Course Rank System

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November 7, 2015

Project Report
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1 Introduction

- This report consists of major implementation details, inputs used and their respective outputs and some screen shots of Course Rank System.

- Course Rank system is a user friendly portal which contains courses and their description at some University (IIT Bombay in our case).

- This allows students to see course description, reviews given by seniors, and previous years’ statistics. It also contains a public discussion box where students can interact with professors teaching that particular course.

- Professors can modify the course content as per their interest since all professors need not follow same original course content.

- It also contains LDAP login where students of IIT Bombay can directly login through their LDAP credentials with out signing up.

- The database of the system is built very efficiently by spending a lot of time by drawing ER diagram first and then getting schema from it. Postgresql database is used for this system and application is developed on java.

2 Work Summary

The work of building Course Rank system can be divided into 4 stages at a higher level.

- The first stage corresponds to designing the ER diagram of Course Rank and developing the schema diagram of database for Course Rank. Then writing sql scripts to add tables with corresponding constraints to the postgresql database of Course Rank.

- The second stage is to write back-end java classes and functions to fetch the required data from database so that they can be used in corresponding jsps.

- The third stage is to make the jsps and other front-end files using bootstrap, jQuery, Angular JS, javascript etc.

- The fourth stage is testing with huge records and debugging the code. This also includes adding validations to all forms and also validate the access to some jsps according to their access levels.
3 Implementation Details

We used Postgresql DBMS to manage database. We used java for backend and jsp, bootstrap and angular JS, java script, jQuery in the frontend. We made use of eclipse IDE which provides a very good user interface for developing JDBC applications. We are currently running the program on tomcat-7 server (port 8080). Since, our database is very huge with 19 tables, it is very difficult to draw and visualize ER diagrams and schema diagrams on paper. Hence, we used an online tool called ERDplus to draw the ER and schema diagrams.
https://erdplus.com/

We started with designing the database and spent a lot of time on it as it is the most important part of the application. Hence, we spent approximately more than half amount of time on designing it. After starting building application, we didn’t overcome a situation to change database schema for any reasons. This is a very good proof that our database is optimal. Please find the ER diagram and schema diagram later in this report.

The inputs section of the report talks more about the sql related details of Course Rank. Coming to the back-end of Course Rank, We divided the back-end code into two packages named as database and object. Object package contains object classes that represent certain tables or combination of tables in Course Rank. They are more used as data structures and they never interact with data structures. It contain classes for Comment, Course, Pair, People, Reply, Review.

The other package called as Database, actually contains methods that gets connection from database and either retrieve required data or do the required transactions. This contains classes called as CommentRetrieval, CourseRetrieval, FormValidations, GradeRetrieval, PeopleRetrieval, ReplyRetrieval, ReviewRetrieval. Coming to the external web-app libraries, apart from the standard postgresql-jdbc.jar, we used another library for LDAP authentication called as netldap.jar. This library provides methods using which we can connect to IIT Bombay LDAP server.

4 Inputs

The main key inputs required for Course Rank is courses. Hence, we are using the IIT Bombay course database. It contains around 6700 courses with all the information. Please find the courses and their description at IIT Bombay in the link below.
http://iitb.ac.in/asc/Courses
Second major input for Course Rank is the users. We incorporated sign up into this system so that any one can sign up and get login credentials. We added admins ourselves into the database and also added some instructors into database manually. We kept ldap login so that IIT Bombay users (including instructors) can login directly without any sign up. Admin will have to approve the people who login through LDAP Ids as we can’t get entire required information from LDAP server of IIT Bombay though we are getting basic details like name, department etc. from LDAP server of IIT Bombay. Please find all the sql scripts in the link below.

http://www.cse.iitb.ac.in/~sai.kiran/CourseRank/

The commands to drop all the tables of Course Rank can be found in file drop.sql. The commands that creates all the tables of Course Rank can be found in create_tables.sql. insert_variable.sql file contains insert commands to insert into table named as variable. Since, there are many tables and you might have troubles inserting values into them onto your database as order of inserting matters because of foreign key constrains, we wrote a bash script which does everything for you i.e; dropping existing tables, creating tables and inserting values into them in correct order.

Make sure that you change the directory to your directory where you had downloaded the .sql files. Also change the username and database credentials in the script file to your credentials. Then go to the directory where script file is present and run these commands:

```bash
$ chmod 777 run.sh;
$ bash run.sh
```

This will create entire Course Rank database on your database with all the 6700 courses.

5 Insertion of huge courses data set into database

- As mentioned earlier, we are using IIT Bombay’s course database. We got all the information from its database into a csv file which can be found in the link below with name as courses_final.csv.

www.cse.iitb.ac.in/~sai.kiran/CourseRank/courses_final.csv

- For converting this huge data set into an file with sql inserts, we used a python script since it provides many easy ways to deal with csv files. The csv file uploaded is tab separated.
• This python script can be found in the link below. It is named as convert.py.
   http://www.cse.iitb.ac.in/~sai.kiran/CourseRank/convert.py

• Then we ran the run.sh script by redirecting output into insert_all_courses.sql file. This file is also attached in the links provided above.

6 Indexes

We used indexing to quickly locate data without having to search every row in a database table every time a database table is accessed. The bottleneck to our application is the transactions of comments, reviews, and courses. In case of courses we always access them by department names. In case of reviews and comments we will access them by time they are created. Hence, we created indexes in these as follows:

   CREATE INDEX course_index ON course (course_id, dept_name);
   CREATE INDEX comment_index ON comment (comment_id, course_id, created_at);
   CREATE INDEX reply_index ON reply (comment_id, created_at);
   CREATE INDEX review_index ON review (course_id, given_at);

After creating these indexes, we observed that the home page is loading faster by 1-2 seconds in some laptops.

7 Validations and access permissions

• We tried to incorporate java-script validations where ever there is a form. For example, in sign up form, statistics form, review form etc.

• Similarly, though we manage to hide the relevant link to user if he is not allowed to navigate to that link, he might actually type the resultant link in url by seeing in other people’s browser may be and can do malicious things.

• To avoid this we checked the access level permissions in each and every jsp page(both front end and back end action pages).

• A good example to this is, A student can give course review only if he had done that course. But, even though we won’t show the anchor
button to those students who had not done the course, he can type the url with required parameters and fill the review.

- But this is not possible in our case as we will detect this in review.jsp and warn him saying that you are not allowed to access this page instead of showing review form.

8 Outputs(Screens) in CourseRank

Login:
This web page asks for username and password of the person to look into necessary details of the courses offered by every department. If he types in wrong pair of username, password it notifies him by showing invalid username or password. This page is common to all people i.e Admin,instructors,students and spectators.It also has an option to login using LDAP ID for IITB students.

Signup:
This html page is for people who are not registered for application i.e students not from this institution. This adds the person signing as a spectator. It has fields like email,name,address,username, password. If username is already registered it asks to change the required field. None of them can be
empty or null for successful signup of the person.

After logging in you are directed to homepage.

**Homepage:**

Homepage is different for admin and others.

- This page has courses listed according to department name given in the search field to all of them. Each entry will be different for admin and others.

- People who are not Admins will be having features like view reviews, view stats and more info along with corresponding course ID and course name in each entry.

- Along with the above mentioned features Admin will be having other features like edit course content which is used to modify the content of that course and delete feature which is used to delete that course from the curriculum.

- Admin will also be having features like approve requests which are used to add students and instructors of this institute to student table or instructor table, add course feature which is used to add a new course.
Figure 3: Sign Up page of CourseRank

Figure 4: Homepage for Admin of CourseRank
Figure 5: Homepage of CourseRank (Non Admin)

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Course Code</th>
<th>Course Name</th>
<th>Reviews</th>
<th>Grading Status</th>
<th>View More</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AE 102</td>
<td>Data Analysis and Interpretation</td>
<td></td>
<td>View Reviews</td>
<td>View More</td>
</tr>
<tr>
<td>2</td>
<td>AE 152</td>
<td>Introduction to Aerospace Engg.</td>
<td></td>
<td>View Reviews</td>
<td>View More</td>
</tr>
<tr>
<td>3</td>
<td>AE 153</td>
<td>Introduction to Aerospace Engg.</td>
<td></td>
<td>View Reviews</td>
<td>View More</td>
</tr>
<tr>
<td>4</td>
<td>AE 201</td>
<td>Flight Mechanics I</td>
<td></td>
<td>View Reviews</td>
<td>View More</td>
</tr>
<tr>
<td>5</td>
<td>AE 202</td>
<td>Thermodynamics</td>
<td></td>
<td>View Reviews</td>
<td>View More</td>
</tr>
<tr>
<td>6</td>
<td>AE 203</td>
<td>Continuum Mechanics</td>
<td></td>
<td>View Reviews</td>
<td>View More</td>
</tr>
<tr>
<td>7</td>
<td>AE 204</td>
<td>Measurements and Instrumentation</td>
<td></td>
<td>View Reviews</td>
<td>View More</td>
</tr>
<tr>
<td>8</td>
<td>AE 356</td>
<td>Naval Architecture</td>
<td></td>
<td>View Reviews</td>
<td>View More</td>
</tr>
</tbody>
</table>

Figure 6: Requests needed to be approved by admin

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Student ID</th>
<th>Email</th>
<th>Name</th>
<th>Address</th>
<th>Approve</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>130050070</td>
<td><a href="mailto:bade.d@iiit.ac.in">bade.d@iiit.ac.in</a></td>
<td>BADE DURGAPRIYA</td>
<td>IT Bombay, Pin-400076, Mumbai</td>
<td>Approve</td>
</tr>
<tr>
<td>2</td>
<td>130050051</td>
<td><a href="mailto:saikumar.s@iiit.ac.in">saikumar.s@iiit.ac.in</a></td>
<td>KUTUM SAIKUMAR</td>
<td>IT Bombay, Pin-400076, Mumbai</td>
<td>Approve</td>
</tr>
</tbody>
</table>
Figure 7: Course Page showing modified content and original content

- View review option corresponding to a course will take us to the review page of that particular course, View Stats option will take us to statistics page of that course, More Info option will take you to course page which contains all the information contained regarding that course.

- After choosing an option in homepage user will be directed to one of the pages mentioned below.

**Course Page:**

- This page contains original course content, modified course content, option to see previous years grading statistics, comments along with the replies given to this course.

- It also will be having all the names of instructors who is taking this course in a given semester for different sections.

- This page is different for everyone. Along with the above mentioned parts we will be having different options for different people which are shown based on their designations.

- Instructor will have an option to modify the course content of the course he is teaching so that students can get a brief idea what will be
Figure 8: Course Page of admin showing comments along with replies on in the course which will be shown on the modified content part of the page. Only instructors who is teaching that course in that particular semester will be having this option and only he can perform this action.

- Original course content gives the details of course like course code, course name, total credits of the course, type of the course (whether it is theory or lab), lectures per week, number of tutorials per week, number of hours required for practicals per week, number of hours required for self study per week, whether the course is half or full semester, prerequisites if any, reference textbooks, short description of the course.

- Modified course content will be having course code and name same as that of the original content while the other fields being default. Modified content will be shown along with instructor name who modified it along with the time stamp at which it is last modified.

- Admin will be having an option to delete the comments which are inappropriate.

- On clicking grade statistics we are redirected to the grading statistics page of this course.

- Along with these a student who takes this course in the previous offerings and passed will be having an additional option Give Review
Figure 9: Review page of CourseRank

which is used to give review which will be then changed to Review given after he gives the review.

Reviews:

- On clicking view review option in the homepage corresponding to a course redirects the user to this page.

- It will be having all the reviews given by students of university who took the course and passed them. Reviews will contain a short review of the course, difficulty level, rating along with student name and time at which review is given.

- There will be an option to view the reviews based on ratings, difficulty level and most recent review.

- Along with these a student who takes this course in the previous offerings and passed will be having an additional option to give the review for this course.
Statistics:

- On clicking view stats option in home page corresponding to a course or Grade statistics option in course page user will be redirected to this page.

- This will be directed to the page in which year and semester have to be filled for knowing the grading statistics of that particular semester and year.

- After filling in year and semester and clicking submit button, All the grading statistics along with instructor name who took that course are displayed in a table which will have number of students who got different grades along with total no. of students.

Edit Course, Delete Course, Add course:

- These features are only given to admin.

- Edit Course option is given to admin which is shown on his homepage along the corresponding course. This is used to change the original content of the course like total credits etc.
Figure 11: Edit Course page of CourseRank

Figure 12: Add course page of CourseRank
• Add course option is given to admin which is shown on his homepage. This is used to add a new course in curriculum.

• Delete Course option is given to admin which is shown on his homepage along the corresponding course. On clicking this a prompt is given for confirmation on which the course is deleted.

9 References Used

(1) https://erdplus.com/
(2) http://www.postgresql.org/
(3) http://www.latextemplates.com/
(4) http://getbootstrap.com/
(5) https://angularjs.org/
(6) https://www.w3schools.com/jquery/