F
16	12mse1025	Differential and Differences Equation	MAT105	Theory	4	A
17	12mse1025	Discrete Mathematical Structures	MAT106	Theory	4	B
18	12mse1025	Linear Algebra	MAT202	Theory	4	B
19	12mse1025	Applied Probability Statistics and Realiability	MAT207	Theory	4	C
20	12mse1025	Research Methods for Management	MGT304	Theory	3	B
21	12mse1025	Modern Physica	PHY101	Theory Lab	4	A
22	12mse1025	Soft Skills	STS421	SS	1	B
23	12mse1025	Object Oriented Programming using C ++	SWE101	Theory	3	A

Student provide their ratings for each course they study as specified in table 5

Table 5
Student's Ratings

S. No	Time Stamp	Name	Reg no	Engineering Chemistry	Environment Studies	Basic Electrical and Electronics	Effective Englisht	English for Enginners–1
1	4/19/2016 22:09:09	Akshay	12mse 1035	3	3	4	4	4
2	4/19/2016 22:20:43	A. Rajesh	12mse 1019	4	4	4	4	4
3	4/19/2016 22:24:51	S. Shyma	12mse 1023	3	3	3	3	3
4	4/19/2016 22:31:47	B. Jayendra	12mse 1087	2	2	2	2	2
5	4/19/2016 22:43:52	G. Bhargava	12mse 1043	2	2	3	2	2
6	4/19/2016 22:54:53	Dheeraj	12mse 1049	4	1	2	3	1
7	4/19/2016 19:27:16	Khokila. V	12mse 1160	3	4	5	5	3
8	4/19/2016 21:52:45	Vignesh. V	12mse 1170	3	3	1	4	4
9	4/19/2016 22:24:07	R. Ravali	12mse 1025	3	3	5	0	5
10	4/19/2016 22:40:24	Abinandhan	12mse 1085	3	3	3	3	3
11	4/19/2016 0:45:18	Vinoth kumar J	12mse 1113	5	4	3	4	4
12	4/27/2016 20:12:02	Soni	12mse 1008	5	4	2	5	5
13				3.333333333	3	3.083333333	3.25	3.333333333

Recommendation of a course to be re-registered will be done based on the student's grade and the course with higher rankings.

Figure 3 illustrates the recommendation of the courses to the students. It can be said that the list of courses are first suggested according to the grades of that particular student and then as per the rating, only one course is recommended.

Courses are rated by the students as a feedback. If a student tends to improve the grade, a list of courses will be sorted in which the student has secured fewer grades. Out of the courses listed, the ratings are analyzed and courses with high rating are recommended to the student for the grade improvement.
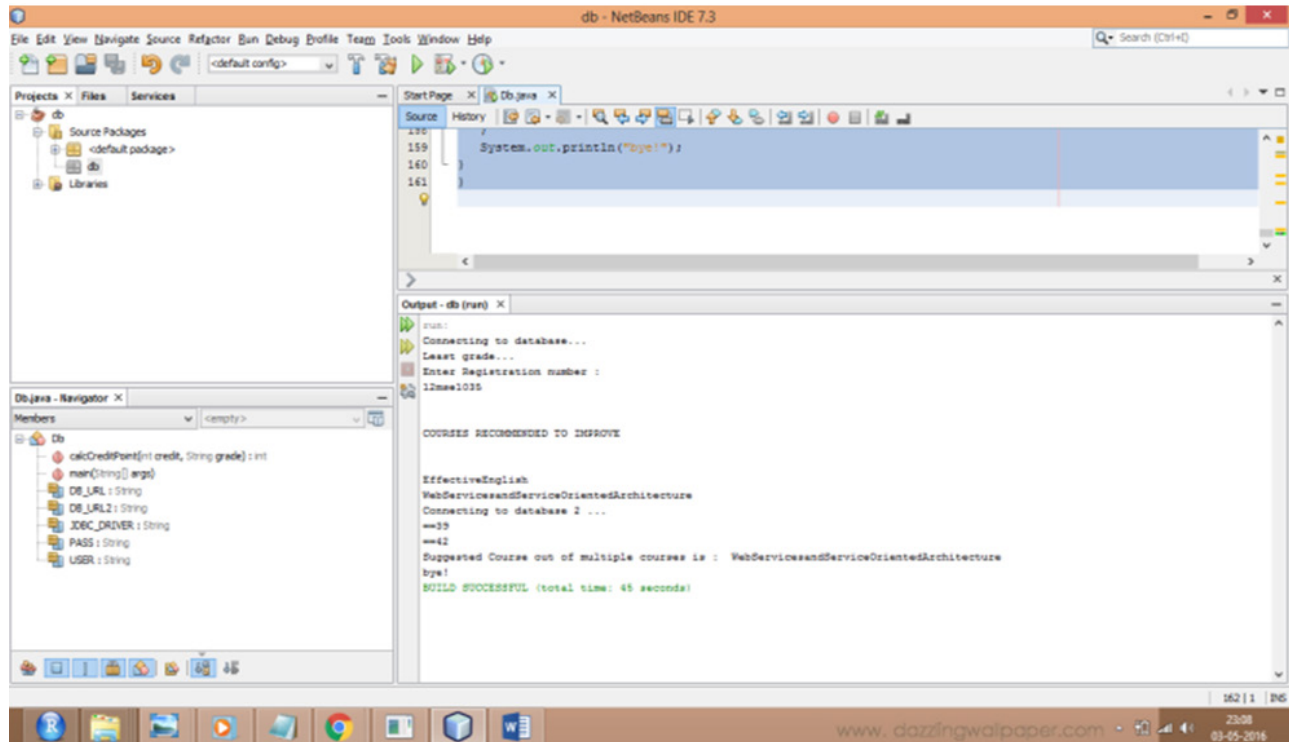
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Figure 3: Recommendation of a course

5. CONCLUSIONS

System is developed which help students to re-register the course according to their course with credits with respective grades. The student is recommended to re-register the course according their rating for the course and his performance in that particular course. This system makes a student with multiple lower grades, to select the course as per the suggestion instead of getting confused about the courses. Now, this system is developed only for one branch (MS Software Engineering) of only one batch. This can developed for multiple batches from different branches to make the work easier for the all students. The proposed method recommends courses only for grade improvement through re-registering the courses. If a student has more number of arrears and confused in selecting which arrear course has to be considered for examination, the proposed method can be used with the same methodology.

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