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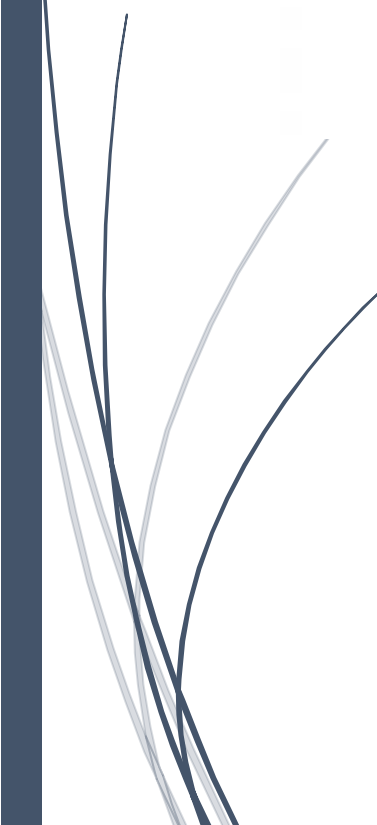
Diversity in Computing Final Report



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an Oirdheiscirt

South East
Technological
University

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Academic year: 2023/2024

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1. Introduction

This is the final report for the Diversity in Computing web application. In today's fast-paced world, technology plays a central role in shaping our lives. From smartphones to social media, computing has become an integral part of how we connect, learn, and work. Yet, if you take a closer look at the people driving these innovations, you'll notice something striking: a lack of diversity.

When we talk about diversity in computing, we're not just referring to different backgrounds or identities. We're talking about the richness of perspectives and experiences that come from having a truly inclusive community. Unfortunately, the reality is that certain groups, especially women and minorities, are significantly underrepresented in computing programs.

But why does this matter? Well, beyond just being a matter of fairness, diversity in computing is crucial for driving innovation and solving complex problems. When we bring together people with different backgrounds and viewpoints, we unlock new ideas and approaches that can lead to better solutions for everyone.

That's where this project comes in. I am not just here to talk about the problem; I am here to do something about it. Inspired by recent research suggesting a link between the language used in course descriptions and student demographics, I am starting on a journey to uncover the hidden biases that may be shaping who chooses to study computing.

Using cutting-edge technology like natural language processing and OpenAI API, I am diving deep into the world of course descriptions. My goal? To understand how the language we use to describe computing programs might influence who decides to enroll. By shining a light on these subtle yet powerful dynamics, I hope to spark conversations and drive change in how we attract and welcome students into the world of computing.

This project isn't just about numbers or algorithms; it's about people. It's about creating a future where everyone, regardless of their background, feels empowered to pursue their passion for technology. So, join me as I start on this journey to build a more diverse and inclusive computing community, one word at a time.

2. Project Description

The Diversity in Computing web application aims to address the issue of underrepresentation in computing programs by analyzing the language used in course descriptions. Inspired by recent research linking course description language to student demographics, the project delves into uncovering hidden biases that may influence enrollment decisions. By using natural language processing (NLP) techniques and tools like NLTK and OpenAI's GPT-3.5 Turbo, the application examines textual data extracted from various sources, including third-level institutional websites. Through a robust architecture that includes PostgreSQL for database management, Flask for web development, Scrapy for web scraping, and HTML/CSS/JavaScript for frontend development, the project aims to provide insights into diversity in computing education. Users interact with the application through a user-friendly interface, where they can select or enter course descriptions for analysis. The analysis results offer recommendations for modifying descriptions to promote diversity and inclusivity, fostering a more inclusive computing community.

Some screenshots to get a feel of what the web applications is about:

1. Select or enter Course Description Interface

This screenshot shows the area where users can select or enter a course description for analysis. The interface includes dropdown menus for selecting the institution, level, and course title, as well as a text area for manual entry of descriptions. Users can easily navigate through the options and input their desired course description for analysis.

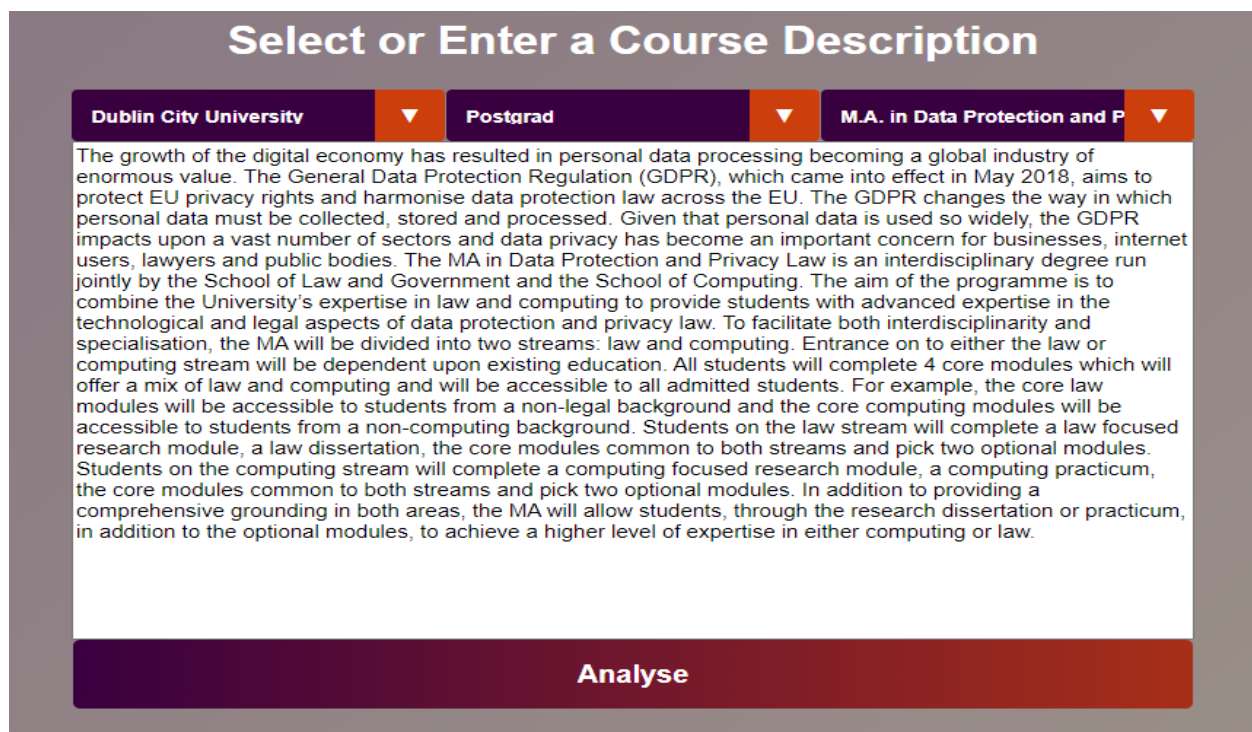


Figure 1. Select or Enter Course Description

2. Analysis Result Display Interface

In this screenshot, users are presented with the analysis results of the selected or entered course description. The NLP process aims to categorize descriptions based on their predominant themes, distinguishing between 'educational,' 'social,' and 'technological' aspects. The interface displays insights into the linguistic characteristics of the description, along with recommendations for modifications to enhance diversity-related language patterns. Users can view both the original and modified descriptions, facilitating a better understanding of the analysis outcomes.

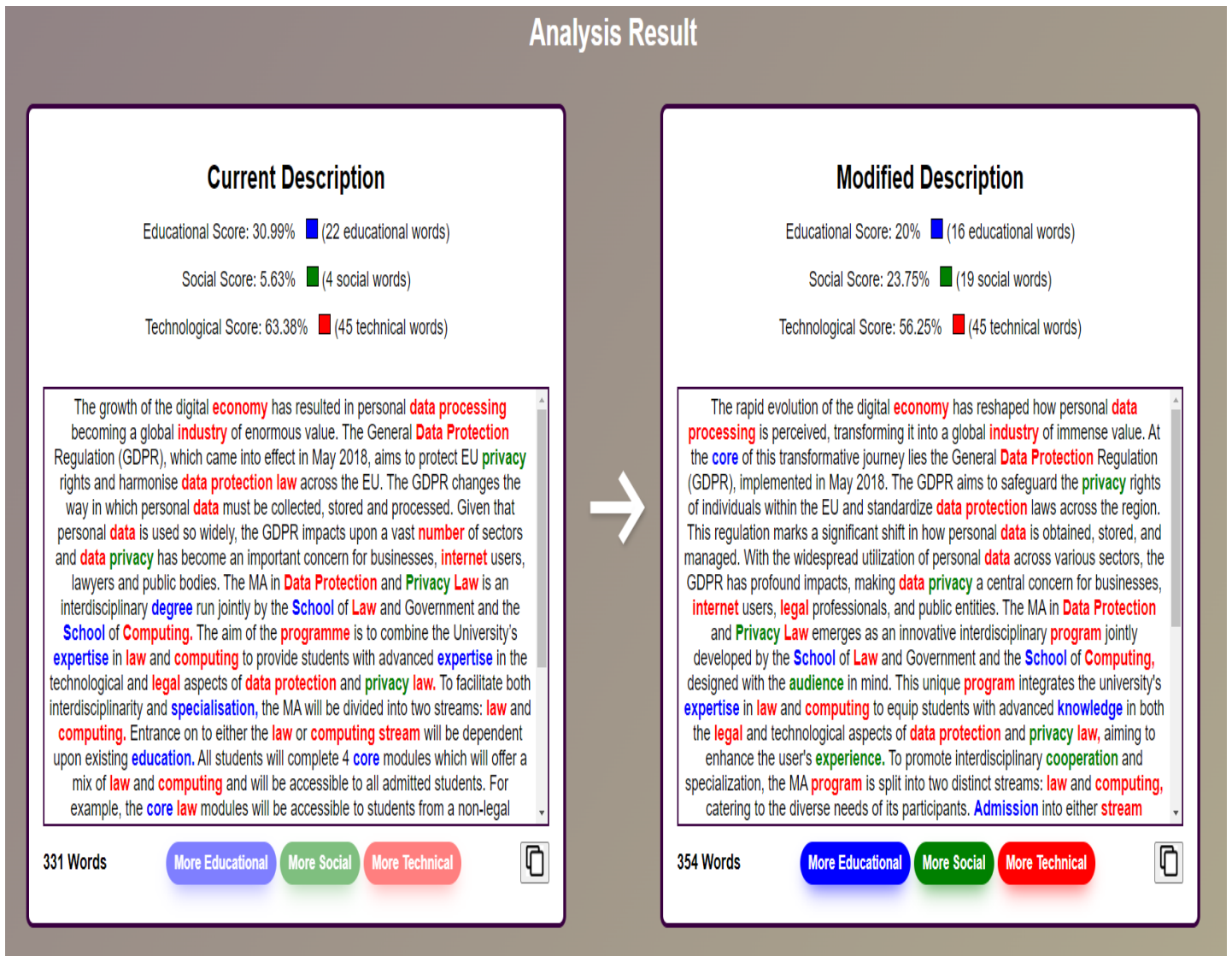


Figure 2. Analysis Result Page

3. Application Flow Chart

The application flow chart provides a structured representation of the user interactions and system functionalities within the application. Each step in the chart corresponds to a specific use case or system function, outlining the logical progression of actions within the application:

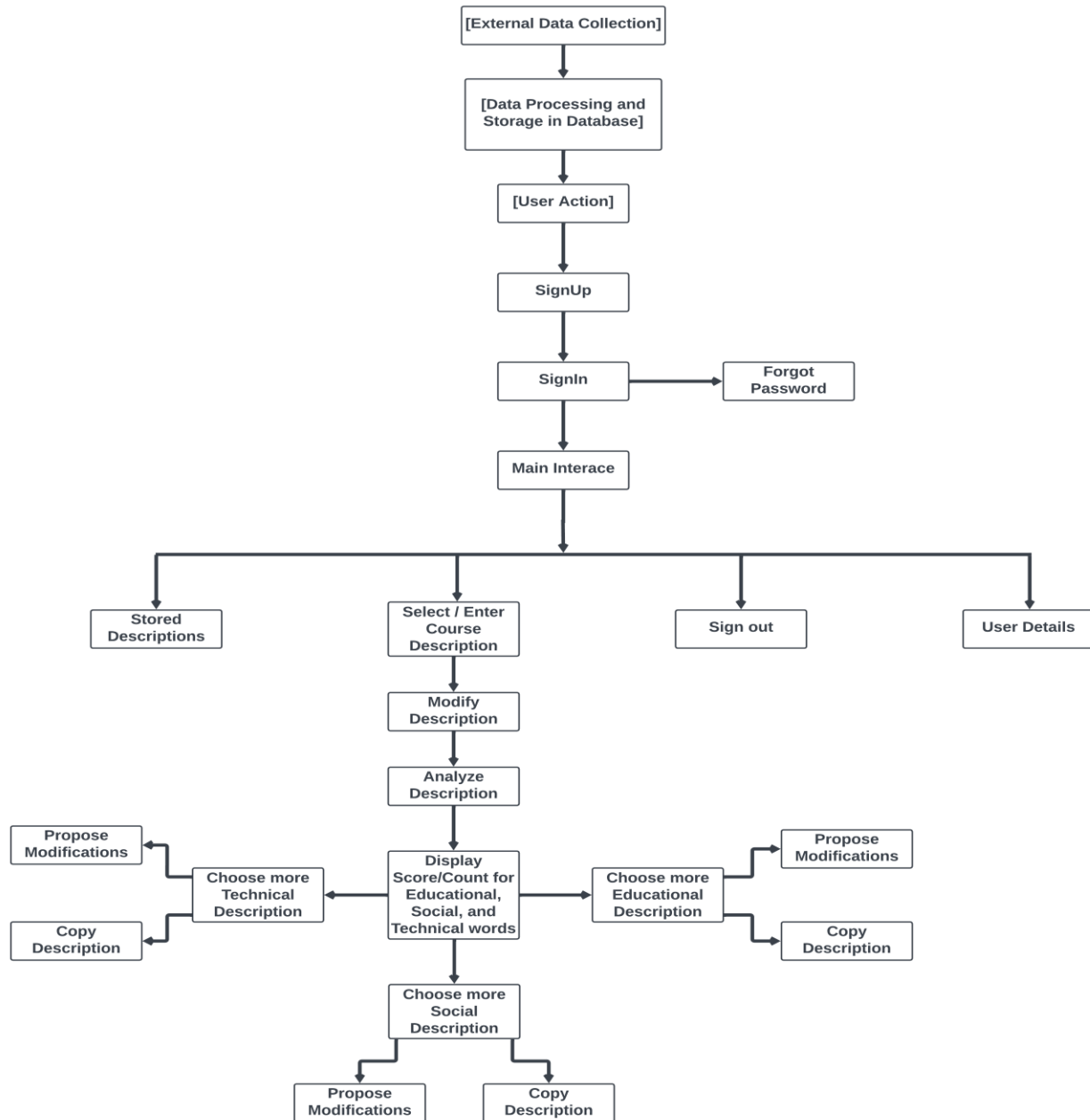


Figure 3. Application Flow Chart

4. Architecture Overview

The architecture of my project is designed to be robust, scalable, and capable of handling the complexities of analyzing text data from various sources. At its core, my system consists of several key components working together seamlessly to achieve my objectives. Here's a detailed breakdown of the architecture:

4.1 Database Management with PostgreSQL and pgAdmin 4

To handle user registration/login information securely, I opted for PostgreSQL 16 managed through pgAdmin 4. PostgreSQL was chosen for its robust features, including reliability, scalability, and extensive support for complex queries. Additionally, pgAdmin 4 provides a user-friendly interface for database management, enhancing the efficiency of administrative tasks.

4.2 Web Development with Flask

Diversity in Computing is powered by Flask, a lightweight and versatile web framework for Python. Using Flask allowed me to develop the application with flexibility and efficiency. Throughout the development process, I used various Flask components, such as Flask-SQLAlchemy for database integration, session management, and routing functionalities. By employing Flask, I could streamline development and ensure seamless interaction between different parts of the application.

4.3 Course Description Scraping with Scrapy

In alignment with the project's objective of analyzing course descriptions from various third-level institutions, I used Scrapy, a robust web crawling and scraping framework. The purpose of web scraping from university web pages was to collect a diverse range of course and module descriptions for subsequent analysis. By automating the data extraction process from websites such as [Ingenic.ie](https://www.ingenic.ie), the project ensured access to a comprehensive dataset essential for fulfilling its analytical objectives.

4.4 Frontend Development with HTML, CSS, and JavaScript

The front end of Diversity in Computing is crafted using HTML, CSS, and JavaScript, providing a responsive and intuitive user interface. HTML structures the content, CSS enhances visual presentation and layout, while JavaScript adds interactivity and dynamic behavior to the interface. Through meticulous front-end development, I aimed to deliver a seamless user experience, facilitating effortless navigation and engagement with the application.

4.5 Natural Language Processing (NLP) Pipeline

The NLP pipeline serves an important role in the project's objective of analyzing textual data to identify biases within course descriptions. By employing advanced techniques and tools such as NLTK and OpenAI's GPT-3.5 Turbo, the pipeline facilitates the extraction of key insights from the text. Specifically, the NLP process aims to categorize descriptions based on their predominant themes, distinguishing between 'educational,' 'social,' and 'technological' aspects. ChatGPT, an essential component of the pipeline, contributes significantly to the analysis by providing contextual understanding and generating recommendations for modifying descriptions to enhance their inclusivity and appeal to diverse populations. This integrated approach enables a comprehensive analysis of the language used in course descriptions, shedding light on potential biases and trends that influence student enrollment decisions.

4.6 Version Control and Collaboration with GitHub

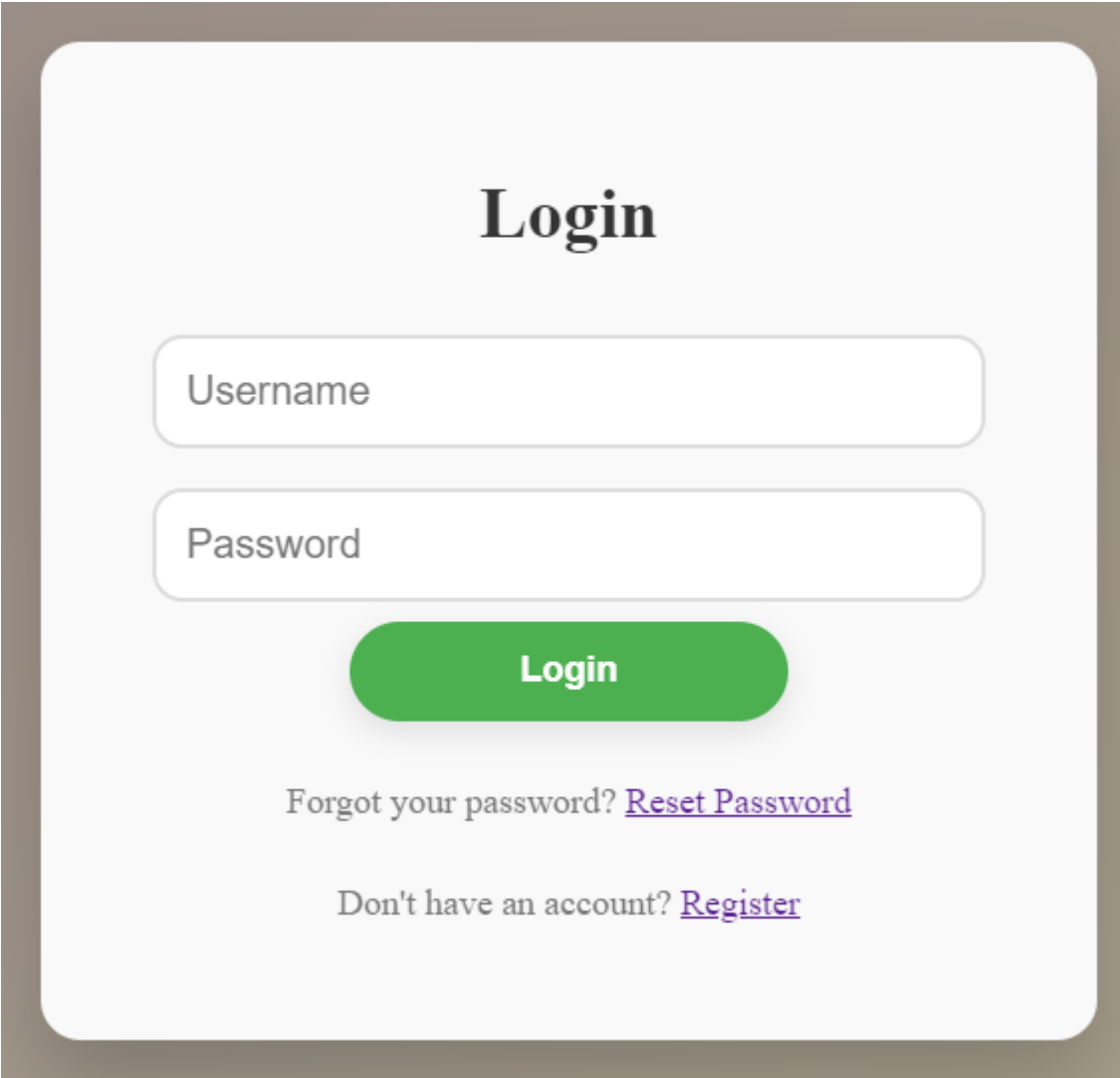
Throughout the project lifecycle, I relied on GitHub for version control, enabling me to maintain a detailed history of changes and manage the project's codebase efficiently. Regular commits to the repository allowed me to track progress transparently and facilitated the identification of issues or bugs. Additionally, GitHub's features, such as branching and pull requests, aided in organizing code changes and implementing new features systematically. Although I worked on this project independently, GitHub served as a valuable tool for managing the development process and ensuring code quality through self-review and continuous improvement.

In summary, the architecture of Diversity in Computing is meticulously designed to integrate diverse technologies and components seamlessly. By using PostgreSQL, Flask, Scrapy, HTML/CSS/JavaScript, and GitHub, I created a robust and scalable system capable of handling the complexities of text data analysis. Through careful planning and execution, I aimed to deliver a sophisticated yet user-friendly solution to uncover insights about diversity in computing education.

5. Application screenshots

5.1 Login Page:

The login page of this web application provides users with a secure gateway to access the system. It features a simple, yet effective interface designed for ease of use and efficiency. Users are prompted to enter their username and password to authenticate their identity and gain access to the application's functionalities. In case of any authentication errors, such as an incorrect username or password, users are notified with an error message displayed in red font for clarity. Additionally, the login page offers convenient options for users who may have forgotten their password, allowing them to reset it easily.

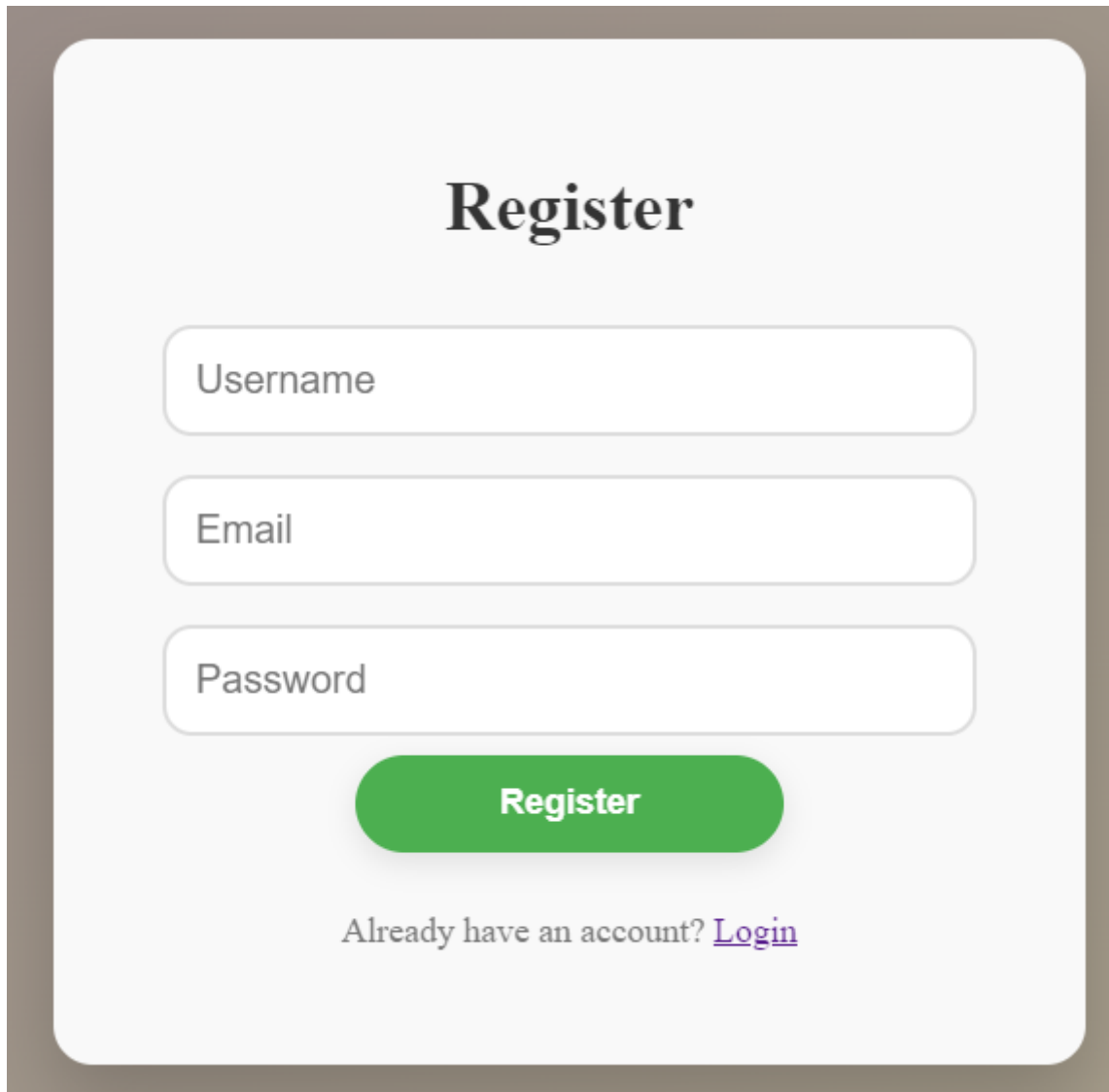


The screenshot shows a login page with a white background and a dark grey border. At the top center, the word "Login" is written in a large, bold, black serif font. Below this, there are two rounded rectangular input fields. The first field is labeled "Username" and the second is labeled "Password". Both labels are in a grey font. Below the input fields is a green rounded rectangular button with the word "Login" in white text. At the bottom of the page, there are two lines of text: "Forgot your password? [Reset Password](#)" and "Don't have an account? [Register](#)". The links are in a purple color.

Figure 4. Login Page

5.2 Register Page:

The register page offers new users the opportunity to create an account and join the Diversity in Computing community. It presents users with a straightforward registration form where they can input their desired username, email address, and password. To enhance security and ensure password strength, the registration form includes validation requirements for passwords, such as a minimum length and a combination of uppercase letters, lowercase letters, digits, and special characters. Upon successful registration, users gain access to the application's features and become part of the Diversity in Computing platform.

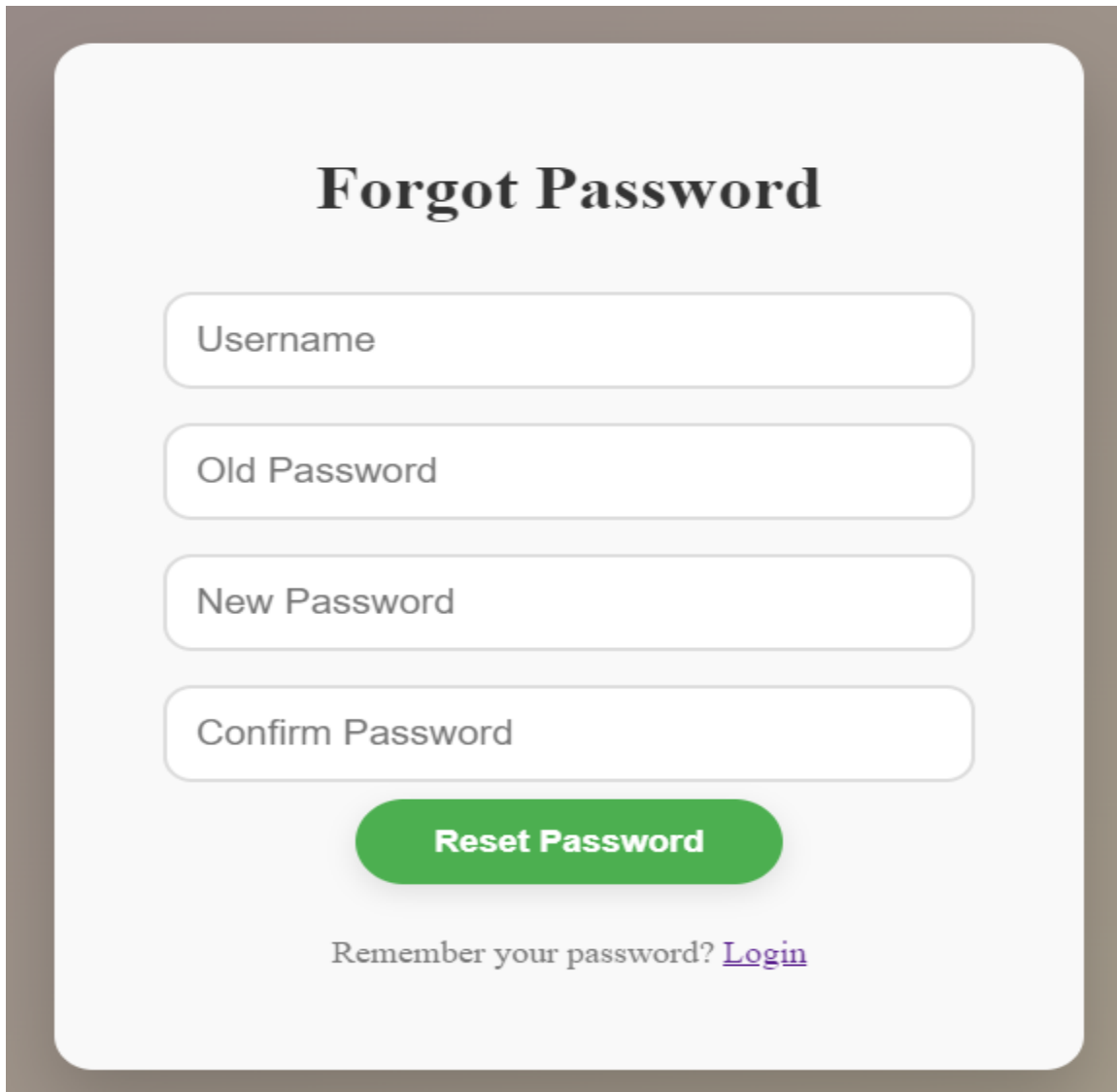


The image shows a registration form titled "Register". It features three input fields: "Username", "Email", and "Password". Below the fields is a green "Register" button. At the bottom, there is a link that says "Already have an account? [Login](#)".

Figure 5. Register Page

5.3 Forgot Password Page:

The forgotten password page serves as a lifeline for users who have trouble accessing their accounts due to forgotten passwords. It offers a user-friendly interface for users to initiate the password reset process effortlessly. Users are prompted to enter their username along with their old and new passwords, as well as confirm the new password for security purposes. If any errors occur during the password reset process, such as an incorrect old password or mismatched new passwords, users are promptly notified with a red error message for clarity. This page streamlines the password recovery process, ensuring a seamless user experience for all.



The image shows a 'Forgot Password' form with the following elements:

- Title:** 'Forgot Password' in a large, bold, black serif font.
- Input Fields:** Four rounded rectangular input fields stacked vertically, labeled 'Username', 'Old Password', 'New Password', and 'Confirm Password'.
- Button:** A prominent green rounded rectangular button with the text 'Reset Password' in white.
- Link:** A text link 'Remember your password? [Login](#)' located below the button.

Figure 6. Forgot Password Page

5.3 Home Page:

The index.html or home page of the Diversity in Computing web application serves as the main entry point for users. Here's an overview of what the home page includes:

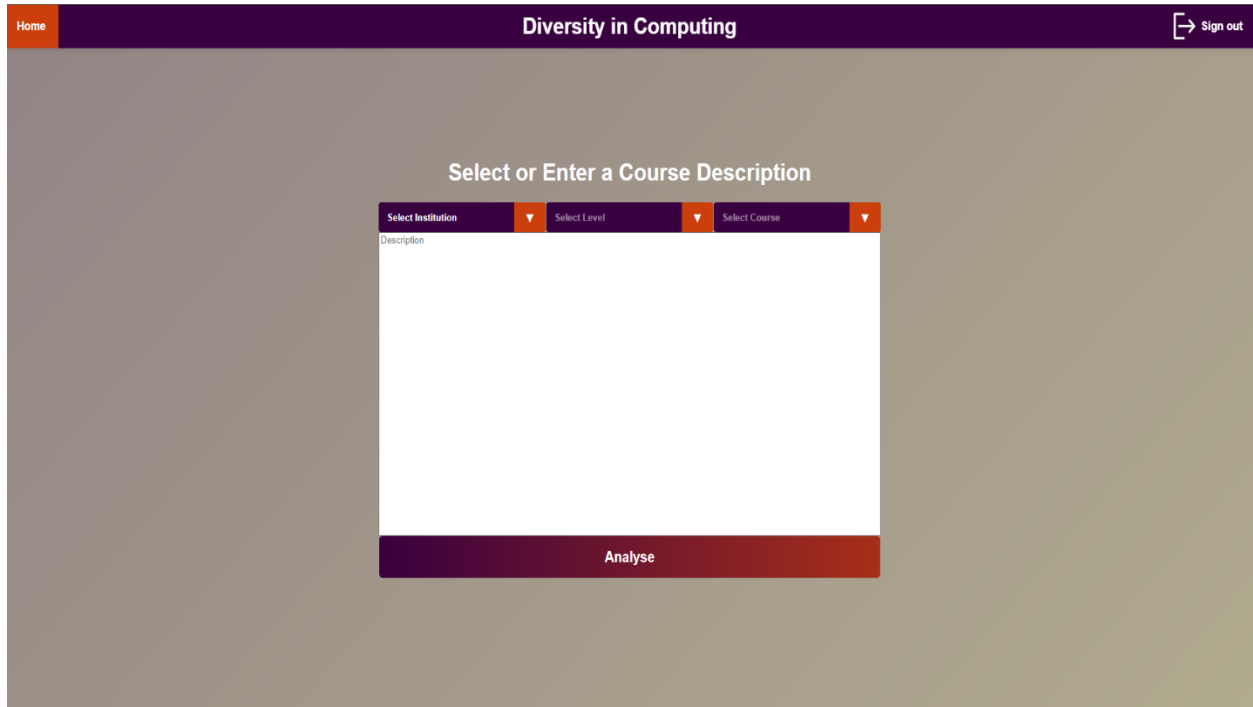


Figure 7. Home Page

Navigation Bar

At the top of the page, there is a navigation bar that provides easy access to different sections of the application. It includes links to the home page, the title of the application "Diversity in Computing", and a Sign Out option.



Figure 8. Navigation Bar

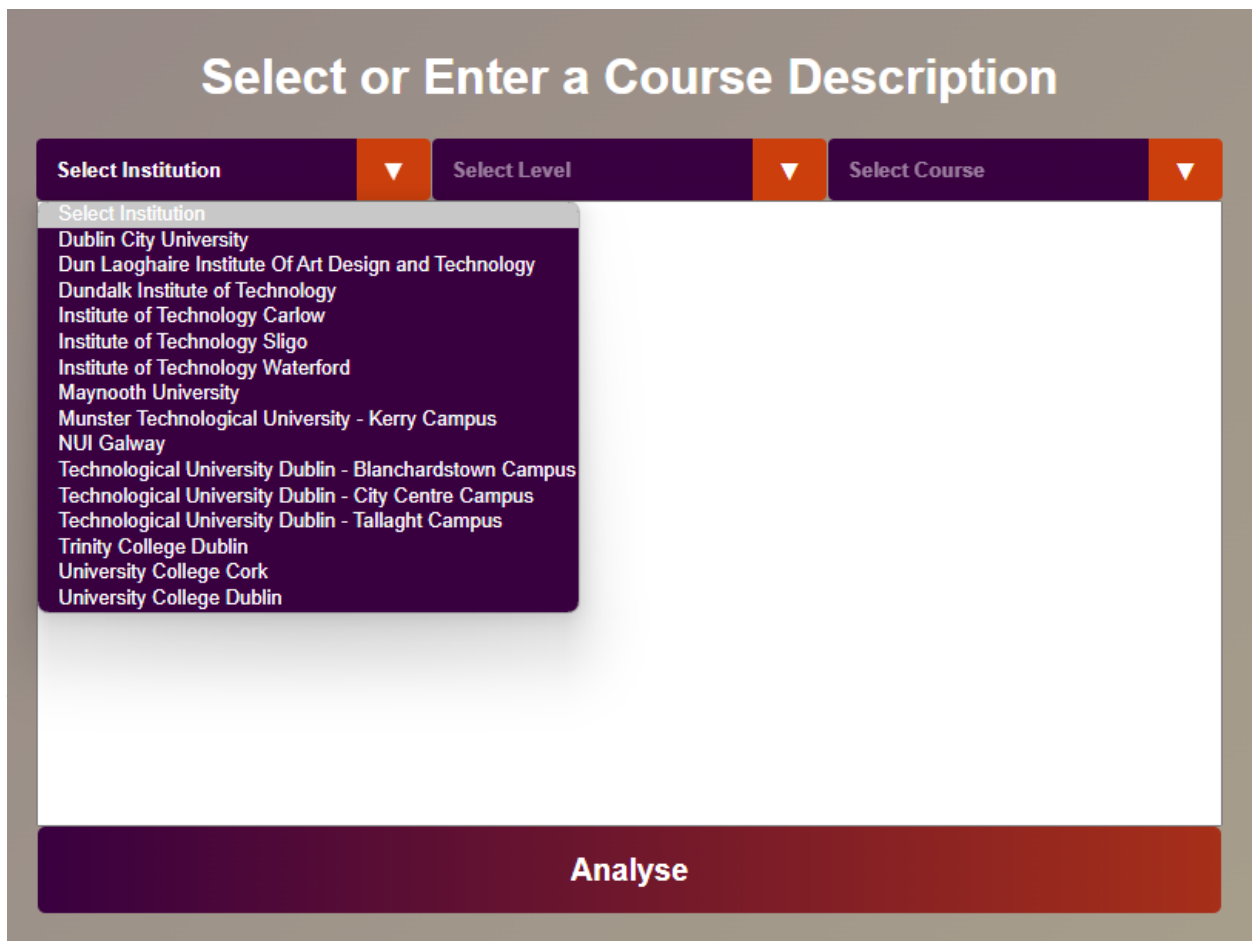
Course Selection Form

The main section of the page contains a form where users can select or enter a course description for analysis. It consists of the following components:

Dropdowns Container: This section contains dropdown menus for selecting the institution, level, and course title. The options in these dropdowns are populated dynamically based on the available data.

1. Select Institution dropdown:

This dropdown menu allows users to select the institution from which they want to analyze course descriptions. The options in this dropdown are dynamically populated based on the available data retrieved from the server.



The image shows a web form titled "Select or Enter a Course Description". At the top, there are three dropdown menus: "Select Institution", "Select Level", and "Select Course". The "Select Institution" dropdown is currently open, displaying a list of institutions. Below the dropdowns is a large empty text input field. At the bottom of the form is a red "Analyze" button.

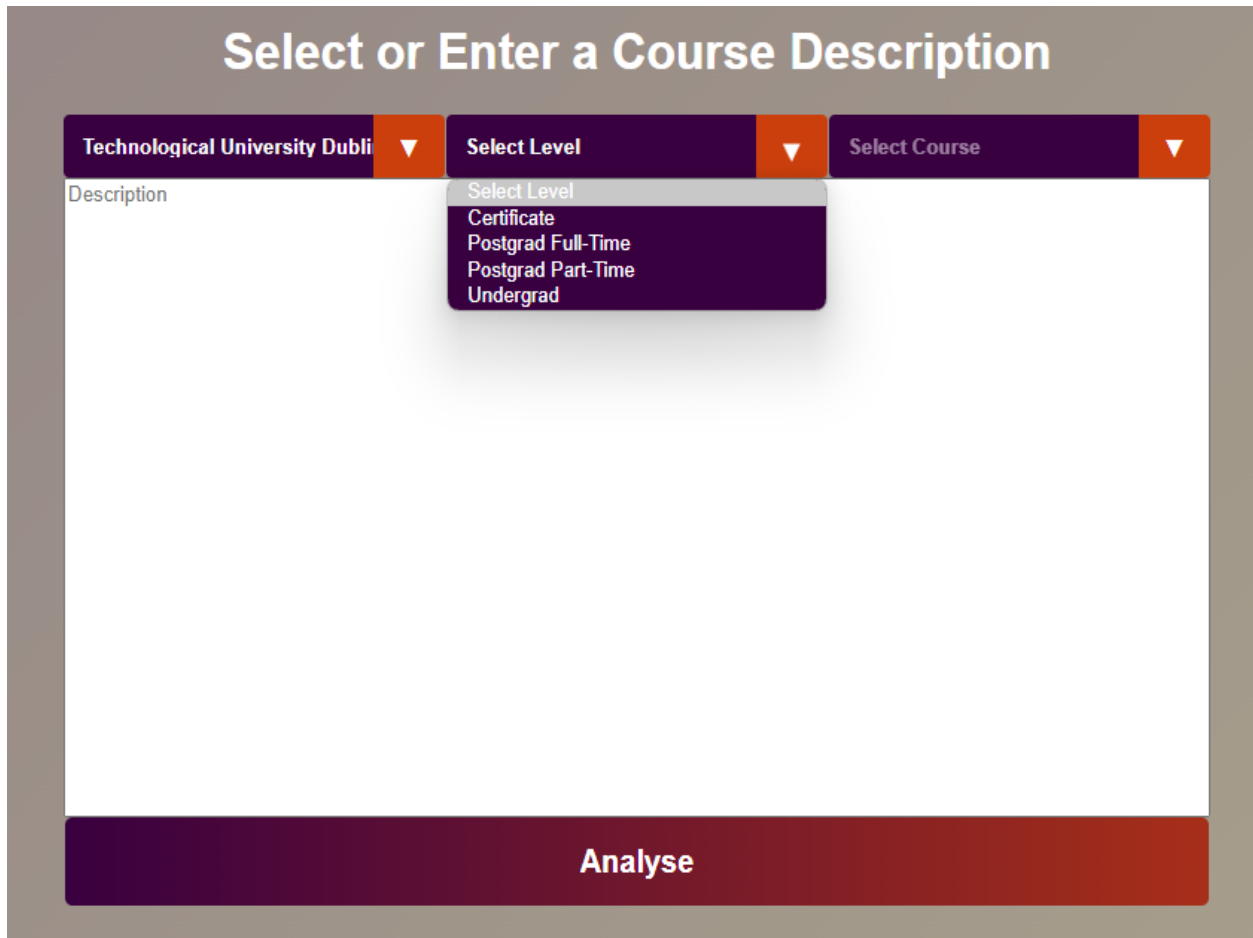
Select Institution	Select Level	Select Course
Select Institution		
Dublin City University		
Dun Laoghaire Institute Of Art Design and Technology		
Dundalk Institute of Technology		
Institute of Technology Carlow		
Institute of Technology Sligo		
Institute of Technology Waterford		
Maynooth University		
Munster Technological University - Kerry Campus		
NUI Galway		
Technological University Dublin - Blanchardstown Campus		
Technological University Dublin - City Centre Campus		
Technological University Dublin - Tallaght Campus		
Trinity College Dublin		
University College Cork		
University College Dublin		

Analyze

Figure 9. Select Institution Dropdown

2. Select Level dropdown:

This dropdown menu enables users to specify the level of the courses they are interested in analyzing (e.g., undergraduate, or postgraduate). The options in this dropdown are initially disabled until the user selects an institution from the first dropdown. Upon selecting an institution, this dropdown is populated with the corresponding levels available for that institution, allowing users to narrow down their selection further.



The image shows a web form titled "Select or Enter a Course Description". At the top, there are three dropdown menus: "Technological University Dubli", "Select Level", and "Select Course". The "Select Level" dropdown is currently open, showing four options: "Certificate", "Postgrad Full-Time", "Postgrad Part-Time", and "Undergrad". Below the dropdowns is a large text input field labeled "Description". At the bottom of the form is a red button labeled "Analyse".

Figure 10. Select Course Level Dropdown

3. Select Course dropdown:

This dropdown menu allows users to choose a specific course title for analysis. Like the level dropdown, the options in this dropdown are initially disabled until both the institution and level are selected. Once an institution and level are chosen, this dropdown is populated with the available course titles for the selected institution and level. Users can then select a course title from the populated list, providing specificity in their choice of course description to analyze.

The screenshot shows a web interface with the title "Select or Enter a Course Description". At the top, there are three dropdown menus in a row, each with a dark purple background and a white downward arrow. The first dropdown is labeled "Technological University Dubli", the second is "Undergrad", and the third is "Select Course". The "Select Course" dropdown is currently open, displaying a list of five course titles in white text on a dark purple background: "BSc (Hons) Computer Science", "BSc (Hons) Computer Science (Infrastructure)", "BSc (Hons) Information Systems and Information Technology", "BSc Hons Comp Science (international)", and "Business Computing". Below the dropdowns is a large white text area with the label "Description" in the top left corner. At the bottom of the form is a prominent red button with the word "Analyse" in white text.

Figure 11. Select Course Dropdown

4. User selects course:

After selecting a course from the dropdown menu, the corresponding course description is automatically populated in the text area below the dropdowns. This feature enables users to quickly access and review the description of the chosen course without the need for manual input. By dynamically updating the text area, users can easily visualize the course description they have selected, facilitating a seamless analysis process. This functionality enhances user experience by providing immediate feedback and visibility into the content of the chosen course.

Select or Enter a Course Description

Technological University Dublin ▼ Undergrad ▼ BSc (Hons) Computer Science ▼

Computer scientists are critical to the global infrastructure that underlie our communications, finance, health, energy, transport and many other vital systems. Are you interested in understanding the algorithmic complexity of problems, automating human intelligence, providing ubiquitous access to information and designing secure and effective software and computer systems? If so, this course will prepare you for work in an exciting industry. If you want to work as a software application developer in a variety of commercial and industrial environments, this course will equip you with the understanding and skills needed to progress in an exciting and constantly changing industry. It will qualify you to work in a wide range of computer development areas – whether in the mainstream computer industry or in stimulating, leading application areas such as internet applications development, games development, enterprise systems, e-commerce, music technology, systems technology, systems security, knowledge management and data mining. You will spend the early years of the course gaining a thorough grounding in the fundamentals of computer science; then develop highly relevant skills in software design and development. In your final year, you will specialise in a chosen field, such as Enterprise Systems Development (how to create large, scalable, safe, secure and reliable software systems using the latest technologies), Applied Intelligence (advanced methods in computer science such as machine learning and the Internet of Things), Digital Games Development & Simulation (how to design and implement computer games and simulated environments that model novel and complex worlds and characters) and, Security and Forensics (how to recover evidence from a computer system, providing security for information through Steganography and Cryptography algorithms). You can apply to participate in an international exchange for the second half of third year as part of your experiential learning. The third-year is focused on experiential learning. You will participate in a business and enterprise module, and may then opt to participate in our highly successful work placement programme. The School of Computer Science maintain close liaisons with various industry partners. Alternatively, you can work with community organisations on our innovative service-learning module, whereby you take responsibility for interesting ICT projects in the community. We have institutional links with many industry leaders such as Oracle, Microsoft, IBM, Facebook, VMware, Salesforce, SAP, Ocuco, Google, Twitter, Apple, LinkedIn through sponsorship, work placement, project co-operation and graduate employment.

Analyse

Figure 12. User Selects Course

Custom Alert Popup:

A custom alert popup is included to provide feedback to users when necessary. For example, if a user attempts to submit a course description with fewer than 50 words, the alert will inform them of the requirement.

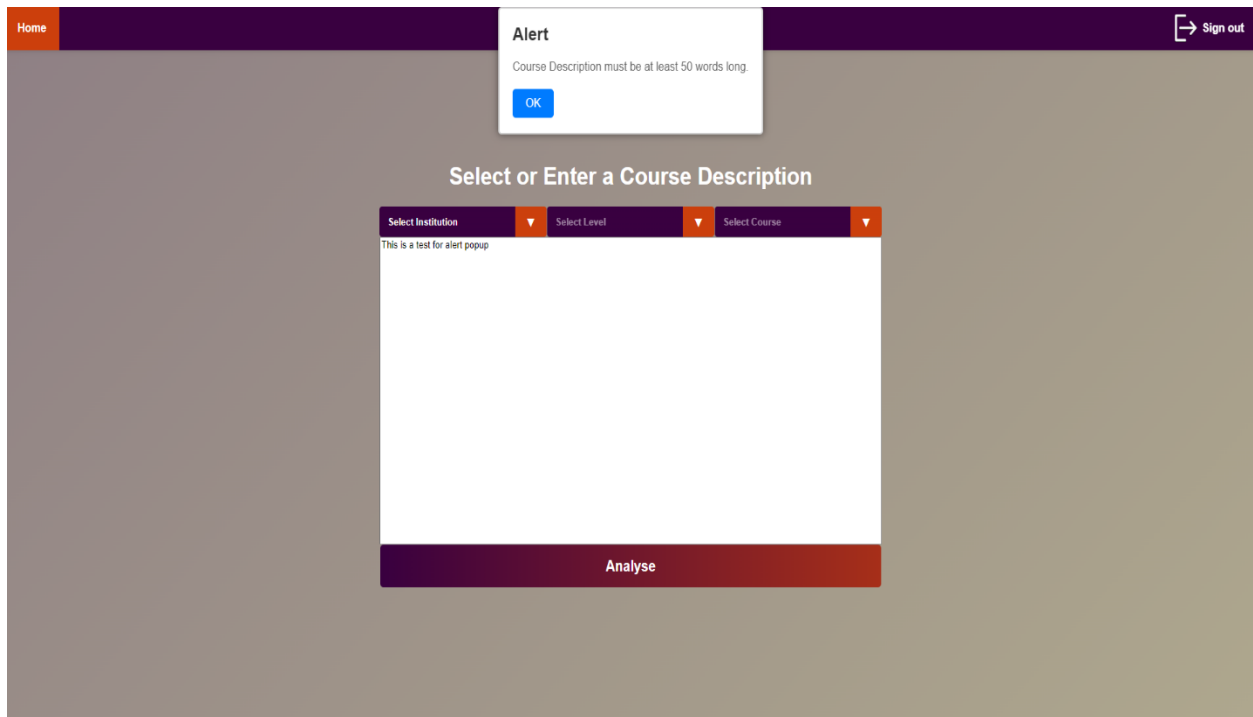


Figure 13. Custom Alert Popup

Overall, the index page provides a user-friendly interface for users to interact with the Diversity in Computing web application, allowing them to select or enter course descriptions for analysis and receive feedback on their submissions.

5.4 Result Page

The result page of the Diversity in Computing web application is a comprehensive display of the analysis outcome generated based on the user's input course description. It provides users with valuable insights into the linguistic characteristics of the entered/selected description, along with recommendations for modifications to enhance diversity-related language patterns.

Home Diversity in Computing Sign out

Analysis Result

Current Description

Educational Score: 26.92% (21 educational words)
Social Score: 6.41% (5 social words)
Technological Score: 66.67% (52 technical words)

Computer scientists are critical to the global infrastructure that underlie our communications, finance, health, energy, transport and many other vital systems. Are you interested in understanding the algorithmic complexity of problems, automating human intelligence, providing ubiquitous access to information and designing secure and effective software and computer systems? If so, this course will prepare you for work in an exciting industry. If you want to work as a software application developer in a variety of commercial and industrial environments, this course will equip you with the understanding and skills needed to progress in an exciting and constantly changing industry. It will qualify you to work in a wide range of computer development areas – whether in the mainstream computer industry or in stimulating, leading application areas such as internet applications, development, games development, enterprise systems, e-commerce, music technology, systems technology, systems security, knowledge management and data mining. You will spend the early years of the course gaining a thorough grounding in the fundamentals of computer science; then develop highly relevant skills in software design and development. In your final year, you will specialise in a chosen field, such as Enterprise Systems Development (how to create large, scalable, safe, secure and reliable software systems using the latest technologies), Applied Intelligence (advanced methods in computer science such as machine learning and the Internet of Things), Digital Games Development & Simulation (how to design and implement computer games and simulated environments that model novel and complex worlds and characters) and, Security and Forensics (how to recover evidence from a computer system, providing security).

384 Words More Educational More Social More Technical

Modified Description

Educational Score: 0% (0 educational words)
Social Score: 0% (0 social words)
Technological Score: 0% (0 technical words)

Print Recommendations

0 Words More Educational More Social More Technical

Figure 14. Result Page

Navigation Bar

Like the index page, the result page features a navigation bar that allows users to navigate back to the home page or sign out of the application. This ensures consistency in user experience across different pages of the application.

Home Diversity in Computing Sign out

Figure 15. Navigation Bar

Here's a breakdown of the key components and functionalities of the result page:

1. Current Description: This section displays the original course description entered by the user. It provides detailed insights into the composition of the description, including educational, social, and technological word scores. Additionally, users can view the individual words in the description categorized by their linguistic characteristics, such as educational, social, or technological. The word count of the description is also prominently displayed, giving users an overview of its length.

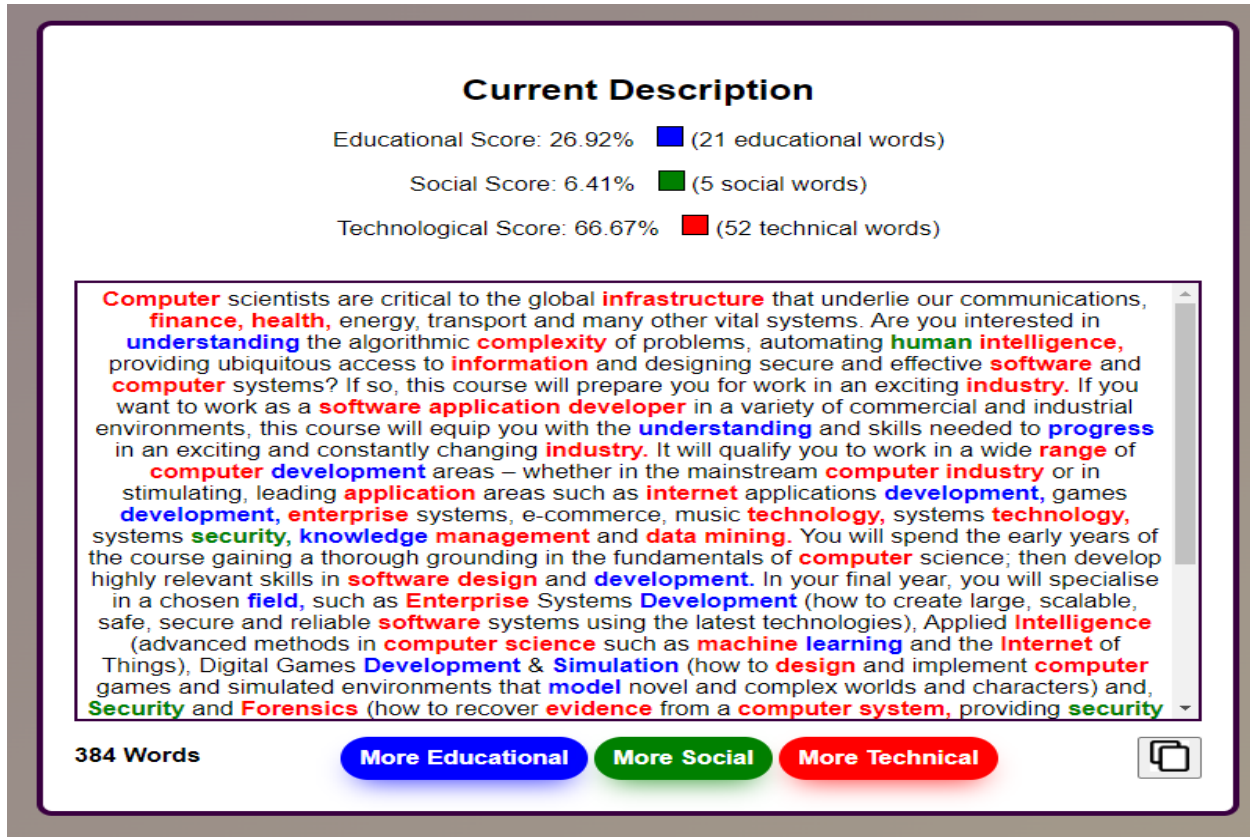


Figure 16. Current Description

2. Recommendation Buttons: Below the current description, there are buttons labeled "More Educational," "More Social," and "More Technical." These buttons allow users to generate modified versions of the original description with emphasis on specific linguistic characteristics. For example, clicking the "More Social" button will generate a modified description with increased emphasis on social language. These recommendations aim to assist users in refining their course descriptions to promote diversity and inclusivity.



Figure 17. Recommendation Buttons

3. Modified Description: In this section, users can view the modified version of the original description based on their selected recommendations. Like the current description section, users can observe the educational, social, and technological word scores, as well as the individual words categorized by their linguistic characteristics. The word count of the modified description is also provided for reference.

Modified Description

Educational Score: 16.42% (11 educational words)

Social Score: 40.3% (27 social words)

Technological Score: 43.28% (29 technical words)

Computer scientists play a pivotal role in shaping our interconnected world, influencing how we communicate, manage finances, and access essential services in healthcare and transportation. If you are drawn to unraveling the intricacies of algorithms, leveraging **human intelligence** through automation, ensuring universal access to **information**, and crafting secure and efficient **software** and **computer** systems, then this course is tailored for you. It will prepare you for a rewarding **career** in a vibrant **industry** that thrives on **innovation**. By immersing yourself in this **program**, you will explore the foundations of **computer science** and hone your skills in **software design** and **development**, embracing a social and cooperative **philosophy** throughout your journey. As you **progress** through the **curriculum**, you will have the freedom to specialize in diverse fields such as **Enterprise Systems Development**. Here, you'll learn to create robust and scalable **software** solutions using cutting-edge technologies, prioritizing **user interaction** and **usability**. Alternatively, you can delve into Applied **Intelligence**, engaging with advanced concepts like **machine learning** and the **Internet** of Things to enhance **user experience** and address societal challenges. If you have a passion for immersive experiences, the Digital Games **Development & Simulation** track will guide you in crafting captivating virtual worlds and characters that resonate with a global **audience**. For those interested in safeguarding **privacy** and **user security**, the **Security** and **Forensics** specialization offers **training** in protecting **information** and implementing ethical **cybersecurity** measures, emphasizing ethical **responsibility** in **technology** use. Moreover, beyond academic endeavors, this course provides experiential **learning** opportunities designed to enhance your **awareness** of the **impact** of

361 Words

[More Educational](#) [More Social](#) [More Technical](#)

Figure 18. Modified Description

4. Copy to Clipboard Button: To facilitate easy sharing or reuse of the analysis results, a "Copy to Clipboard" button is provided for both the current and modified descriptions. Users can click this button to copy the text to their clipboard, enabling seamless integration with other applications or platforms.



Figure 19. Copy to Clipboard Button

6. Problems Encountered

It was a challenging project from start to finish because the technologies used in this project were new to me. My journey through this project was a rollercoaster ride filled with highs, lows, and everything in between. Along the way, I encountered several challenges that put my skills and determination to the test. In this section, I will take you behind the scenes and share the real, raw struggles I faced, how I tackled them, and the valuable lessons I learned from the experience.

6.1 Technical Hurdles

Technical obstacles slowed my progress from the beginning. Developing a web scraper to collect course and module descriptions from various institutional websites proved to be a daunting task. I encountered issues with inconsistent website structures, dynamic content loading, and rate limiting, all of which significantly slowed down my progress. Overcoming these challenges required creative problem-solving, and strong determination.

6.2 Issue with Highlighting Text in Textarea

During the development of the analysis page, I faced a significant problem when attempting to highlight educational, social, and technical words within the displayed text. The primary challenge came from the limitations of rendering text inside a textarea element, which does not support styling individual words or phrases. To overcome this issue, I created a solution that involved refactoring the rendering logic to dynamically generate HTML elements instead of relying on the textarea element. By using server-side templating and iterating through each word in the text, I dynamically created HTML elements with appropriate styling classes based on the word's category. This allowed me to successfully implement the required highlighting functionality while maintaining the integrity of the user interface.

6.3 Time Management Struggles

As the project timeline unfolded, time management emerged as a recurring struggle for me. Balancing coursework, personal commitments, and project milestones demanded careful planning and discipline. With deadlines approaching, and the pressure to deliver results increased with each passing day. Despite my best attempts to allocate time effectively and prioritize tasks, unexpected delays and unexpected challenges often disrupted my plans. Learning to adjust to changing priorities and effectively manage expectations became crucial skills as I navigated the unpredictable world of project management.

7. What I Learned

As I reflect on the journey that has brought me to this point, I am struck by the many lessons learned, the challenges overcome, and the growth experienced along the way. In this section, I want to share with you some of the most impactful insights and transformative lessons that have shaped my understanding, my perspective, and my journey as a software developer.

7.1 Embracing the Unknown:

The most important lesson I've learned throughout this project is the importance of embracing the unknown. When I first started on this journey, I had no idea where it would lead me or what challenges I would face along the way. But rather than letting fear or uncertainty hold me back, I chose to embrace the journey with an open mind and a sense of curiosity.

7.2 Time Management:

Throughout the development of my project, I learned the crucial skill of time management. Juggling multiple modules alongside this project required careful prioritization and allocation of my time. By setting weekly targets and working consistently towards them, I was able to make steady progress and stick to the project schedule. This experience highlighted the critical importance of effective time management in achieving success.

7.3 Organization:

Another essential skill I acquired during this project was organization. Maintaining detailed documentation and staying on top of development tasks on a weekly basis helped me stay focused and on track. This project highlighted the significance of organizational skills, particularly in managing a project of considerable size and complexity.

7.4 Agile Practices:

This project introduced me to agile practices, which proved to be immensely valuable. Adopting a framework of iterative development, and regular meetings with my supervisor allowed for greater flexibility and adaptability. Overall, this experience improved my understanding of agile methodologies and equipped me to apply them in future projects.

7.5 Academic Writing/Research:

The process of researching and writing multiple documents involved in the development of the project improved my academic writing skills significantly. It has improved critical thinking, research and citation, technical writing, and collaboration. Conducting research required analytical skills and developed the ability to find and reference credible sources. Complying with a specific format, tone, and writing style improved technical writing skills and provided an opportunity to practice complying with academic writing standards, which improved clarity, organization, and conciseness in writing. Collaboration and feedback from my supervisor helped develop the ability to write more effectively and efficiently and ensured that the documentation was of high quality.

7.6 Presentation Skills:

Presenting my project provided an opportunity to refine my presentation skills in various aspects. Effective communication, including clear articulation and confident delivery, was crucial in conveying key project details. Engaging with the audience enabled me to develop the ability to captivate and maintain their interest, while also receiving valuable feedback for improvement. This experience not only improved my presentation skills but also instilled greater confidence in public speaking, a vital skill in professional settings.

8. What would I do differently?

Reflecting on the journey of this project, I cannot help but acknowledge the numerous lessons learned and the areas where I could have improved my approach. In this section, I will delve into what I would do differently if given the chance to start on this project again.

8.1 Embracing Early Planning and Organization

One of the key areas where I would make significant changes is in the realm of planning and organization. Looking back, I realize that I could have benefited greatly from a more structured and comprehensive planning phase at the beginning of the project. Rather than diving headfirst into development, I would take the time to carefully define project goals, outline a clear roadmap, and establish a realistic timeline for execution. By embracing early planning and organization, I believe I could have avoided many of the challenges and setbacks encountered along the way and set myself up for greater success in the long run.

8.2 Embracing Agile Methodologies and Iterative Development

Looking back, I also see the value in embracing agile methodologies and iterative development practices more fully. While I made attempts to iterate and refine my approach as the project progressed, I now realize that I could have benefited from a more structured and disciplined approach to agile development. By breaking the project down into smaller, manageable tasks, and setting clear objectives for each iteration, I believe I could have accelerated the pace of development, minimized risks, and delivered a more robust and polished product in the end.

8.3 Developing a Growth Mindset and Resilience

Finally, one of the most important lessons I've learned from this project is the importance of developing a growth mindset and resilience when confronted with challenges. While there were moments of frustration, disappointment, and self-doubt along the way, I now see them as opportunities for growth, learning, and self-improvement. In the future, I would strive to approach challenges with a more positive attitude, a sense of curiosity, and a belief in my ability to overcome obstacles and achieve my goals. By developing a growth mindset and resilience, I believe I can navigate future projects with greater confidence, clarity, and determination.

In conclusion, while there are certainly aspects of this project that I would approach differently if given the chance, I am grateful for the opportunity to learn from my experiences, grow as a developer, and continue evolving on my journey. By embracing early planning and organization, prioritizing communication, and collaboration, embracing agile methodologies and iterative development, and developing a growth mindset and resilience, I believe I can set myself up for greater success in future projects and endeavors.

9. Project Review

9.1 What I achieved.

1. Database Management and User Authentication:

- Implemented user registration, login, and password change functionalities securely using PostgreSQL and pgAdmin 4.
- Ensured data integrity and confidentiality of user information.

2. Web Development and User Interface:

- Developed a responsive web application using Flask, HTML, CSS, and JavaScript, ensuring cross-platform functionalities.
- Implemented intuitive user interfaces for seamless navigation and interaction.

3. Data Collection and Analysis:

- I used Scrapy for web scraping to gather course and module descriptions from various institutional websites.
- Processed textual data using natural language processing (NLP) techniques, including NLTK and OpenAI's GPT-3.5 Turbo.

4. Insight Generation and Recommendations:

- Analyzed linguistic characteristics of course descriptions to uncover hidden biases using NLP pipeline.
- Provided recommendations for modifying descriptions to promote diversity and inclusivity.

5. Documentation and Version Control:

- Maintained comprehensive documentation of the project architecture, functionalities, and challenges faced.
- I used GitHub for version control, ensuring transparency and facilitating efficient project management.

9.2 What I did not achieve.

1. Machine Learning Pipeline:

If I had more time, I would have liked to get gender statistics for first year students in computing courses from third-level institutions and implement a machine learning pipeline to automatically learn terms that appear in descriptions from institutions with gender, racial, and ethnic diversity, and to debias previously unseen descriptions.

2. Save Descriptions:

Additionally, if I had more time, I would have liked to implement a functionality to save descriptions and a page to view the descriptions, allowing users to revisit and analyze previously submitted course descriptions at their convenience.

9.3 Challenges Faced:

1. Technical Hurdles:

- Overcame challenges in web scraping, including inconsistent website structures and dynamic content loading.

2. Issues with Highlighting Text in Textarea:

- Overcame issues with rendering text within a textarea element to enable the highlighting of educational, social, and technical words through dynamic HTML element generation.

3. Time Management Struggles:

- Balanced project development with coursework and personal commitments, emphasizing the importance of effective time management.

4. Lessons Learned and Growth:

- Embraced the unknown, improved time management, honed organizational skills, and gained insights into agile practices and academic writing/research.

10. Conclusion

In conclusion, the Diversity in Computing project has been a journey of exploration, learning, and growth. Through the careful design and implementation of a robust architecture, I have developed a web application capable of analyzing textual data to uncover hidden biases in course descriptions. By using technologies such as PostgreSQL, Flask, Scrapy, HTML/CSS/JavaScript, and natural language processing tools, I have created an application for promoting diversity and inclusivity in computing education.

Throughout this project, I have encountered numerous challenges, from technical hurdles to time management struggles. However, each obstacle has presented an opportunity for learning and growth. By embracing the unknown, improving time management, honing organizational skills, and gaining insights into agile practices and academic writing/research, I have emerged stronger and more resilient.

The key findings and insights from this project show the importance of diversity in computing education. By analyzing linguistic characteristics of course descriptions and providing recommendations for promoting diversity and inclusivity, this project aims to spark conversations and drive change in how we attract and welcome students into the world of computing.

Moving forward, I am excited to continue exploring opportunities for improving diversity and inclusivity in technology fields. By applying the lessons learned from this project and embracing a growth mindset, I am confident that I can contribute to building a more diverse and inclusive computing community, one word at a time.

I extend my sincere gratitude to all those who have supported me throughout this journey, including my supervisor, colleagues, friends, and family. Your encouragement, guidance, and feedback have been invaluable, and I am deeply grateful for your unwavering support.

With this project, I hope to inspire others to join me in the pursuit of a future where everyone, regardless of their background, feels empowered to pursue their passion for technology. Together, let us work towards building a more diverse and inclusive world, where every voice is heard, and every perspective is valued.

11. Acknowledgements

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I would like to acknowledge the support and encouragement of my friends and family throughout this journey. Their unwavering belief in me and their constant encouragement have been a source of strength and motivation, for which I am truly grateful.

Finally, I would like to express my heartfelt thanks to all those who have contributed to this project in any way, whether through feedback or encouragement. Your support has been invaluable, and I am deeply grateful for your contributions.

Thank you.

12. Declaration of Plagiarism



Work submitted for assessment which does not include this declaration will NOT be assessed

DECLARATION

1. I declare that all material in this submission e.g., thesis/essay/project/assignment is entirely my own work except where fully acknowledged.
2. I have cited the sources of all quotations, paraphrases, summaries of information, Tables, diagrams, or other material; including software and other electronic media in which intellectual property rights may reside.
3. I have provided a complete bibliography of all works and sources used in the preparation of this submission.
4. I understand that failure to comply with SETU's regulations governing Plagiarism constitutes a serious offence.

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Student Signature(s):

A photograph of a handwritten signature in black ink on a light brown, textured paper background. The signature is cursive and appears to read 'Daniel Giedraitis'.