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Coursify

CMPE 272 Enterprise Software Platforms
Team Project Report

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Submitted by: Project Group 26

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1. Introduction

Our project is designed after analyzing the problem we face every time we register for our courses each semester. We decided to develop a system which could solve the problem of course selection including one's interest in specific technology. Our service is able to help the students plan the courses very effectively.

Coursify, as the name suggests is an easy to use web user interface. Just by selecting your major department and your specialization courses, you are set to plan your career in a right way. You can specify which technology you want to learn and it will give you an overview of all the combinations which can help you in learning that technology. Based on the students' feedback on a course, we are able to provide an overview and analysis of which course is better and the technology being taught in that class.

2. Problem

While choosing courses for a semester, we as students, have faced problems. We are unaware about the courses. We know which technology we want to learn, but not sure under which course. Also we are not sure if our choices or plan satisfy the prerequisite and co-requisite condition criteria. We became certain of this problem after we discussed it with our fellow students. They were also of the same opinion as us that course selection is not an easy process. The constant flipping through web pages to see the course listing, the requirements or some reviews from seniors on rate my professor, creates more confusion due to scattered data and the constant flipping.

3. Solution

Coursify aims to provide a solution to all these student problems.

What Coursify provides is a service, where you are asked for few inputs and based on the provided inputs Coursify gives you the output. These inputs are the details like your department, major and minor course option chosen, expected course completion date, prerequisites if any. If you are interested in learning something specific, Coursify will take care of that as well. All you have to do is choose from the available options in the Interests page, where the technology options will be listed. Based on these inputs Coursify will create a course plan for you. It makes sure that the suggested plan is aligned according to your interests. If you don't like the suggested plan, you have an option to create your own plan. We will check the validity of your plan by making sure that the prerequisite and co-requisite condition criteria are met.

4. System Design

4.1. Functional Component Diagram

Our system consists of various functional components, which are described below.

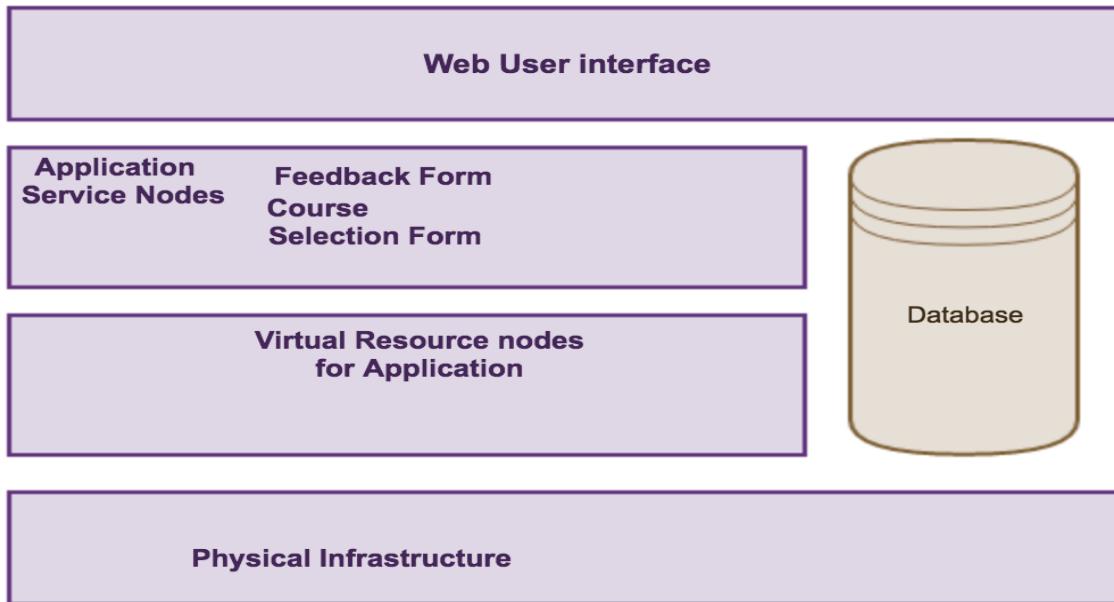


Fig: Functional Components in our services

4.2. Architecture Diagram

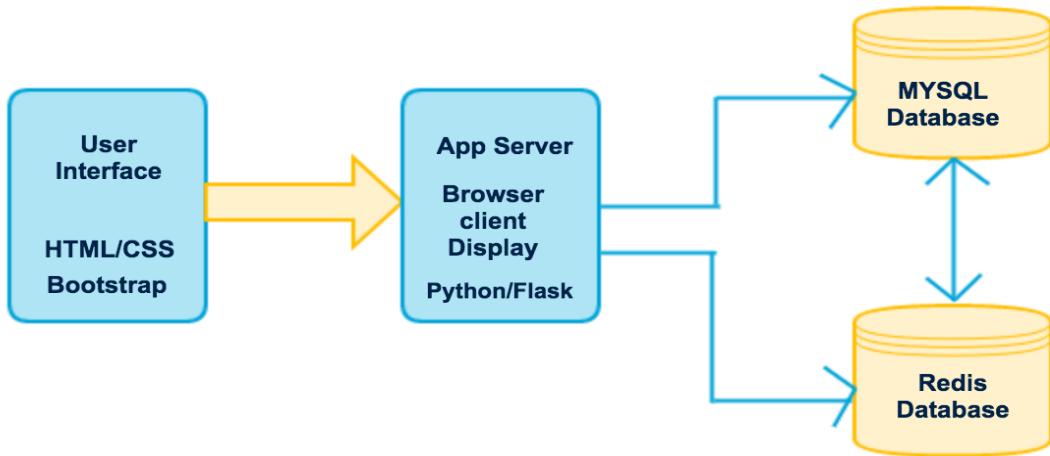


Fig: Architecture Diagram

4.3. User Oriented Infrastructure Diagram

The system consists of following user oriented infrastructure components Architecture Diagram.

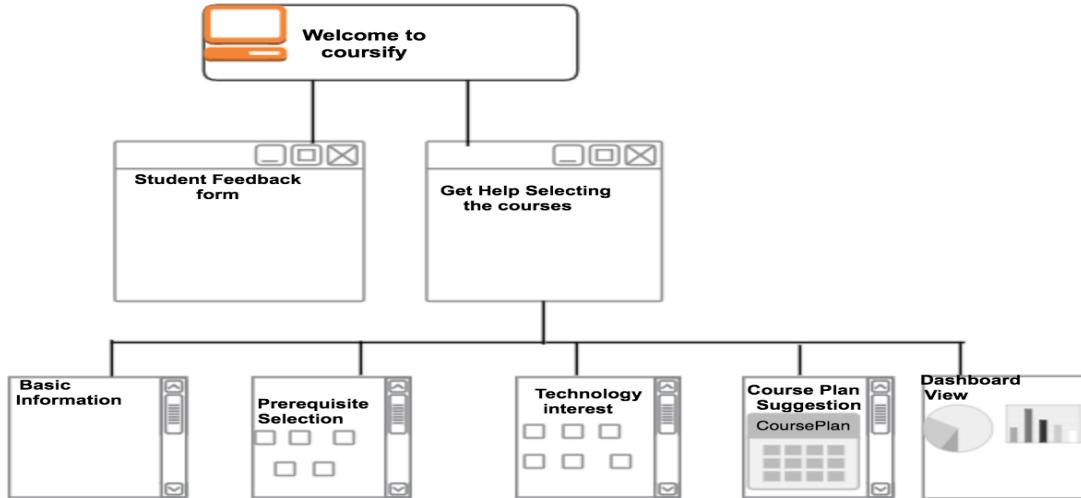


Fig: Infrastructure diagram with all the functional modules

4.4. Deployment Model

The project deployment includes all the mentioned technology usage at each level described below by a deployment model.

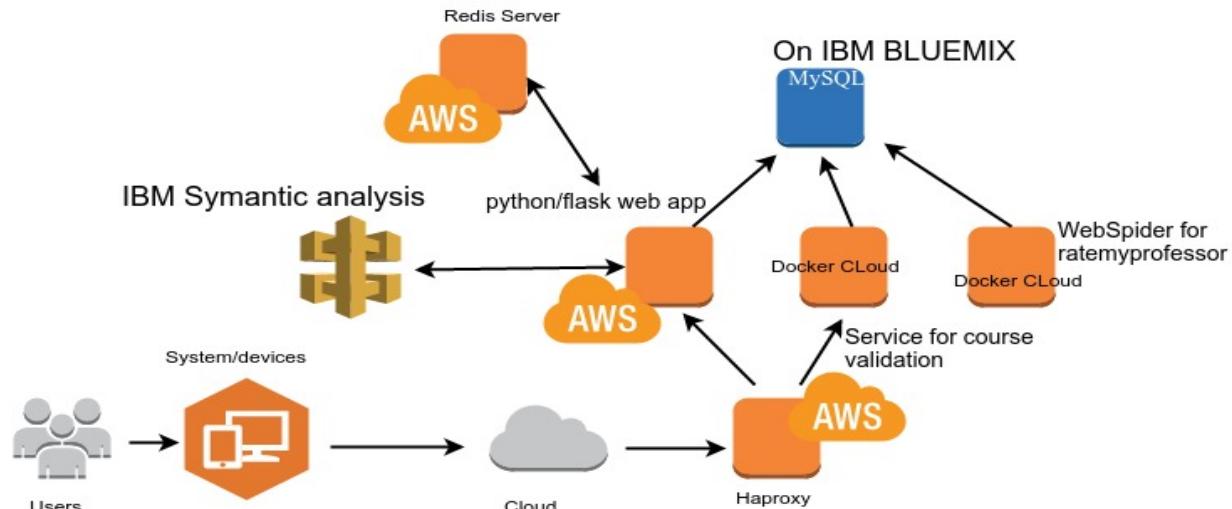


Fig: describes the technology deployment model

4.5. Use Case Diagram

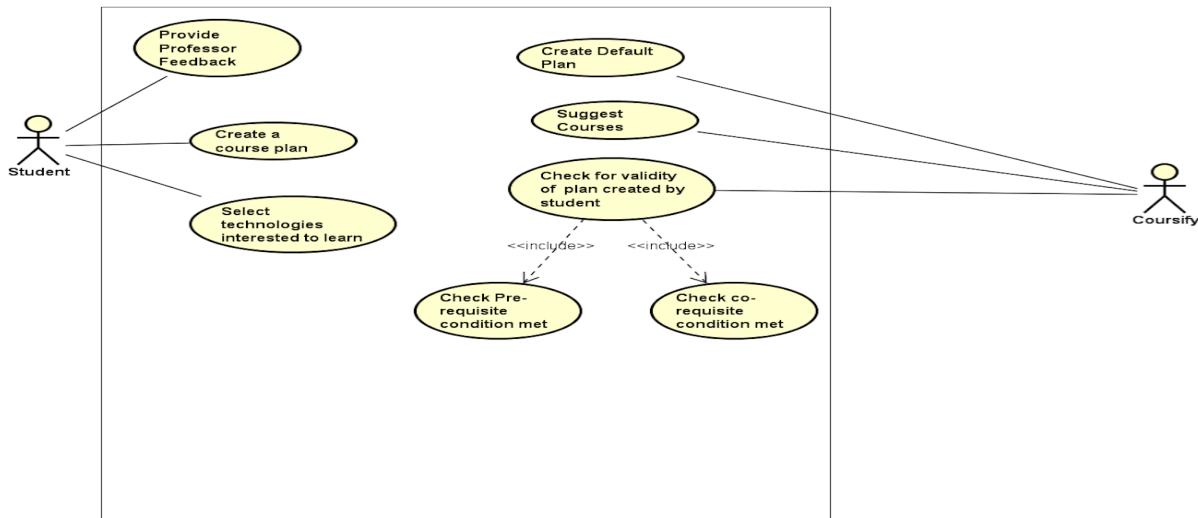


Fig: Use Case Diagram

4.6. Entity Relationship Diagram

Our system uses MYSQL relational Database system, the configuration with all the database tables and their relation model is given below

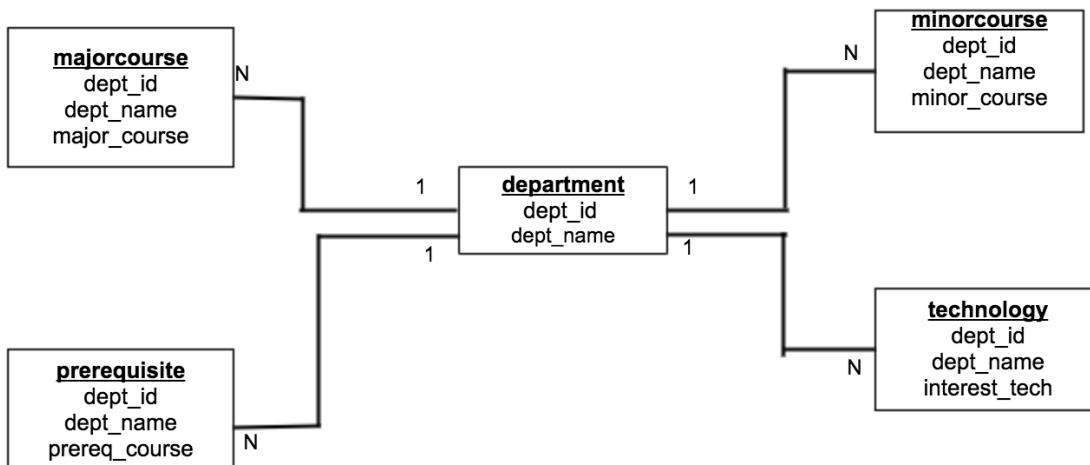


Fig: Entity Relationship Diagram for MYSQL database

5. Component Description of each Module

5.1. Activity Diagram for Users

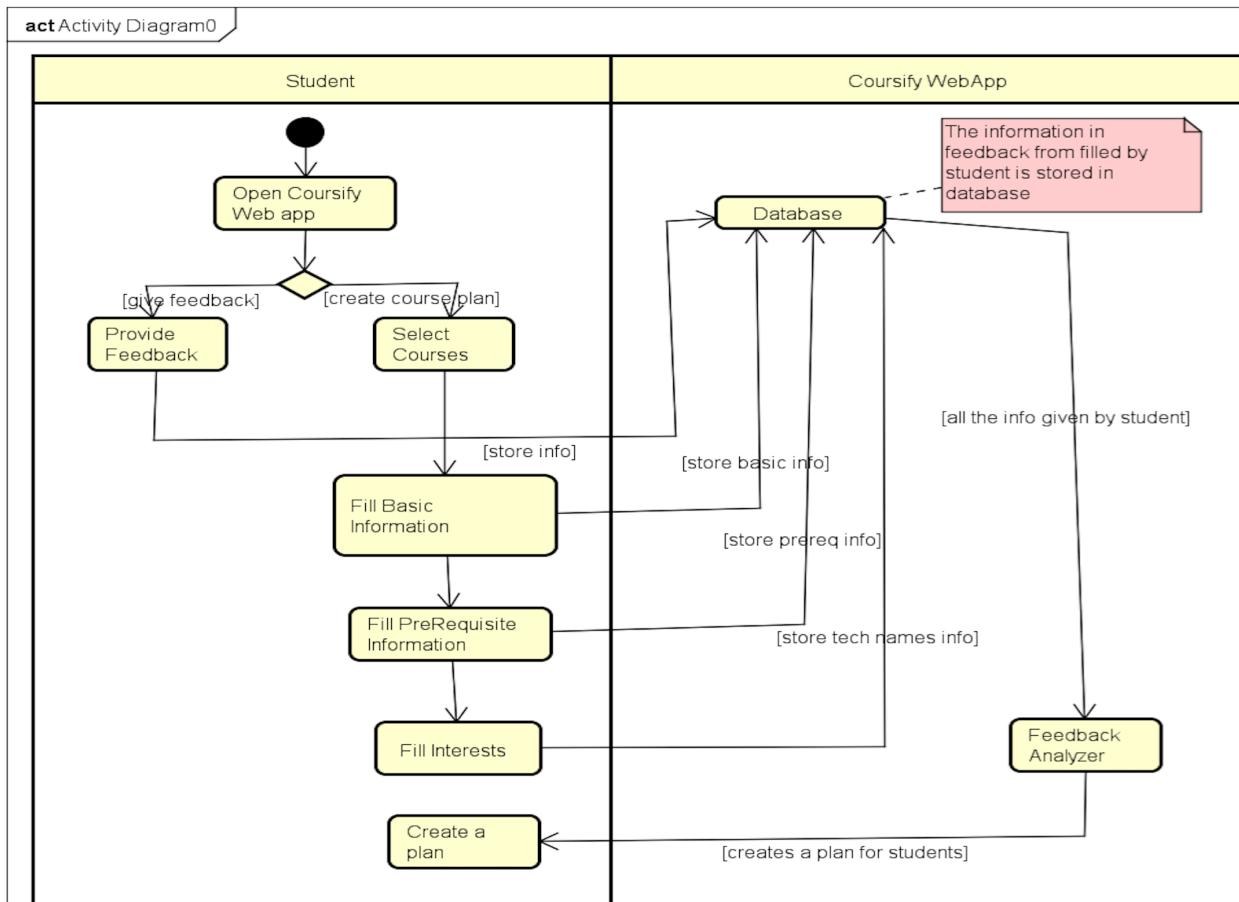


Fig: User activity Diagram

5.2. Landing Page Features and description

The landing page is the first page where the student lands upon opening the Coursify web app. The landing page:

- Describes the features that the Coursify offers, to let the students know what services can they avail using Coursify.
- Provides students with an option to provide feedback.
- Provides students with an option to get help in selecting courses.

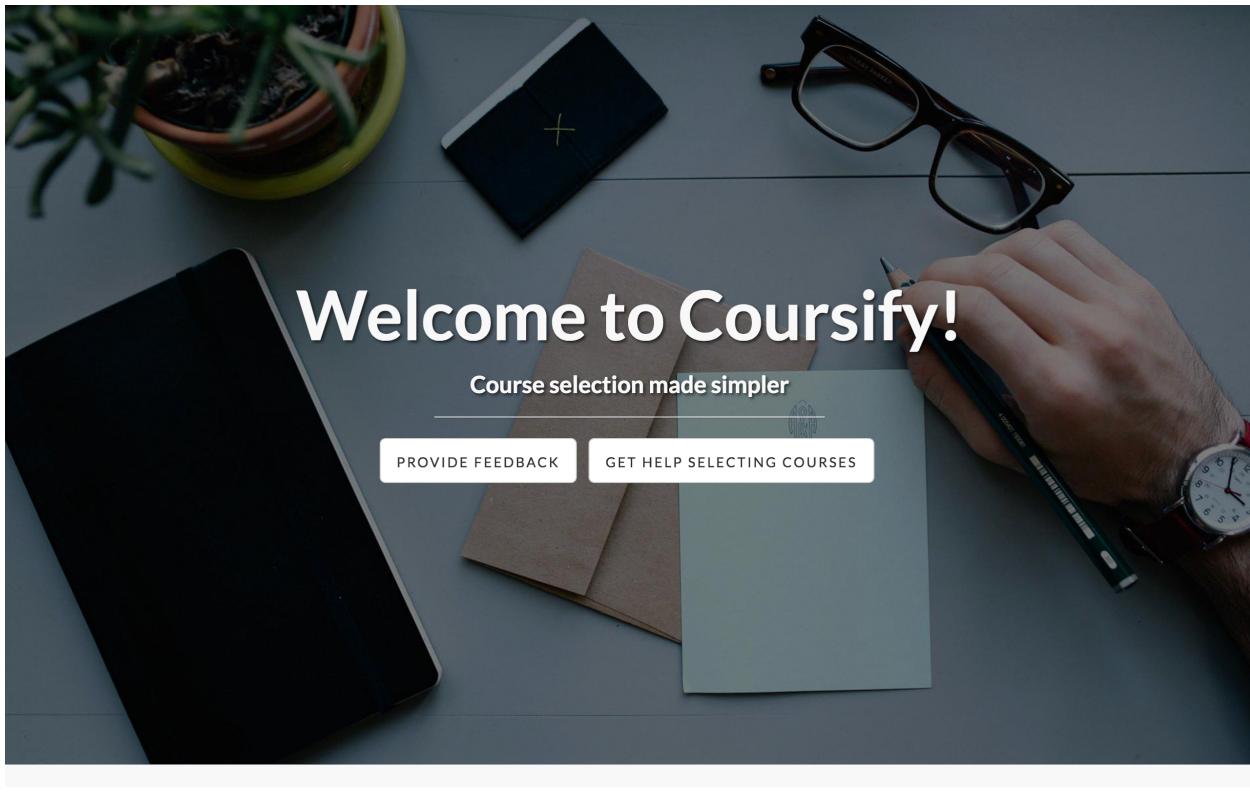


Fig: Image shows landing page of Coursify

5.3. Feedback form features and description

This form has been designed to take the feedback from students regarding a course. The input given in this form is further used for helping students in the course selection process.

Students need to fill in the following information:

- Course Name
- Textbook Used (Yes/No option)
- Course Review Message (A description that student wants to give about the course.)
- Course Level Difficulty (Low/Moderate/Heavy)

- Grade Received (To be chosen from the options in the drop down menu)

Your Feedback Matters!

Which course?

--Choose one--

Textbook Used?

--Choose one--

Course Review

Course Difficulty Level

Low Moderate Heavy

Select Grades Received

--Choose one--

SUBMIT

Fig: shows the image of Feedback Form of Coursify

5.4. Course Selection Module and description

The course selection module's functionality is to ask students for the required inputs, which will be further used to create a course plan for students.

This module consists of different forms for taking the inputs and generating the outputs as per them. We have designed five forms (sub-modules) which make up the whole course selection module. These forms are:

- Basic form
- Prerequisite Selection form
- Technology Selection form description
- Course Plan Suggestion module description

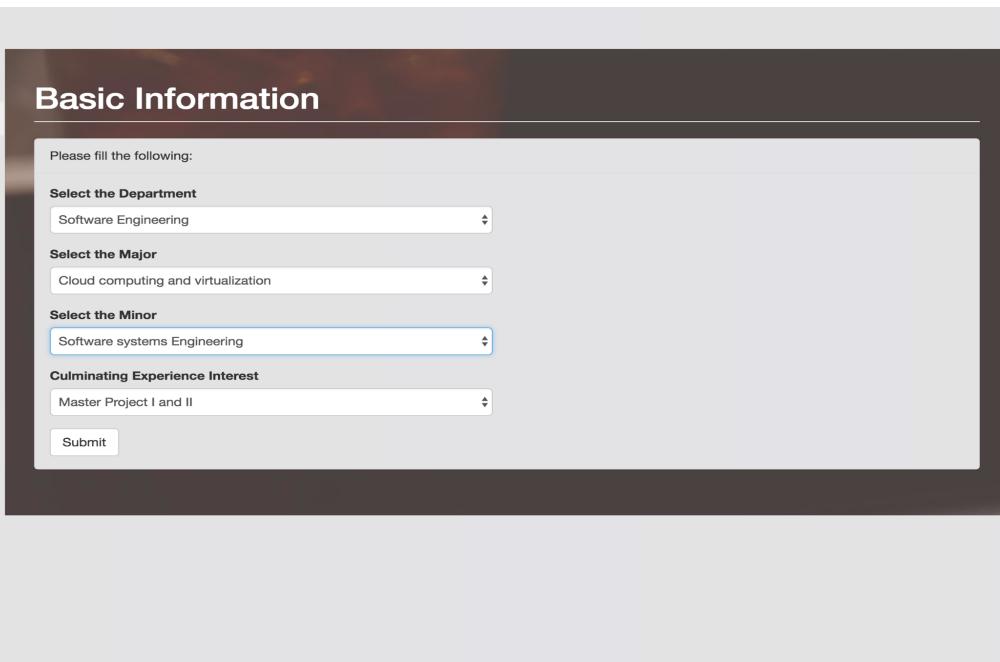
The information about these forms is furnished in the four sections that follow.

5.5. Basic form features and description

Basic form as the name suggests is used to gather the basic information from a student. It asks the students to furnish the following information

- Department
- Major Chosen
- Minor Chosen
- Culminating experience interest

The major and minor information that is entered by a student is used by Coursify to create a default suggested plan for student.



The screenshot shows the 'Basic Information' form on the Coursify platform. The left sidebar has links for 'Basic information', 'Prerequisite selection', 'Interests', 'Dashboards', and 'Plan'. The main area has a title 'Basic Information' and a sub-instruction 'Please fill the following:'. It contains four dropdown menus: 'Select the Department' (Software Engineering), 'Select the Major' (Cloud computing and virtualization), 'Select the Minor' (Software systems Engineering), and 'Culminating Experience Interest' (Master Project I and II). A 'Submit' button is at the bottom.

Fig: shows the image of course selection page of Coursify

5.6. Prerequisite Selection form description

Prerequisite Selection form, as the name suggests, asks students for the prerequisite courses if any assigned to them by the professor. The prerequisite

course options are listed in the form; the student has to only mark the checkbox for the courses assigned to them.

A screenshot of a web application interface titled "Coursify". On the left, there is a sidebar with a search bar and several navigation links: "Basic information", "Prerequisite selection" (which is currently selected and highlighted in blue), "Interests", "Dashboards", and "Plan". The main content area has a dark header with the title "Prerequisite Selection Form". Below the header, a sub-header says "Select all the pre-requisites courses assigned by the college". There is a list of three checkboxes: "Operating Systems" (checked), "Database Design" (checked), and "Object Oriented Programming and Data Structure" (unchecked). At the bottom of the form is a "Submit" button.

Fig: shows the image of Coursify prerequisite selection form

5.7. Technology Selection form description

Technology Selection form is used to gather input from students, regarding the technologies they are interested to learn. This form lists the technologies that have been taught by the professors in the previous semesters. The list here is created by gathering inputs from the other students as well as this team about what was learnt. The technologies selected by students in this form help Coursify create a course plan for them.

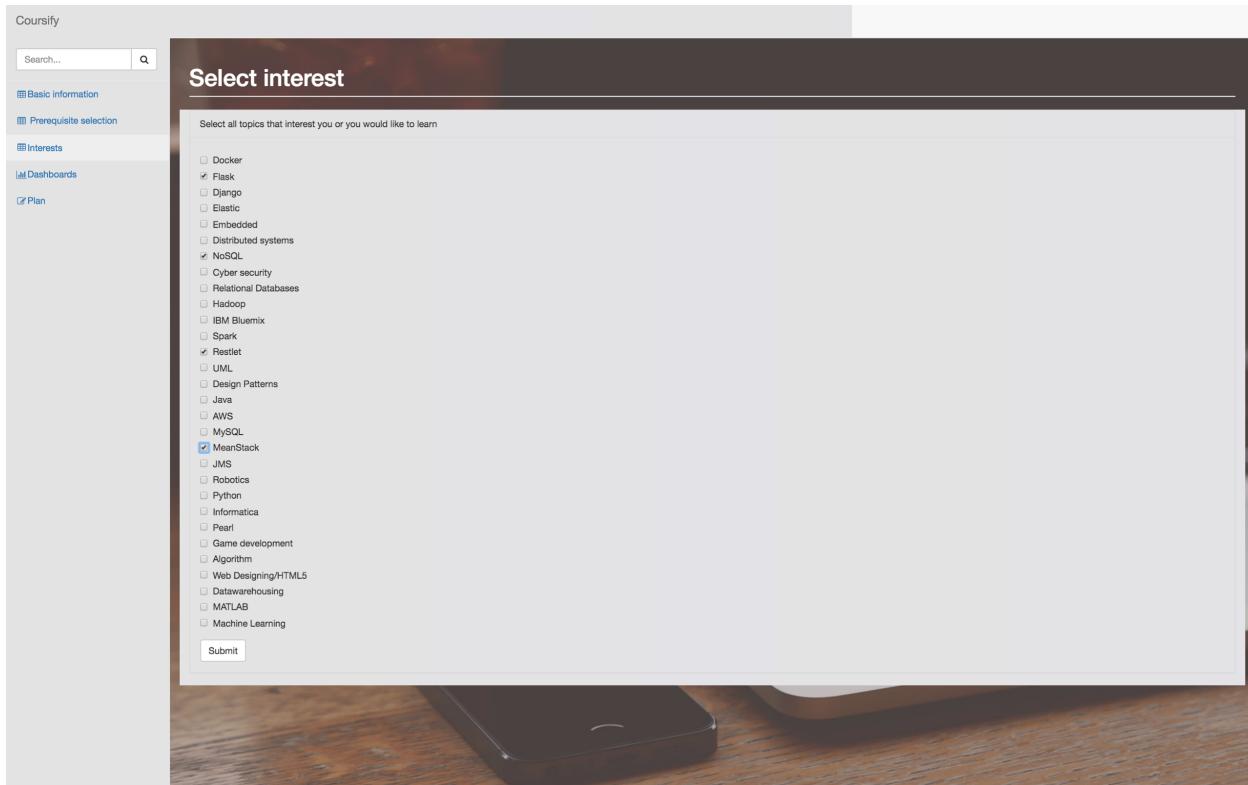


Fig: shows the image of Coursify prerequisite selection form

5.8. Course Plan Suggestion module description

This is the page where the student lands after giving inputs in the previous mentioned forms. Here, there will be four columns each representing four semesters. Each column will contain the suggested subjects (based on student's inputs) that the student can take in each semester. This page gives the student a drag and drop facility, where they can drag a course from one semester (column) to another. If the course dragging activity results in an invalidation like a prerequisite or co-requisite condition violation, the student is notified via a message. This message tells the student what exact violation is done by dragging this course. The main motive behind this page is to help the student understand

the conditions and checks involved in the course selection process. And making it simpler for them at the same time.

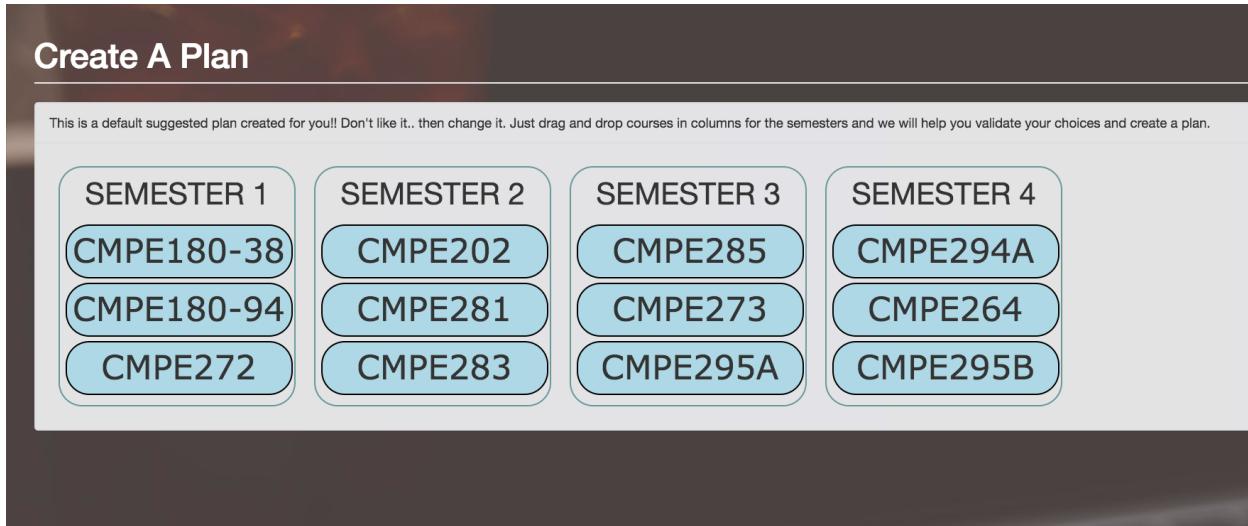


Fig: shows the plan suggestion of Coursify

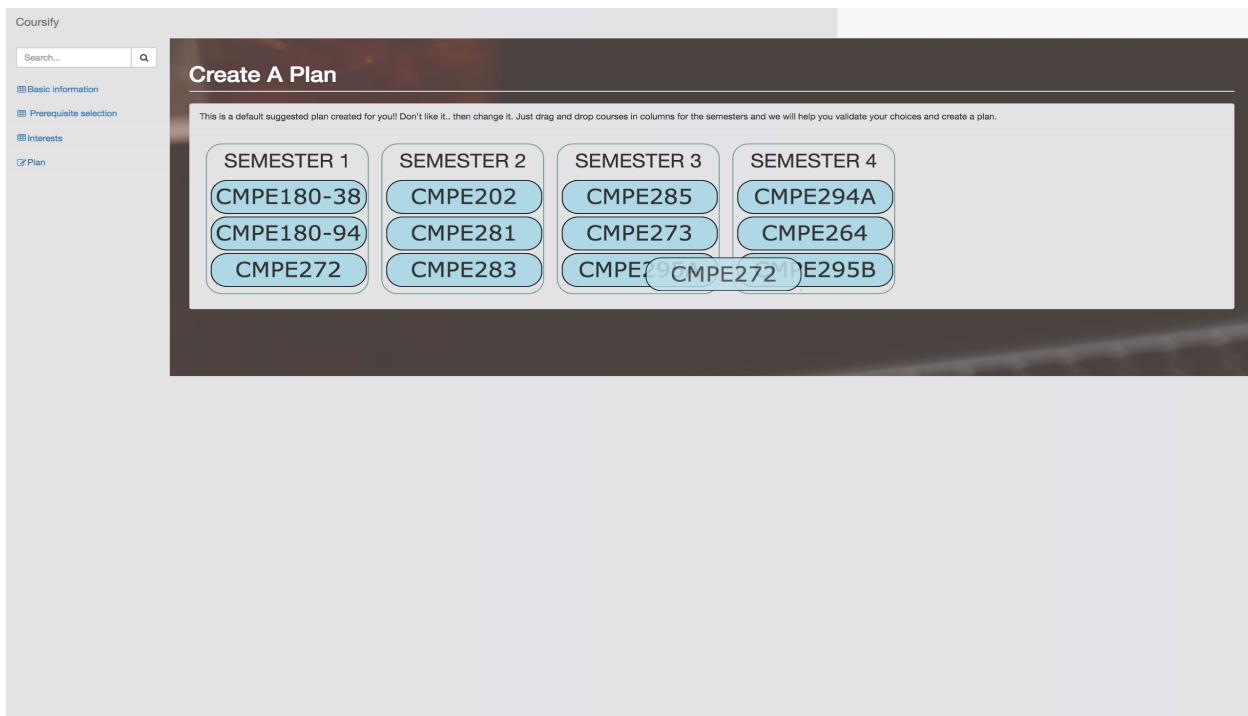


Fig: Shows the drag drop feature of plan suggestion in Coursify

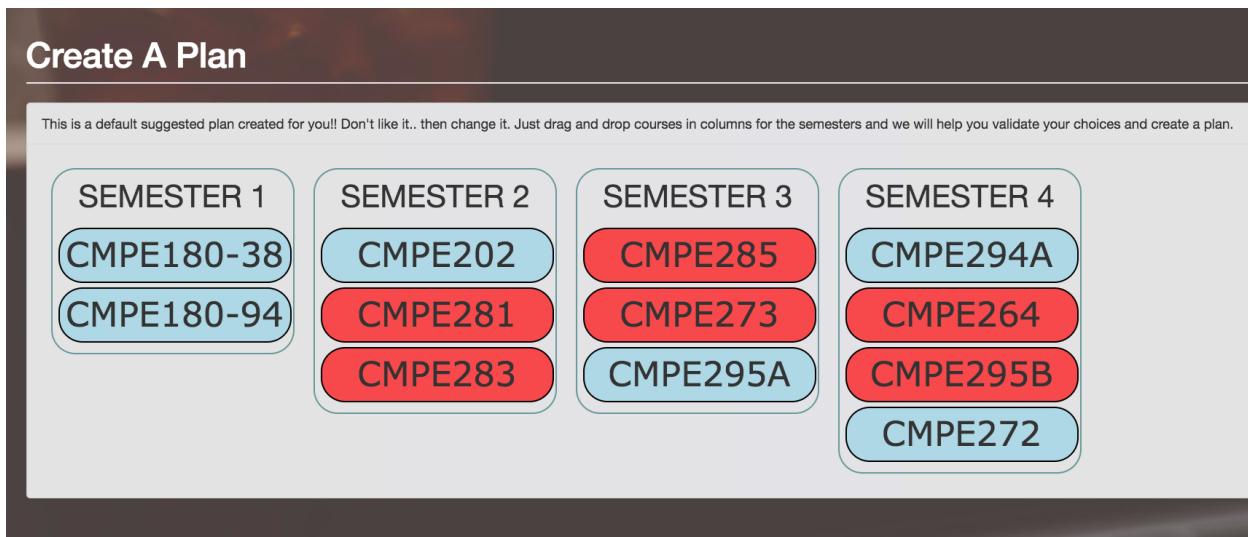


Fig: Shows the co-requisite and pre-requisite validation of plan suggestion in Coursify

6. Feedback Analyzer

At first, we started experimenting with the most common approach of using logistic classifiers. However, logistic classifier labelling of data seemed daunting and accuracy was also not satisfactory.

We then moved on to Python's NLTK library. This gave us better results as compared to the logistic classifier approach. But it struggled to handle associative pairing of words e.g. "not good".

Finally, we decided to use one of the most intelligent enterprise service out in market i.e. IBM Watson's AlchemyAPIs. It provides us REST APIs for the analysis. The result even contains probability as a quantifier. We were pleased with the results and have thus stopped hunting for better solutions.

7. Technology usage and selection

i. The application server for our system is created and using Flask module of python. The choice of this technology is totally based on its easy implementation and powerful features, it is very reliable and gets integrated with most of the database systems in a go. Flask is the best web framework so far. The logical part requirement for our project is well supported by all the inbuilt modules and libraries of python. Moreover, following features motivated us for using this technology.

1. Built in functions and fast debugger.
2. Plug in for any ORM is easy.
3. HTTP request handling functionalities.
4. The configuration is very flexible.
5. Strong documentation, Fast templates and Strong WSGI features.

ii. Web User interface using HTML/CSS and Bootstrap

For our user interaction, we needed the technology which could provide us everything a typical website would require. In our project user interaction is the main platform which should be convenient and user friendly with excellent look and feel. Among all the available CSS frameworks, we used Bootstrap for following reasons.

1. Its very easy to get started.
2. It includes base styling for most HTML elements
3. All the components required for a good user interface to work is provided by it.

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- 4. Good user documentation is available.
- iii. MySQL database for storing all the course, department and Professor related information.

We are using MYSQL database for storing all our relational database entities. Following are strong reasons which motivated us to use this database design for our project.

 - 1. For our web application, we needed extension which allows us to connect to MYSQL and, Flask has Flask-MYSQL which would allow our app to talk to MYSQL with ease.
 - 2. High performance, availability and robust transactional support system.
 - 3. Open source and very good documentation.
- iv. Redis database

We are using Redis database in our system as it is open source, in-memory dataset and with very fast transactional support, as our application service requires fast data retrieval, Redis is the system we could rely on. For Flask application, which has extension built in support for Redis and module such as redis-py provides the complete solution for our system.

- v. AWS RDS Instance

For the sake of Scalability and Security incentives, we are using AWS RDS service for our MySQL database system, it is very reliable and has multi level security tier which provides and supports the database model for our project. It is very good

service for backup and recovery options and persistent connection for all the users.

vi. Docker Hub

We are using this lightweight open source service for suitable environment support and easy workflow for our application. The fast and minimum run time motivates us to use this technology.

vii. IBM Bluemix/ AlchemyAPI

We are using the most intelligent natural language processing technology and machine learning algorithms to extract semantic meta-data from content, and using it to providing better information extraction.



Fig: shows the technology we are using for building Coursify

8. Conclusion

Coursify aims to make the course selection process less stressful for students by providing them all the required information at one place. Coursify is one stop that provides students information on courses, professors and course enrollment conditions. It is for the students to plan their degree in such a way that they could make the most of their semester by learning and focusing on what they want to learn. All the other analysis and suggestion is done by Coursify, all they need is to select their requirements and fill up the feedback form for more analysis and suitable results.

9. References

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2. <https://hub.docker.com/>
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5. <http://wwwalchemyapi.com/>