



POLITECNICO
MILANO 1863

SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE

Design Document

STUDENTS & COMPANIES

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1 | Introduction

A. Purpose

The purpose of this document is to provide a detailed description of Student&Companies. It will help developers to implement the required system features and it should provide the customer with a clear description of the system, allowing him to verify that it meets the specified requirements.

B. Scope

Student&Companies is a platform that connects students, companies, and universities to facilitate the internship research, announcement and selection process. The platform provides services such as internship announcements, profile management, a recommendation system, interview management, and performance feedback. The platform is designed to be user-friendly and easy to use for students, companies, and universities. It is a web-based application that can be accessed from any device with an internet connection.

C. Definition,acronyms,abbreviations

C.1. Definitions

- **Student:** A person who is looking for internships.
- **Company:** An organization which wants to announce internship opportunities to students.
- **University:** An educational institution that is related to students and their internships.
- **User:** A generic term for students, companies, and universities who use the platform.
- **Candidate:** A term for students whose applications are selected and that will take

part in the interview process.

- **Internship:** A opportunity offered by companies to students to gain practical experience in a real job environment.
- **CV:** Curriculum Vitae, a document that contains all necessary information about students to be able to apply for internships.
- **Recommendation:** A suggestion made by the platform to students and companies based on statistical analyses and keyword searches.
- **Interview:** A questionnaire form, that can be followed by an external meeting between students and companies, to evaluate the student preparation and make him understand what the company is looking for.
- **Feedback:** Helpful information written by students and companies about their internship experiences to improve a performance of the two parties.
- **Notification:** A message sent by the platform to inform students and companies about important events, such as new internship offers, matching CVs, interview results etc.
- **Interview:** A meeting between students and companies to decide an assignment of the internship offer.
- **Platform:** The Students&Companies (S&C) system that provides the services to students, companies, and universities about internships.
- **Keyword:** A significant word or tag used to describe content, such as the skills, experiences, and preferences of students and companies.
- **Comment:** The text that is written by students and companies to provide feedback or complaints about their internship experiences.
- **Complain:** A text that expresses dissatisfaction, issues, or annoyance about the internship experiences. It will be treated as a synonym of feedback in this document.

C.2. Acronyms

- **S&C:** Students&Companies
- **CV:** Curriculum Vitae
- **UI:** User Interface
- **UX:** User Experience

- **API:** Application Programming Interface
- **HTTPS:** Hypertext Transfer Protocol Secure
- **TLS:** Transport Layer Security
- **REST:** Representational State Transfer

C.3. Abbreviations

- **CO:** Company
- **ST:** Student
- **UNI:** University

D. Revision History

E. Reference Documents

- Assignment RDD AY 2024–2025.

F. Document Structure

This document is structured as follows:

- **Section 1: Introduction**
- **Section 2: Architectural Design**
- **Section 3: User Interface Design**
- **Section 4: Requirements Traceability**
- **Section 5: Implementation, Integration, and Test Plan**
- **Section 6: Effort Spent**

The time spent by each group member on each task will be registered in this section.

It will be used to present the effort dedicated by each member and to present the progress of the development of the project.

- **Section 7: References**

The other references that not include in the reference documents will be added in this section.

2 | Architectural Design

A. Overview

S&C will be developed as a multi-tiered, client-server architecture, as shown in Figure 2.1. The system will be divided into three main layers: the presentation layer, the application layer, and the data layer. The presentation layer will be responsible for managing the user interface and the user interaction. The application layer will be responsible for managing the application logic. The data layer will be responsible for managing the data storage and the data access.

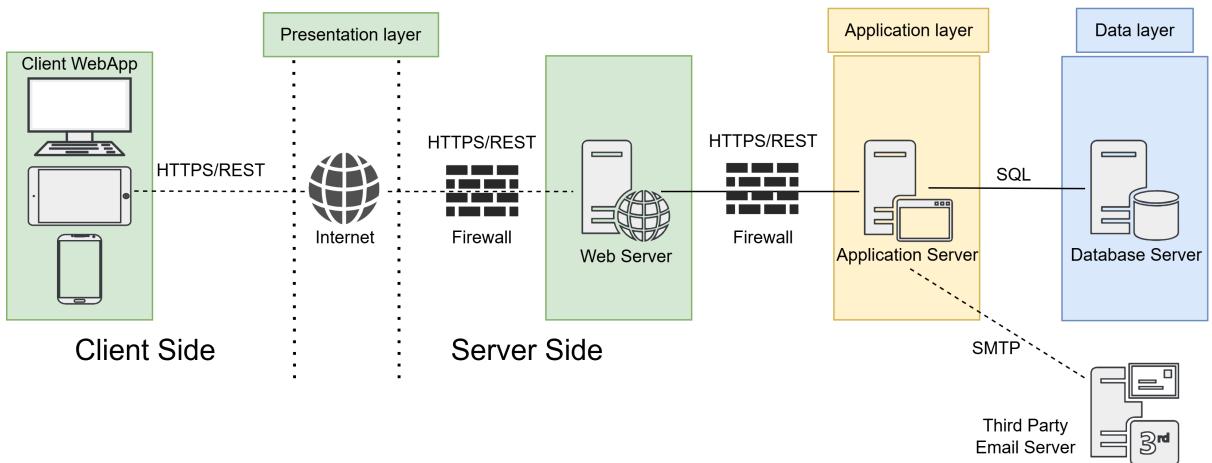


Figure 2.1: S&C architectural overview

In the following paragraph we describe each tier presented in Figure 2.1: and what layer it deploys:

Client Side

- **Web App:** It is the user interface. It will be responsible for managing the user interaction. This means that it will be responsible for hosting part of the presentation layer.

Server Side

- **Firewall:** It will be responsible for managing the security of the system, by filtering the incoming and outgoing traffic and restricting the access based on predefined rules. It will be placed between the Web Server and the Internet and between the Application Server and the Web Server. In this way, the web server will reside in a DMZ (Demilitarized Zone), while the application server will resides in a protected internal network.
- **Web Server:** It serves as a gateway between the client and the application server (backend). It will be responsible for hosting part of the presentation layer. For example, it will be responsible for serving the web pages to the client, handling requests routing to the application server, managing load balancing, and handling security.
- **Application Server:** It will be responsible for managing the application logic. This means that it will host the application layer. For example, it will be responsible for processing the client requests, execute the business logic, and coordinates with the database and email server.
- **Database Server:** It will be responsible for managing the data storage and the data access. This means that it will host the data layer. For example, it will be responsible for storing and retrieving the application data, and executing the database queries.
- **Mail Server:** It will be responsible for managing the email communication. This means that it will be responsible for sending emails to the users. It is triggered by the application server.

The Figure 2.1 also shows how the tiers interact with each other. The Web App interacts with the Web Server through HTTPS/REST requests; the Web Server interacts with the Application Server through HTTPS/REST calls; the Application Server interacts with the Database Server through SQL queries; and the Application Server interacts with the Mail Server through SMTP requests.

B. Components view

B.1. High-level components and interactions

B.2. Low-level components and interactions

C. Deployment view

D. Component interfaces

E. Runtime view

F. Selected architectural styles and patterns

F.1. Three-Tiered Architecture

As described in Section Overview, the Students&Companies (S&C) platform is build using a multi-tier architecture. This decision was made with the aim of providing a more scalable and flexible system. The system is divided into three main layers: the presentation layer, the application layer, and the data layer. Each layer has its own responsibilities and plays a specific role in the system: the presentation layer serves as the front end, accessible through the GUI, while the application layer and data layer together form the back end of the system, accessible via API-based methods.

- **Presentation Layer:** The presentation layer is implemented as a generic web application accessible through a web browser. It is responsible for managing the presentation logic, including user interaction, the user interface, and rendering information. This layer serves as the front end of the system, the only part that the user can access directly.
- **Application Layer:** The application layer is implemented as a set of RESTful web services. It is responsible for managing the functional logic of the system, controlling communication between the presentation layer and the data layer. This layer allows the system to react to user input and generate appropriate responses accordingly. It includes the Application Server and is also used to interact with third-party services.
- **Data Layer:** The data layer is responsible for managing the data storage and access within the system. All operations that require data manipulation must be performed through interactions with the data layer. The platform uses a Relational Database Management System (RDBMS), making the data accessible through SQL queries.

F.2. RESTful API

The Representational State Transfer (REST) style is designed to be stateless, enabling more efficient and seamless communication between the client and the server. It uses standard HTTP methods (GET, POST, PUT, DELETE) to perform operations on resources. The decision to incorporate RESTful APIs into the architecture provides advantages in terms of performance, modifiability, and simplicity by defining conventions for interacting with resources in resource-oriented manner.

F.3. Model-View-Controller (MVC) Pattern

One of the most recommended design patterns for the Three-Tier Architecture is the Model-View-Controller (MVC) pattern. It separates the application into three components: the model, the view, and the controller, minimizing interdependencies between the components and improving the maintainability, manageability, and scalability of the system. Each component can be developed, tested, and maintained independently.

- **Model:** Contains the state and application logic and is independent of the other components.
- **View:** Represents the visual presentation logic of the Model and is responsible for displaying data to the user.
- **Controller:** Acts as an intermediary between the Model and the View. It receives user input forwarded by the View, then processes operations and updates the Model and the View accordingly.

G. Other design decisions

- **Design patterns related to the behavioral aspects:** Observer Pattern and State Pattern.
- **Design decisions related to the system's requirements:** Some design decisions are already described in the RASD, such as reliability, availability, scalability, security, maintainability, and portability. The following sections revisit availability, scalability, and security to emphasize their importance in the system.

G.1. Observer Pattern

The Observer pattern is particularly useful when multiple objects need to be notified about a change in the state of another object. In the context of the S&C platform, a large number of functionalities require the participation of multiple objects, such as notifying users about the results of an interview or updates on the status of an application.

G.2. State Pattern

The State pattern is recommended to efficiently manage operations across different states and handle transitions between them, as it allows objects to change their behavior when their internal state changes. In the context of the S&C platform, the State pattern can be used to manage the lifecycle of an application for a internship position.

G.3. Availability

The system is designed to be highly available, ensuring that users can access the platform at any time, as described in the RASD, with at least 99.8 percent uptime. To achieve this, critical components should be replicated across multiple servers to provide redundancy and fault tolerance in case of failure. Load balancing is correctly configured to distribute incoming traffic, preventing overload on any single server. Continuous monitoring of the system's performance allows for the detection and resolution of any issues that may arise in real-time.

G.4. Scalability

The platform is designed to handle increased user loads in the future by scaling individual layers independently, thanks to the architectural styles and patterns mentioned earlier. As described in the RASD, the system can be scaled horizontally by adding more servers or vertically by increasing the resources of existing servers, without affecting performance. This scalability is essential, especially as the number of users grows, leading to a higher volume of application requests over time.

G.5. Security

The system is designed to ensure the privacy and security of user data both during transmission over the network and while stored in the database. This includes the use of authentication and authorization mechanisms to ensure that only authorized users can access the system, reducing the risk of unauthorized access. Additionally, a firewall and

Intrusion Detection System (IDS) are set up in the network to protect the system from external threats and attacks. Protocols like HTTPS are used to encrypt communication between the client and server, and other encryption algorithms are employed to protect sensitive data stored in the database, such as user passwords.

3 | User Interface Design

A. User Interface Design

In this section, the user interface design will be presented using mockups within the short description. The design focuses on optimizing the user experience and ensuring that the user can easily navigate on the website to perform the desired actions. There will be separate subsections to describe more clearly the main pages needed to satisfy the user requirements.

A.1. Welcome Page

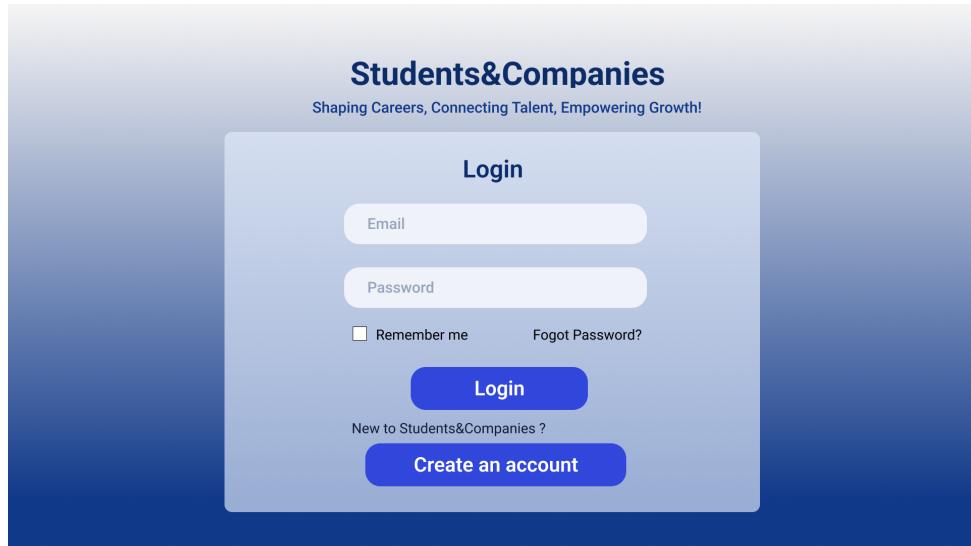


Figure 3.1: Welcome Page

A.2. Register Page

If the User is not registered and wants to create an account, they will be asked to choose the type of account they want to create. Clicking on the type listed will redirect to the corresponding Register Page where the user can fill in the required information.

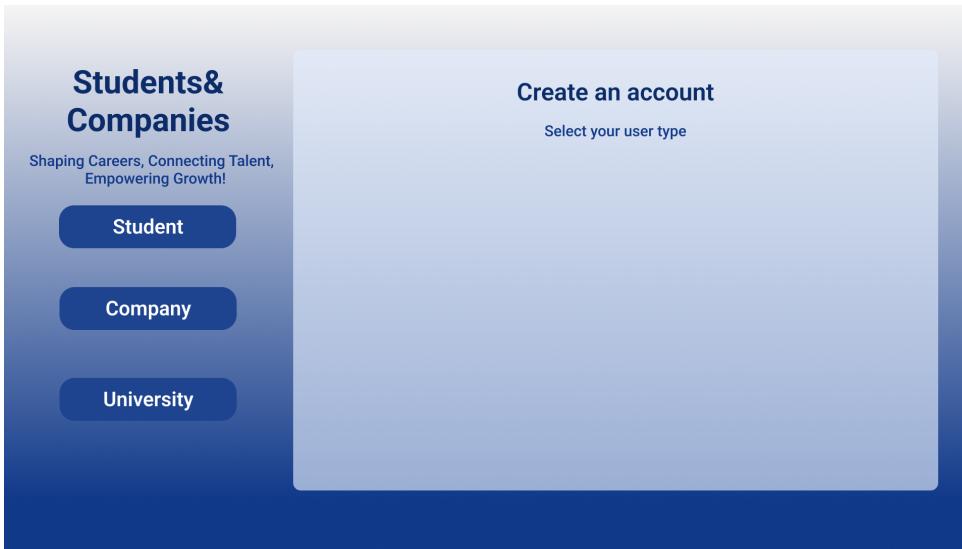


Figure 3.2: Register Page

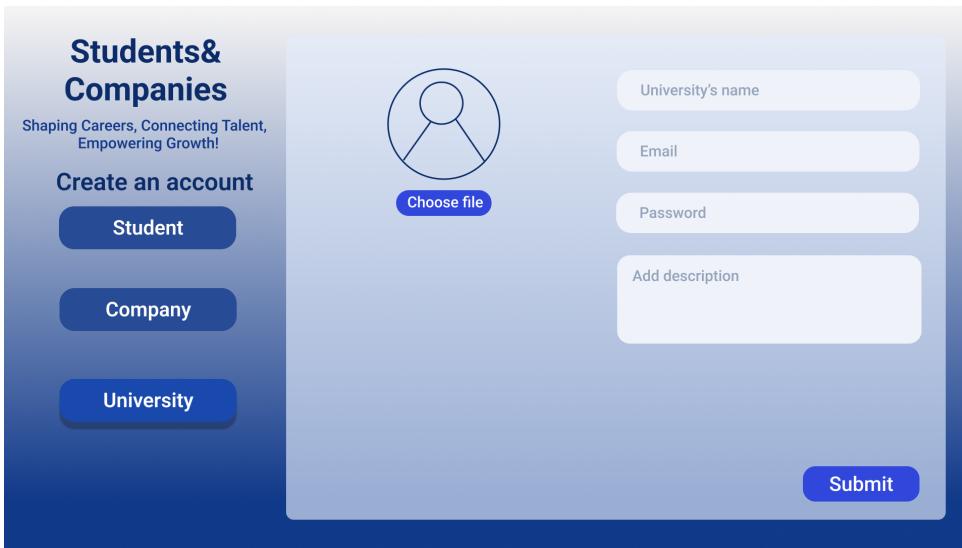


Figure 3.3: University create account

The screenshot shows the 'Create an account' section for students. It features a sidebar with 'Students&Companies' logo and 'Shaping Careers, Connecting Talent, Empowering Growth!' tagline. Below this are three buttons: 'Student', 'Company', and 'University'. The main form area has a placeholder profile picture with a 'Choose file' button. It includes fields for Name, Surname, Email, Password, and a dropdown for 'Select your university'. There are also sections for 'Add fields you're interested in:' (Robotics, Space, Software) and 'Add your skills:' (C++). A 'Upload your CV' field with a 'Choose file' button is also present. A large blue 'Submit' button is at the bottom right.

Figure 3.4: Student create account

The screenshot shows the 'Create an account' section for companies. It has the same sidebar as Figure 3.4. The main form area has a placeholder profile picture with a 'Choose file' button. It includes fields for Legal Name, EIN, Department, Email, Password, and a text area for 'Add description'. There is also a section for 'Add fields the company focus on:' (AI, Software). A large blue 'Submit' button is at the bottom right.

Figure 3.5: Company create account

A.3. Student's view

Once access to the platform, to optimizing the user experience, the student will be able to use the side menu to navigate the main functionalities provided by the platform to satisfy their needs.

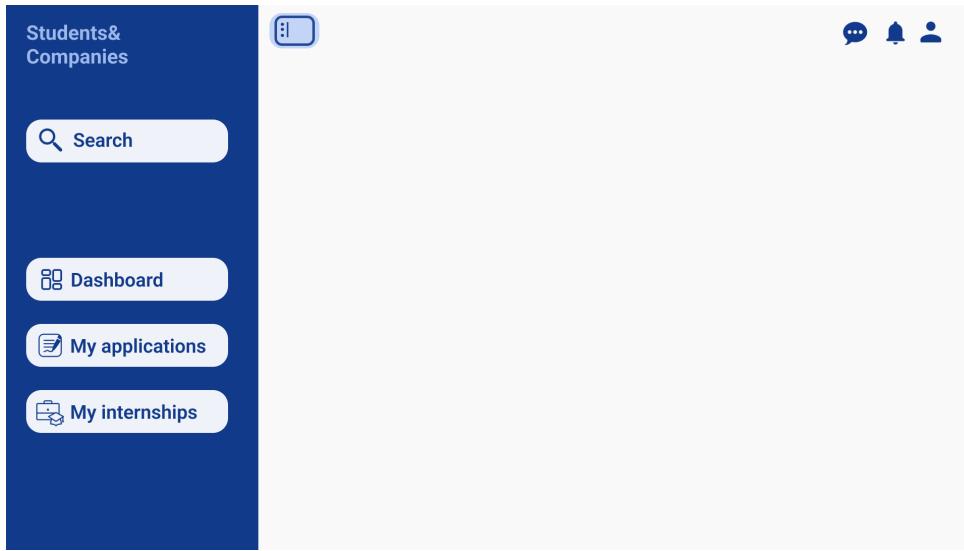


Figure 3.6: Student's Side Menu

By default, the student will be directed to the Dashboard page once logged in.

Application Details	Status
ChatGPT - NLP Engineer 20th Dec. 2024	WAITING
ChatGPT - NLP Engineer 20th Dec. 2024	WAITING
ChatGPT - NLP Engineer 20th Dec. 2024	WAITING
ChatGPT - NLP Engineer 20th Dec. 2024	WAITING

Figure 3.7: Student's Dashboard 1

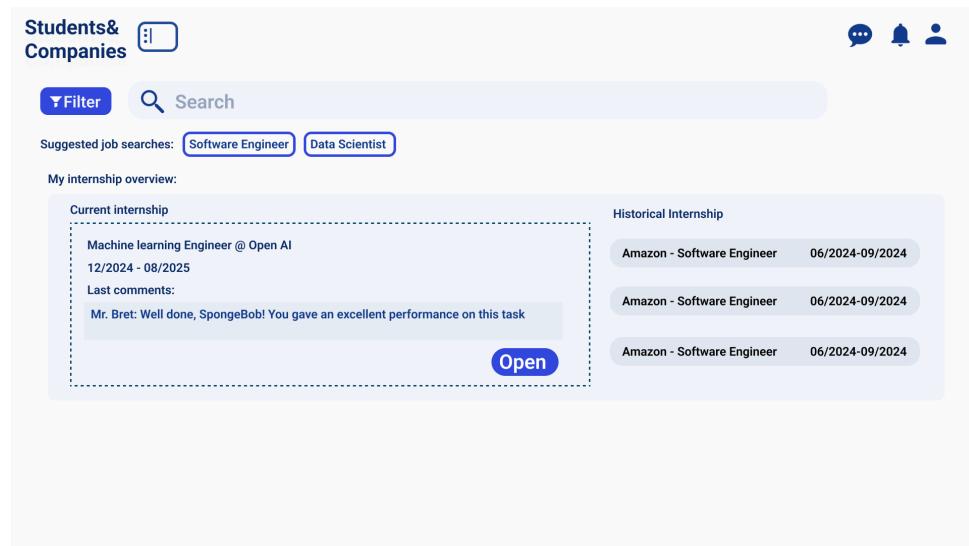


Figure 3.8: Student's Dashboard 2

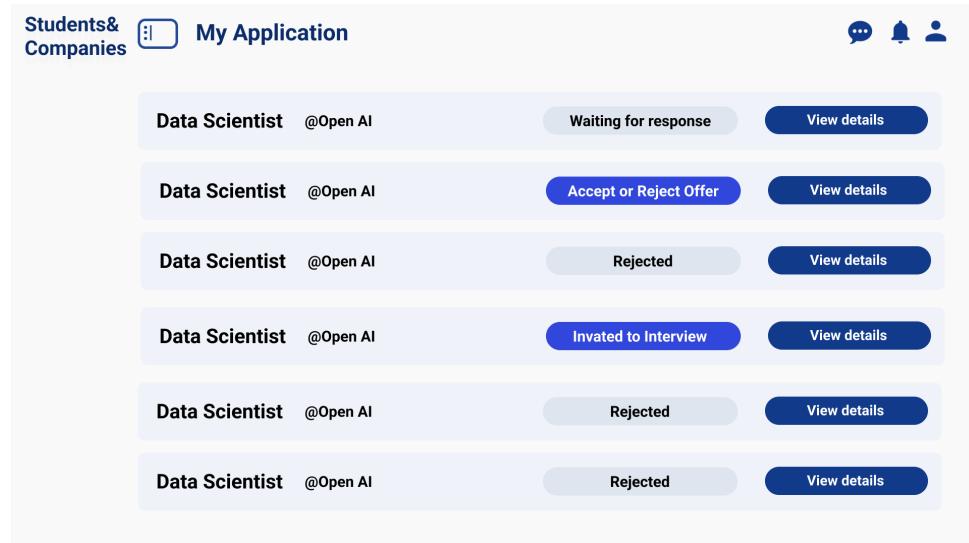


Figure 3.9: My application

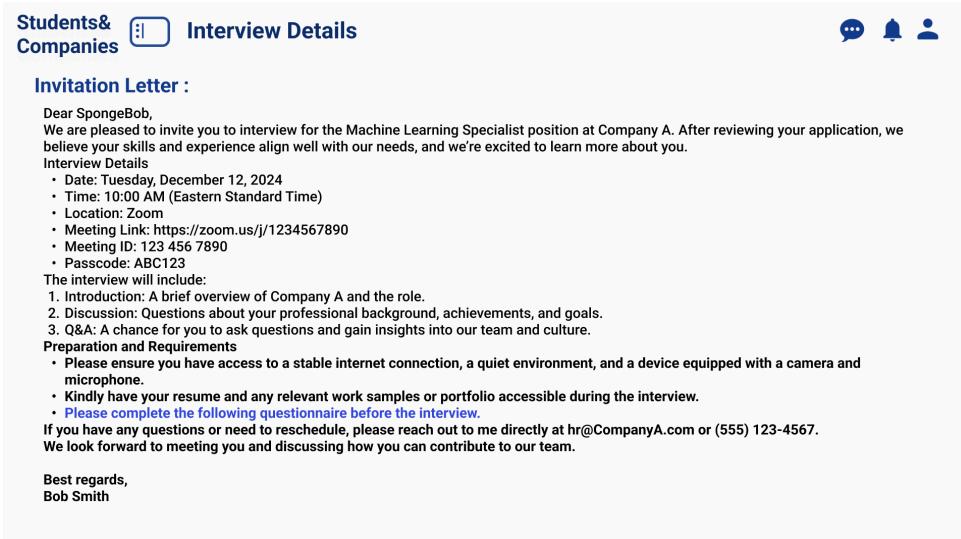


Figure 3.10: Interview details 1

Students& Companies Interview Details

Pre- Interview questionnaire:

- 1. Why did you choose to apply for this internship at Company A?**

Enter your answer here

- 2. What specific skills or knowledge are you hoping to gain during this internship?**

Enter your answer here

- 3. Describe a situation where you solved a problem or overcame a challenge in a project or class.**

Enter your answer here

- 4. What unique skills or perspectives can you bring to our team?**

Enter your answer here

Figure 3.11: Interview details 2

Students& Companies Interview Details

Pre- Interview questionnaire:

5. What do you consider your greatest strength as it relates to this internship?

Enter your answer here

6. How do you handle feedback or constructive criticism?

Enter your answer here

7. Are there any particular areas or tasks in this internship that you are especially excited about?

Enter your answer here

Submit

Figure 3.12: Interview details 3

Students& Companies Offer

Offer Letter :

Dear SpongeBob,
We are pleased to offer you the position of Machine Learning Specialist Intern at Company A. After reviewing your application and interview, we're confident that your skills and enthusiasm make you a great fit for our team. Congratulations!

Internship Details

- Start Date: January 15, 2025
- End Date: April 15, 2025
- Schedule: Monday to Friday, 9:00 AM - 3:00 PM
- Location: Company A headquarters, 123 Innovation Drive, Tech City
- Supervisor: Patrick Star, Senior Data Scientist

During the internship, you'll assist with developing machine learning models, analyzing datasets, and deploying solutions to real-world problems.

Compensation & Benefits

- Stipend: \$1,500/month
- Benefits: Workshops, mentorship, and networking opportunities

Next Steps

Please [accept or reject the offer by clicking the button below](#) by December 12, 2024. For any questions, feel free to contact me at hr@companya.com or (555) 987-6543.

We look forward to having you on board!

Best regards,
Patrick Star

Accept Offer **Reject Offer**

Figure 3.13: Accept or Reject Offer

Current Internship:

Company: OpenAI
Data Scientist

Description overview:

Add Comments

Historical Internships:

Data Scientist
25th Dec. 2023 - 15th July 2024
Company - Amazon

Description overview:....

Data Scientist
25th Dec. 2023 - 15th July 2024
Company - Amazon

Description overview:....

View details

View details

Figure 3.14: My internship

A Company A

Data Scientist Intern open

1 day ago

Milan, Lombardy, Italy

Application deadline: 15th Dec. 2024

Position available: 2

On-site, full time

Apply

Description of the job:

- Qualifications: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
- Benefits: Ut enim ad minim veniam, quis nostrum exercitationem ullamco laboriosam, nisi ut aliquid ex ea commodo consequat.
- Overview: Duis aute irure reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint obcaecat cupiditat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Figure 3.15: Internship announcement details

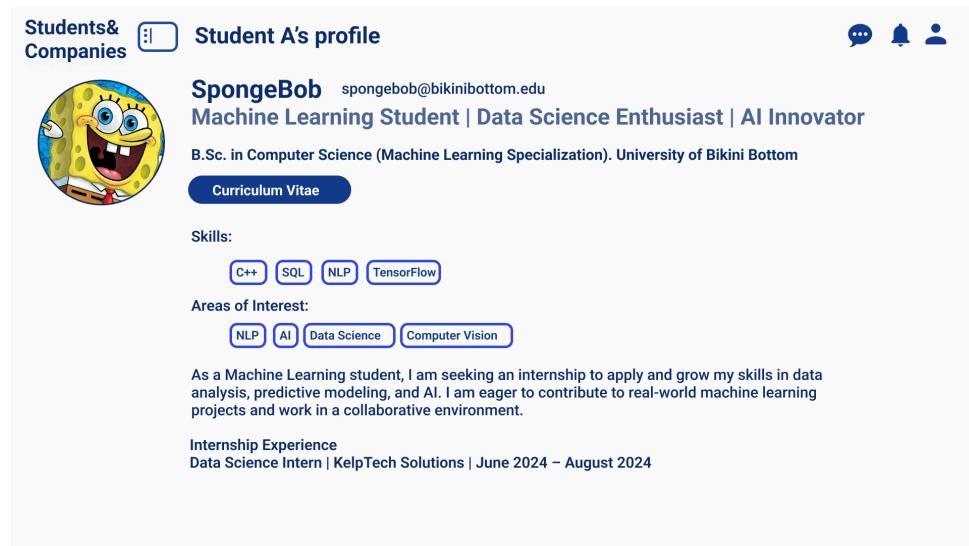


Figure 3.16: Student's profile from other's view

A.4. Company's view

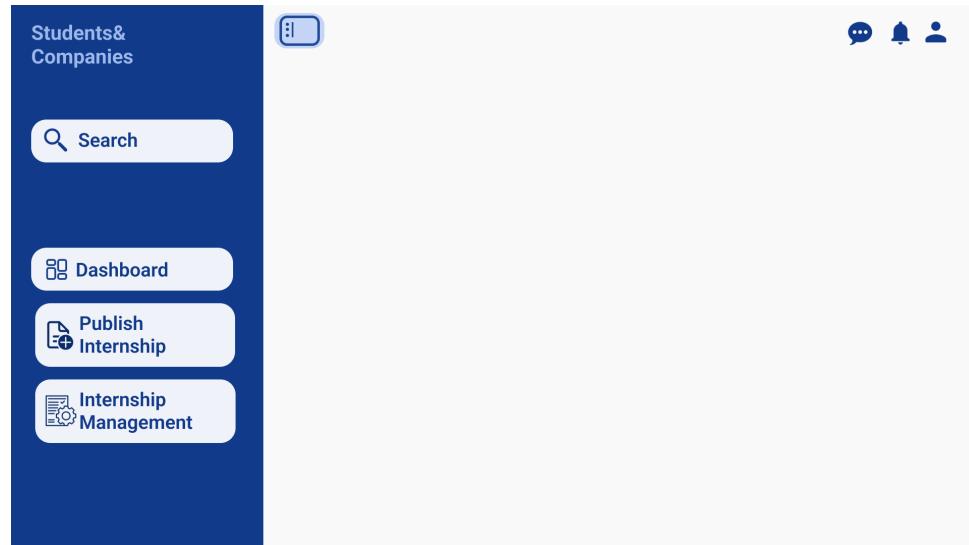


Figure 3.17: Company's Side Menu

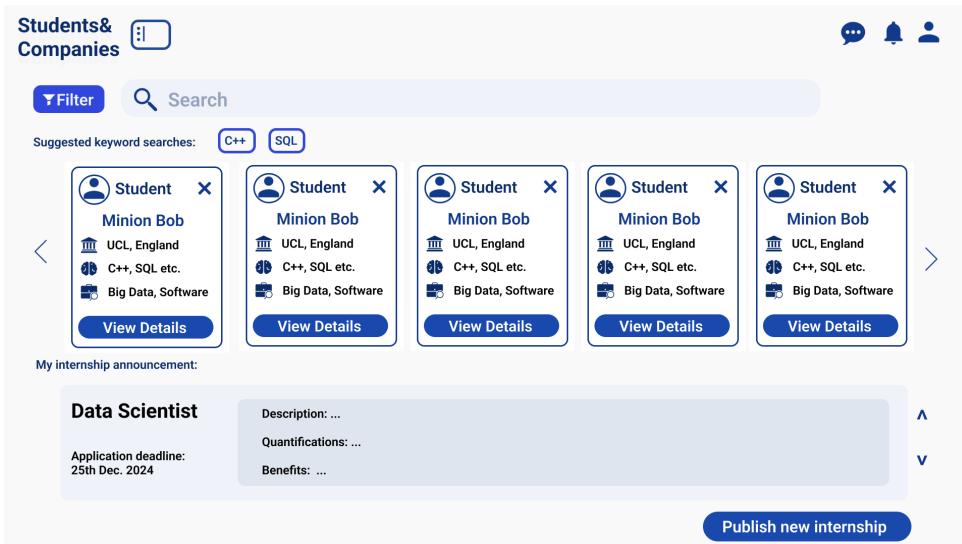


Figure 3.18: Company's Dashboard 1

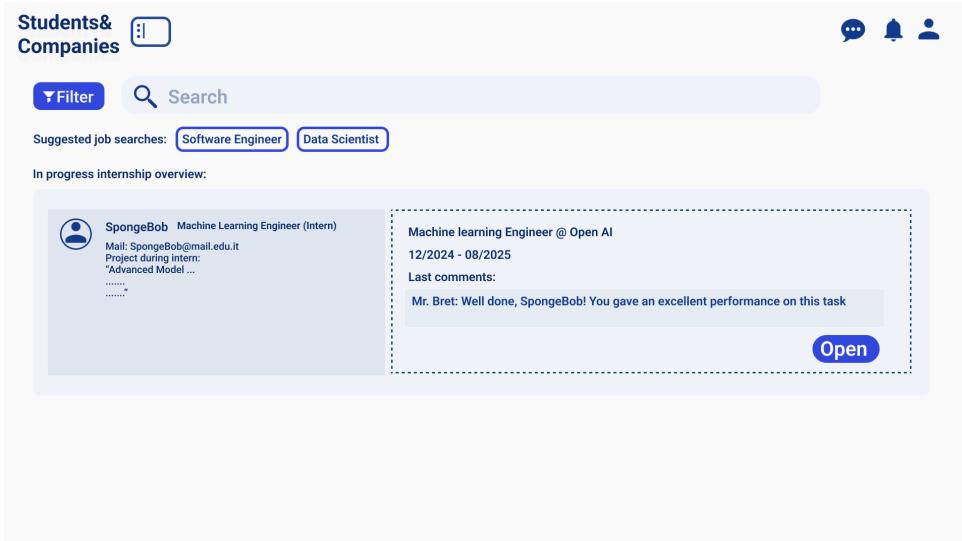


Figure 3.19: Company's Dashboard 2

The screenshot shows a form titled "Publish Internship" for "Students& Companies". The form fields include:

- Role type:** role of Internship
- Employment type:** part-time, full time etc.
- Location:** location
- Work site:** on-site, online etc.
- Number accept:** number accept
- Application deadline:** gg/mm/year
- Qualifications:** requirements etc.
- Benefits:** lunch, opportunity etc.
- Overview description:** others

A blue "Publish" button is located at the bottom right of the form area.

Figure 3.20: Publish Internship

The screenshot shows the "Internship Management" section for "Students& Companies". It displays three internships:

- Data Scientist**: Application deadline: 25th Dec. 2024, current n.application: 5, n. accept: 2. Includes "View details" and "Select Candidates" buttons.
- Data Scientist**: Application deadline: 25th Dec. 2024, current n.application: 5, n. accept: 2. Includes "View details" and "Select Candidates" buttons.
- In selection:** **Data Scientist**: Description overview: Includes "Select Candidates" button.
- In progress:** **Student: SpongeBob**, **Data Scientist**: Description overview: Includes "Add Comments" button.

Figure 3.21: Internship Management 1

The screenshot shows a user interface for managing internships. At the top left, there's a header with 'Students& Companies' and a blue square icon. On the right side of the header are three small icons: a speech bubble, a bell, and a person. Below the header, the text 'Completed:' is displayed. There are three identical-looking card-like components, each representing an internship position:

- Data Scientist**
- 25th Dec. 2023 - 15th July 2024
- Student Super Mario
- Description overview:...
- View details**

This pattern repeats three times, indicating multiple completed internships.

Figure 3.22: Internship Management 2

The screenshot shows a detailed view of an internship listing. At the top left, it says 'Students& Companies' and has a blue square icon. On the right side of the header are three small icons: a speech bubble, a bell, and a person. The main content area starts with a section labeled 'A Company A'. Below this, the title 'Data Scientist Intern' is shown with an 'open' status indicator. The listing includes the following information:

- 1 day ago
- 📍 Milan, Lombardy, Italy
- ⌚ Application deadline: 15th Dec. 2024
- Position available: 2
- On-site, full time
- Description of the job:**
- A bulleted list of qualifications, benefits, and an overview.

Figure 3.23: Internship details in publishing phase



Figure 3.24: Select candidates

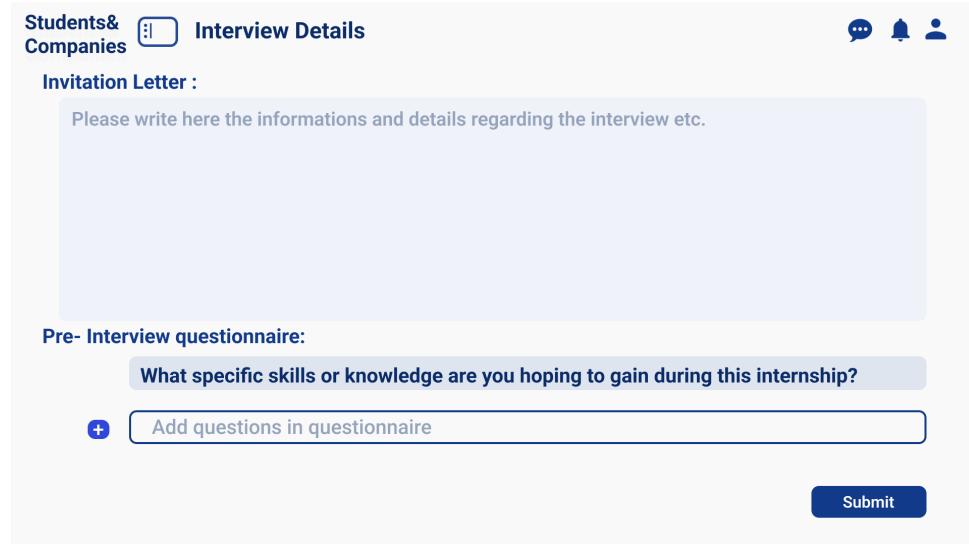


Figure 3.25: Set up interview

A.5. University's view

Students& Companies **Comments(Feedback&Complaint)**

Data Scientist Intern **Description of the job:**

1 day ago
 Milan, Lombardy, Italy
 Application deadline: 15th Dec. 2024
Position available: 2
On-site, full time

- Qualifications: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
- Benefits: Ut enim ad minim veniam, quis nostrum exercitationem ullamco laboriosam, nisi ut aliquid ex ea commodo consequat.
- Overview: Duis aute irure reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint obcaecat cupiditat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Feedback&Complaint section:

Write here...

Submit

Figure 3.26: Feedback and Complaint

Students& Companies **KELPTECH SOLUTIONS's profile**

KELPTECH SOLUTIONS info@kelptechsolutions.com
Technology

123 Innovation Drive, Suite 789, Bikini Bottom City, Ocean Floor

KelpTech Solutions is an innovative technology company located in Bikini Bottom City, specializing in Artificial Intelligence, Machine Learning, and Computer Vision. We are at the forefront of developing cutting-edge solutions that blend the latest advancements in AI with consumer behavior analysis. Our flagship project aims to revolutionize the food industry by creating a Hamburger Preference Detector that uses visual knowledge to predict and personalize hamburger preferences for consumers.

Through the use of machine learning models and image recognition technology, KelpTech's system can analyze visual data of hamburgers and understand the ingredients, presentation, and even customer reactions to recommend the ideal burger for any individual. We aim to transform how consumers interact with food, making dining experiences more personalized and enjoyable.

Specialization:

Announcements Published

Machine Learning Intern @KelpTech Solutions

Figure 3.27: Company's profile from other's view

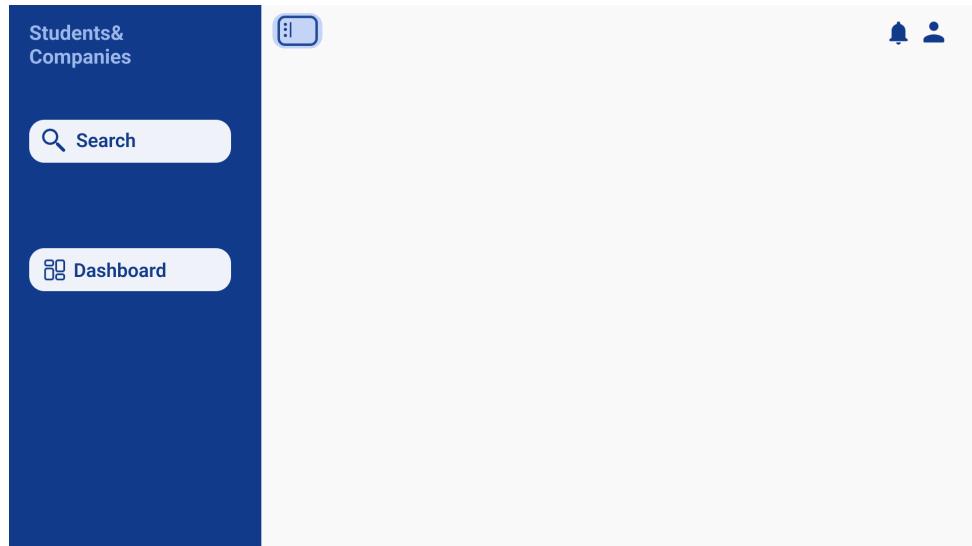


Figure 3.28: University's Side Menu

A screenshot of a university dashboard. At the top left is the text "Students& Companies" and a square icon. To the right are two icons: a bell and a person. Below this is a search bar with a magnifying glass icon and the word "Search". On the left, there is a "Filter" button and a "Student list" section. The student list shows two entries for "SpongeBob": one in a blue box and one in a grey box. Each entry includes a profile picture, the name "SpongeBob", a list of skills ("C++, SQL, ML, historical internship, Machine learning Engineer"), and a "Profile details" button. On the right, there is a section titled "SpongeBob's activities" which lists three "Data Scientist" roles. Each role entry includes the title, dates ("25th Dec. 2023 - 15th July 2024"), company ("Company - Amazon"), and a "View details" button.

Figure 3.29: University's Dashboard 1

The screenshot shows a user interface for posting feedback and complaints. At the top, there are navigation links for 'Students& Companies' and 'Comments(Feedback&Complaint)'. On the right, there are icons for messaging, notifications, and user profile. Below this, a job listing for a 'Data Scientist Intern' is displayed. The listing includes a timestamp ('1 day ago'), location ('Milan, Lombardy, Italy'), application deadline ('15th Dec. 2024'), and position details ('Position available: 2 On-site, full time'). To the right of the listing is a 'Description of the job:' section with three bullet points. Below the listing is a large input field labeled 'Feedback&Complaint:' and another labeled 'Final evaluation:'.

Students& Companies **Comments(Feedback&Complaint)**

Data Scientist Intern [close](#)

1 day ago

📍 Milan, Lombardy, Italy

⌚ Application deadline: 15th Dec. 2024

Position available: 2
On-site, full time

Description of the job:

- Qualifications: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
- Benefits: Ut enim ad minim veniam, quis nostrum exercitationem ullamco laboriosam, nisi ut aliquid ex ea commodi consequatur.
- Overview: Duis aute irure reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint obcaecat cupiditat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Feedback&Complaint:

Final evaluation:

Figure 3.30: Feedback and Complaint

4 | Requirements Traceability

5 | Implementation, Integration and Test Plan

6 | Effort Spent

7 | References