CS 411 Lab 1

Monarch Course Explorer Product Description

Kelsey Marantan

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Version 1

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1 Introduction

Choosing classes can be challenging for students due to limited information available about the structure and expectations of their desired courses. This is particularly disadvantageous for students with inflexible schedules or those balancing a part-time job, considering that a substantial majority of college students (81%) hold part-time jobs (Wan, 2022). In addition, most syllabi are not released until after the semester has started, leaving students uncertain if the class is compatible with their schedule. Figure 1 illustrates the current process flow of choosing classes with this limited information. Improving communication between faculty and students regarding how classes are taught is essential, as it provides effective feedback for faculty and better prepares students for their courses. Old Dominion University currently lacks a tool to facilitate such communication.

To address this issue, the university should provide a website with comprehensive course information, including a central repository of syllabi for students to access before the course begins. This site would also allow students with a verified school email to provide anonymous feedback about courses, improving communication about courses between students and faculty. Moreover, it can assist advisors to provide a more personalized advising experience, especially for courses they are unfamiliar with, and assist ODU's curriculum review committee in reviewing syllabi.

A possible solution to this problem is Monarch Course Explorer, a moderated platform where students can access syllabi for all courses at ODU and provide anonymous feedback about courses. This platform would integrate automatic comparisons between semesters and professors,

providing valuable insights for students to choose courses that align with their individual learning styles. By implementing this tool, Old Dominion University would improve communication between faculty and students, resulting in a more personalized and effective learning experience.

Current Process Flow

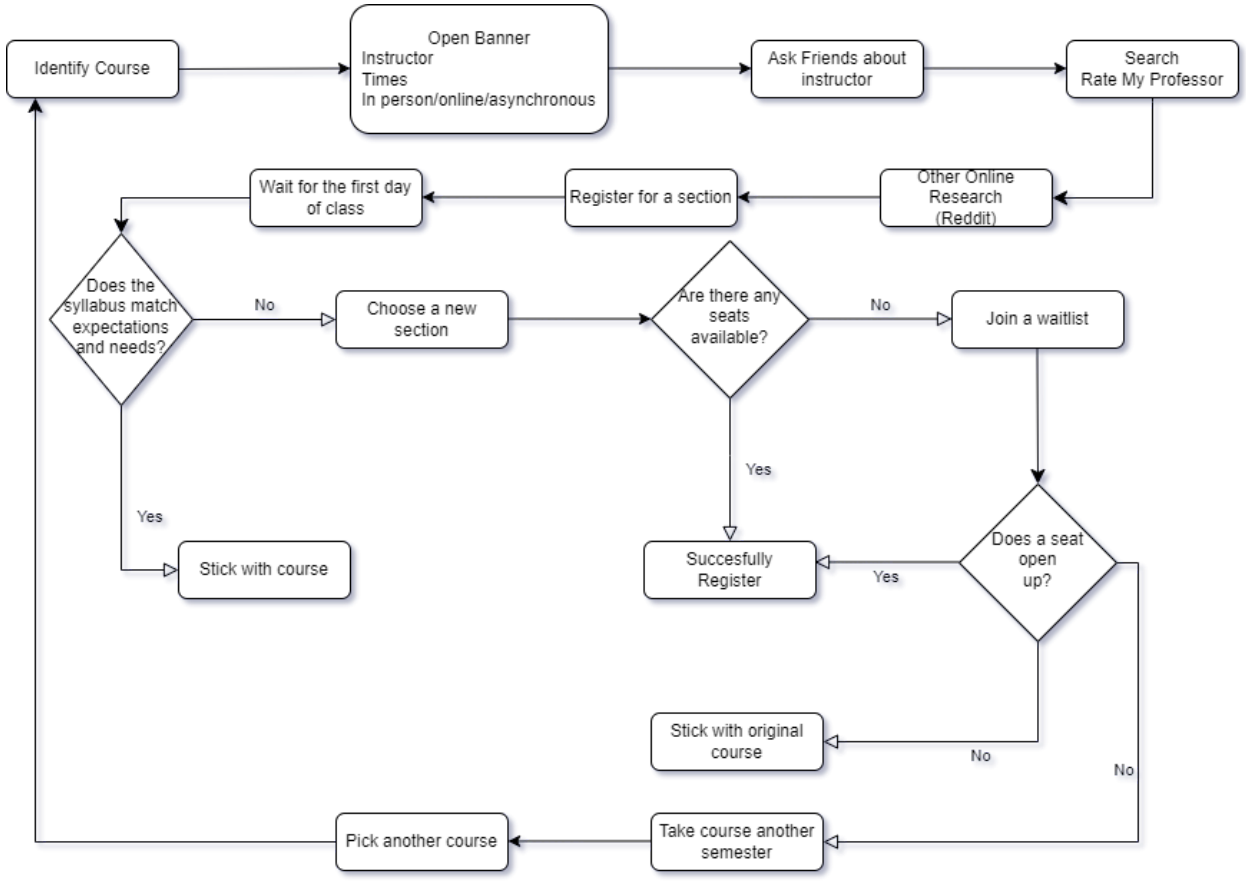

Figure 1 Current Process Flow

2. Monarch Course Explorer Product Description

2.1 Solution

Monarch Course Explorer is a website-based platform that is intended to be used for students and faculty. It streamlines the process of sharing course feedback and grants access to course syllabi, all while ensuring automatic comparisons and filtering. The goal of this website is to be the go-to resource for comprehensive course information, benefiting both students and faculty.

2.2 Solution Characteristics

Monarch Course Explorer has several key characteristics. First, it will establish a central repository of course syllabi, granting students access to syllabi of all courses offered at Old Dominion University. In addition, students can provide constructive and anonymous feedback on courses they have previously taken, which can be conveniently sorted by semester and faculty. Furthermore, this platform will allow faculty to engage with student feedback, allowing them to view, comment, and make necessary changes to their courses in response to student feedback. This provides faculty with timely insights into their courses, fostering continuous improvement. Finally, Monarch Course explorer will serve as a valuable tool for the curriculum review committee, assisting in the evaluation of course syllabi.

Proposed Solution Flow

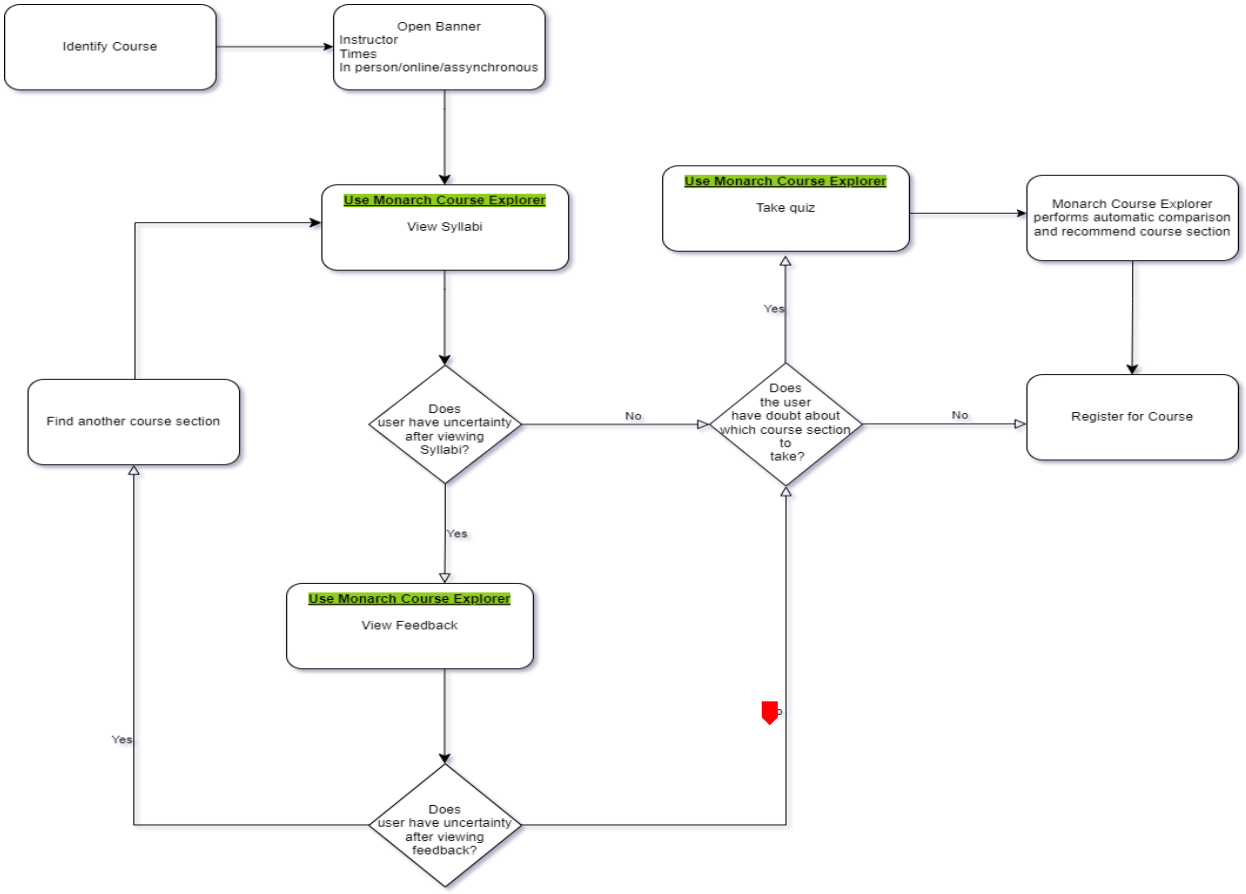

Figure 2 Proposed Solution Flow

2.3 Key Product Features and Capabilities

The product will offer essential features designed to enhance the resources available for students and faculty.

2.3.1 Core product features

To begin with, it will provide convenient access to course syllabi, and the ability to compare them. Additionally, the platform will verify ODU students and enable them to provide feedback on courses. This provides students with more information about courses to fit their learning style and schedule. In addition, this product will ensure timely feedback for professors, assist the review committee with evaluating syllabi, and equip advisors with a versatile tool to

create a more personalized advising experience. Figure 2 illustrates the flow for students using Monarch Course Explorer, showcasing the various paths students can take to sign up for courses.

2.3.2 What is unique

This platform will offer unique features that sets it apart from other educational competitors. First, it will enhance existing course information, providing students with a more comprehensive understanding of each course. Second, it will automate comparisons between semesters or faculty, simplifying access to specific criteria. A verified ODU email will ensure the security of user accounts, while also ensuring the authenticity of feedback. Moreover, the platform will give customized recommendations tailored to individual student needs, using insights gained from a student's quiz, as shown in Figure 2.

2.4 Major Components (Hardware/Software)

On the front end, users can view and compare syllabi, as well as view feedback without having to sign up. But other features such as providing feedback, reporting feedback, and uploading syllabi will require users to sign in with a verified ODU email. Specifically, syllabi upload functionality is reserved for faculty members. On the backend, syllabi will be scraped, normalized, analyzed, and stored in a database. Users will be authenticated with their MIDAS information, but the prototype will have the authentication stimulated. Figure 3 describes the interaction between the frontend and backend.

Major Functional Component Diagram

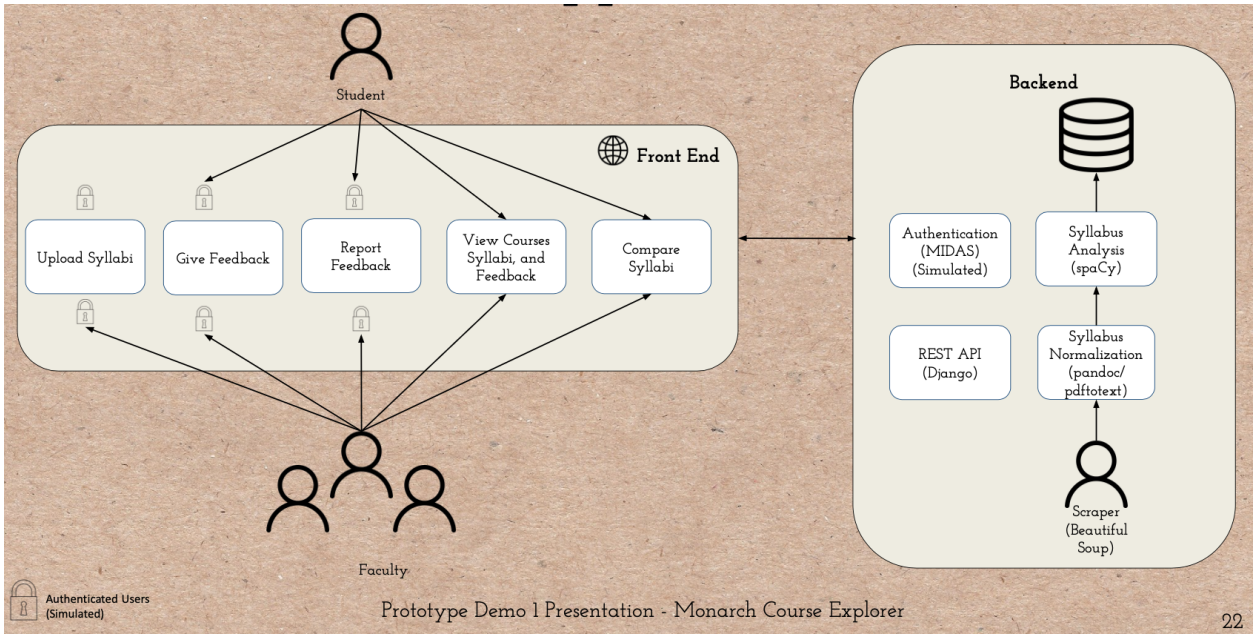

Figure 3 Major Functional Component Diagram

Monarch Course Explorer will be developed as a website. HTML will serve as the user display, defining the meaning and structure of the content. CSS will be responsible for formatting and design of the website. Javascript comes into play for user interaction and ensuring the website is responsive.

Moreover, Monarch Course Explorer will be coded in Python, with the Beautiful Soup Library employed for web scraping of syllabi. NLP will be used for transforming syllabi and for processing feedback. Django REST API will be used to further enhance the functionality.

For data management, Monarch Course Explorer will use PostGresSQL. There will be three databases: syllabi, feedback, and user information.

Furthermore, there will be authentication added to further enhance the security and functionality. MIDAS will be used, as it is Old Dominion University's authentication system, but it will be simulated in the prototype.

3. Identification of Case Study

This product is being developed for Old Dominion University. Old Dominion University has a diverse student population, including many non-traditional students and online distance learning students. For instance, the amount of computer science students who are ages 25 to 34 is nearly equal to those who are the traditional 18 to 21, which may account for the graduation rate to be about 5 years (ODU Factbook). This highlights the significance of tailoring academic support tools to accommodate the diverse needs and circumstances of students.

Therefore, this product highly benefits Old Dominion University students. It addresses the needs of a diverse student population, who may need more tools when selecting courses. Other universities may adopt a product like this in the future, as it serves as a useful tool for students and faculty.

4. Monarch Course Explorer Product Prototype Description

The prototype of Monarch Course Explorer will not have every intended feature of the real world product. However, it will implement key features needed to effectively showcase its ability to provide a solution to the aforementioned problem.

Table of features and functionality, including comparisons between RWP and Prototype

4.1. Prototype Architecture (Hardware/Software)

The necessary hardware for developing the prototype is a computer with internet access. This lets the developers have access to the tools and collaborative environment necessary to create the prototype.

On the software side, the website will be developed using HTML, CSS, and Javascript. HTML will be utilized for User Display, structuring the website's content in a way that ensures accessibility and user-friendliness. CSS is used for formatting and design, ensuring a consistent layout and visually appealing design. Javascript enhances user interaction by adding dynamic elements on the website.

Python will also play a key role in the development process. The Beautiful Soup library will be used for web scraping tasks, SpaCy for NLP transformation of syllabi, and Django for Rest API Implementation. PostGreSQL will be used for the database management system due to its relational capabilities, allowing seamless integration and optimal management of our database. VSCode and Github will be used for collaborative development and software version control.

4.2. Prototype Features and Capabilities

A vast majority of the proposed features will be implemented for the Monarch Course Explorer Prototype, but there will be some features that will be partially implemented. The list of features that will be implemented can be seen in Tables 1-4.

Table 1 Syllabi Features Functionality

Features	Student	Faculty: Professor	Faculty: Advisor	Faculty: Curriculum Committee Member	Real World Product	Prototype
Upload Syllabi		✓		✓	✓	✓
Scrape Syllabi		✓		✓	✓	✓
View Syllabi	✓	✓	✓	✓	✓	✓
Side-By-Side View	✓	✓	✓	✓	✓	✓
Analyze Syllabi in Different Formats					✓	Partial

Table 2 Syllabi Features & Functionality

Features	Student	Faculty: Professor	Faculty: Advisors	Faculty: Curriculum Committee Member	Real World Product	Prototype
Verify Inclusion of Required Sections				✓	✓	✓
View Report of Missing Sections				✓	✓	✓
Fitler by Sections	✓		✓	✓	✓	✓
Compare sections	✓		✓	✓	✓	✓

Table 3 Feedback Features & Functionality

Features	Student	Faculty: Professor	Faculty: Advisor	Faculty: Curriculum Committee Member	Real World Product	Prototype
View Feedback	✓	✓	✓		✓	✓
Rate Feedback	✓	✓			✓	✓
Provide Feedback	✓	✓			✓	✓
Filter Feedback by Semester	✓	✓	✓		✓	✓

Table 4 Other: Features & Functionality

Features	Student	Faculty: Professor	Faculty: Advisor	Faculty: Curriculum Committee Member	Real World Product	Prototype
Authentication	✓	✓	✓	✓	✓	Partial
Take Quiz	✓				✓	✓
View Course Recommendation	✓				✓	✓

The first main feature of the prototype is the ability to analyze and extract information from syllabi. These syllabi will be scraped from professors' websites. If a syllabus for a course is not accessible for scrapping, then the professor will have the option to manually upload a

syllabus. There will be a partial implementation of analysis of syllabi in different formats, such as PDF. This will aid the curriculum review committee with evaluating course syllabi, as the prototype will recognize what sections are missing from a syllabus. Figure 4 shows a visual representation of the syllabus upload and analysis flow.

The prototype will be designed to ensure that users can readily locate and retrieve syllabi for all courses. Users will have access to the original syllabi and the normalized syllabi to ensure a complete understanding of the course requirements without missing any information. The prototype will allow users to filter the syllabi by sections, allowing them to quickly find specific information. This feature automatically compares these sections across different syllabi, helping users in selecting the course that best fits their needs.

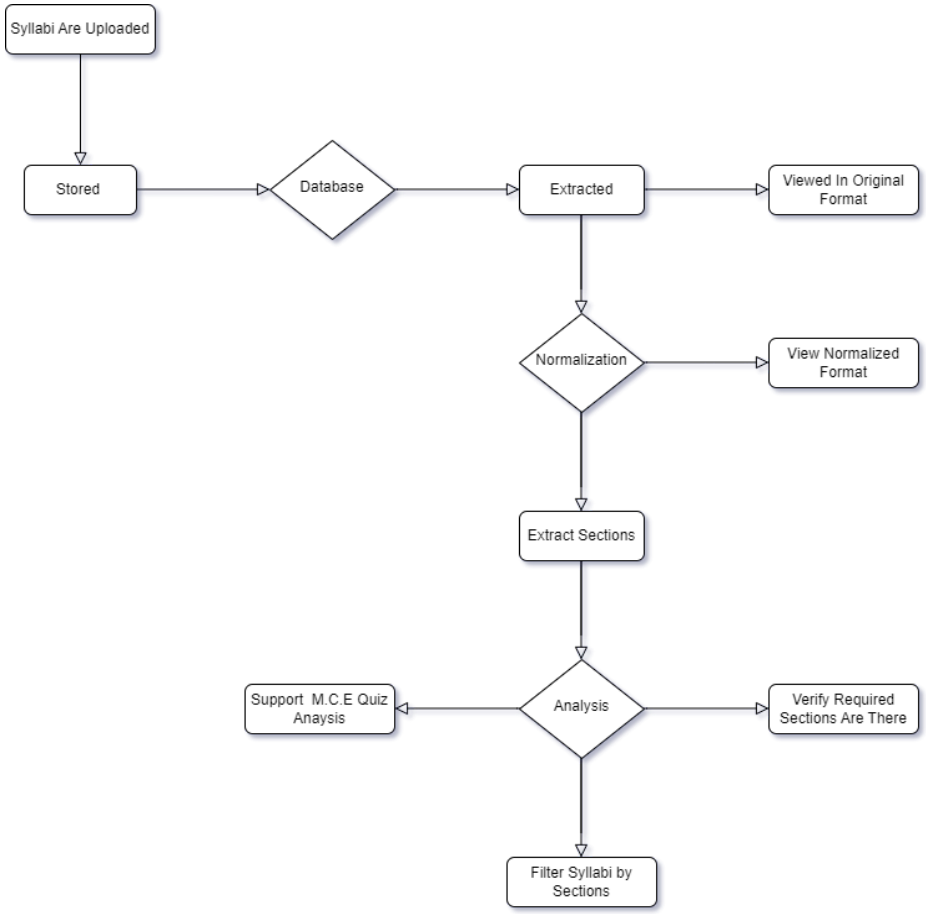

Figure 4 Syllabus Algorithm Flow Chart

Another key feature of Monarch Course Explorer involves student feedback on courses. Students can share insights and suggestions regarding their course experiences, contributing to potential course improvements.

Students can view and filter feedback provided by other students, giving them a clear understanding of what to expect before registering for a course. Professors also have access to this feedback, allowing them to understand the course's strengths and areas of improvement. They can rate and respond to the feedback, thus facilitating communication from both ends.

Advisors can use the feedback as a valuable tool to assist students in choosing courses, especially those that advisors may be unfamiliar with. By viewing and filtering feedback, advisors can provide more personalized and informed recommendations to students, ultimately enhancing communication and the course selection process.

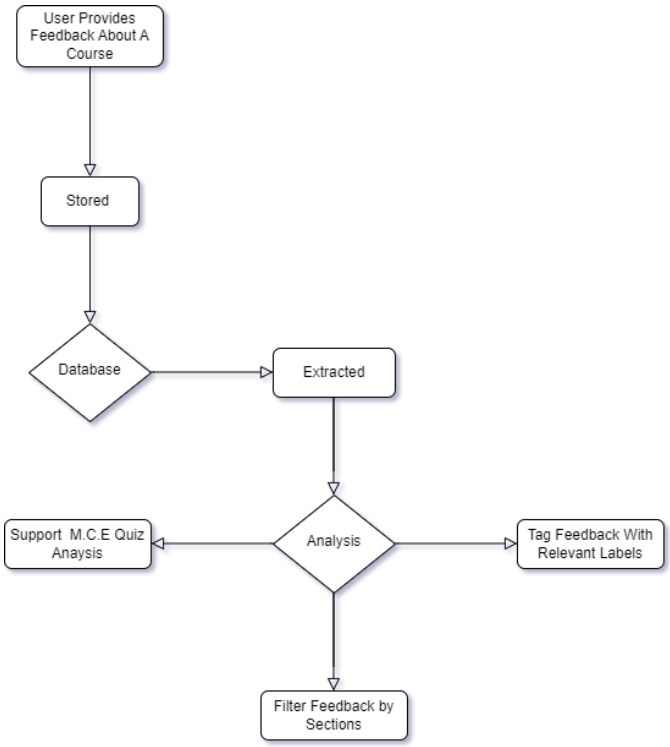

Figure 5 Feedback Algorithm Flow Chart

As referenced in Section 4.2, one of Monarch Course Explorer's underlying goals is to assist students in finding courses that fit their learning style and personal schedule. This is achieved through providing access to syllabi and feedback, offering more information beyond what is already available. A unique feature about Monarch Course Explorer is its capacity to give students a course recommendation through an MCE quiz. Figure 6 gives a visual representation of the MCE quiz. In this quiz, students respond to specific questions, and Monarch Course Explorer extracts and analyzes their answers, subsequently tailoring its recommendations. This feature is particularly valuable for students who may still be uncertain about their course selection even after reviewing the available syllabi and feedback.

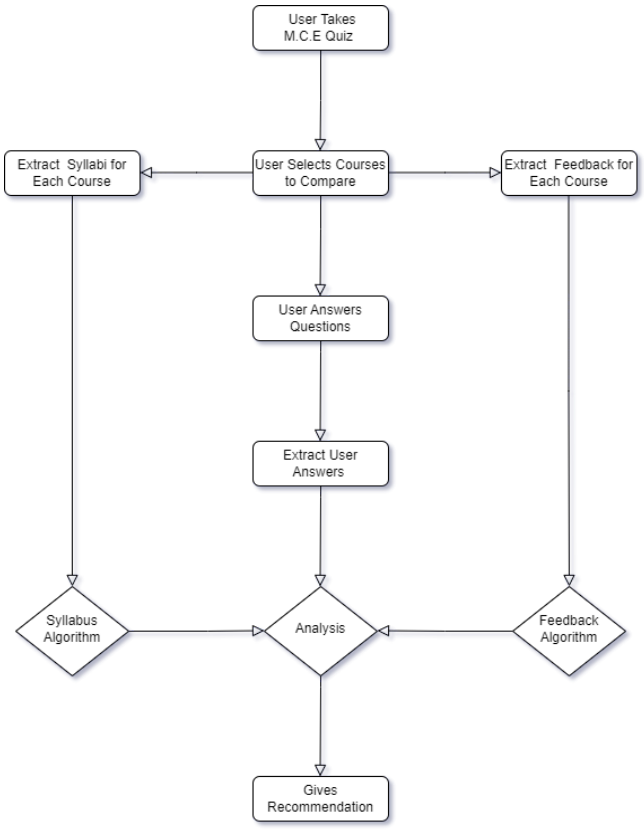

Figure 6 Recommendation Algorithm Flow Chart

4.2.4 Authentication

Authentication is another important feature for Monarch Course Explorer, as it ensures that the users providing feedback are verified students of Old Dominion University. This process is facilitated through Old Dominion University's specialized system, known as MIDAS. However, in the prototype, authentication will be stimulated.

4.3. Prototype Development Challenges

4.3.1 Accuracy of NLP

One challenge that developers will face involves guaranteeing the accuracy of NLP algorithms. NLP plays a key role in the analysis of the syllabi and feedback. However, there can be minor inaccuracies in NLP, impacting the syllabi and feedback analysis. It is important for the developers to employ strategies to enhance the accuracy, but it is also important for the users to take the initiative to manually review the feedback.

4.3.2 Data collection

Data collection is another challenge of developing Monarch Course Explorer due to the extensive amount of data involved. Syllabi that are not already available online will have to be manually uploaded. Moreover, motivating students to provide feedback for their courses is another challenge. To mitigate this, there will have to be active communication regarding the platform’s existence and the significance of participation.

4.3.3 Normalization

Normalizing syllabi to maintain a standardized format is another challenge. Normalization may cause some important information to be left out. While normalization is

essential for the analysis of syllabi, the original syllabus will always be accessible to users. Students will be encouraged to refer to the original syllabus, which is always the most reliable source of information. This shows a balance between ensuring consistency between the syllabi analysis and preserving the information provided by the original syllabus.

4.4 Real World Product Risks

4.4.1 Customer Risks

Monarch Course Explorer heavily relies on obtaining data. This reliance involves faculty to upload syllabi that are not already accessible online. To mitigate this, developers should coordinate with Old Dominion University to facilitate the timely release of current syllabi by faculty. Obtaining feedback for courses that are not accessible online also relies on effective platform promotion from Old Dominion University, utilizing methods like mailer advertisements. A risk associated with the acquired data is an abuse of the platform, such as inappropriate or inaccurate feedback. This can be mitigated through a mix of human and automated moderation.

4.4.2 Technical Risks

From a technical perspective, there are inherent risks associated with developing Monarch Course Explorer. Producing a scraper for each website requires a lot of time and effort, prompting developers to prioritize high value websites, such as the school's website to optimize efficiency. Automatic moderation carries a risk of hiding good feedback, but adhering to best industry practices can protect against tactics such as review planning. Technical issues during normalization may cause some information to be left out of the syllabi or misinterpreted.

However, users will always have access to the original syllabus, accompanied by a disclaimer encouraging users to check the original syllabus.

4.4.3 Security Risks

A notable security risk is that breaching our database would reveal which students offered what feedback, thus compromising anonymity. Mitigating this entails following industry best practices, such as multi-factor authentication and parameterized queries.

4.4.4 Legal Risks

A possible legal risk is receiving cease and desist notifications from scraped websites. Therefore, it is important to review respective terms of service before scraping any website, and diligently honor any compliance requests.

5. Glossary

Beautiful Soup: A Python library for parsing structured data.

Django: A free and open-source, Python-based web framework that follows the model–template–views architectural pattern.

HTML: Hypertext Markup Language, standard markup language for documents designed to be displayed in a web browser.

MIDAS: Monarch Identification and Authorization System, Old Dominion University's log-in and password management system.

NLP: A subfield of computer science and artificial intelligence (AI) that focuses on the interaction between computers and humans in natural language.

PostgreSQL: A free and open-source relational database management system emphasizing extensibility and SQL compliance.

RWP: Real World Product that will be developed and used.

spaCy: An open-source software library for advanced natural language processing, written in the programming languages Python and Cython.

6. References

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