POLITECNICO MILANO 1863

Requirement Analysis and Specification Document

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Contents

List of Figures

List of Tables

1 Introduction

1.1 Purpose

The purpose of the Students & Companies (S&C) project is to create a platform that efficiently matches university students with suitable internship opportunities based on their skills, experiences, and preferences, while also meeting the needs of companies seeking to recruit talent. The platform streamlines the entire internship process, from profile creation and internship listings to matching, interview management, and feedback collection. It aims to improve the overall internship experience, enhance the selection process, and provide universities with tools to monitor and ensure the quality of internships, ultimately benefiting students, companies, and academic institutions alike.

The S&C platform creates a dynamic ecosystem where students, companies, and universities collaborate seamlessly to improve the internship matching process. The system's features not only save time for both students and companies but also enhance the quality and success of internships, ultimately leading to more fulfilling and productive experiences for all parties involved.

1.1.1 Goals

G1 Allows registered students to create their profile and CV and search for internships and apply to them.

G2 Allows registered companies to create and post advertisement for available internship roles and select suitable candidate.

G3 Provide an efficient and intelligent matchmaking process between students and companies based on the students' skills and preferences, the companies' internship descriptions.

G4 Support both students and companies during the selection process, including interview scheduling, questionnaire, feedback collection, and facilitating communication.

G5 Allows registered universities to monitor the internship statuses of their students and take action on any issues or complaints.

1.2 Scope

The scope of the Students & Companies (S&C) platform encompasses the entire process of internship matching and management, addressing the needs of students, companies, and universities. The platform facilitates efficient connections between students seeking internships and companies that offer opportunities. This section analyzes the world phenomenon, machine phenomenon and the shared phenomena that the system will address.

1.2.1 World Phenomena

WP1 Students seek internships to gain professional experience and improve their employability.

WP2 Companies offer internships to attract new talent and provide training.

WP3 The company gets ready for the interview and gathers questions and criteria to evaluate the student based on them.

WP4 The student and the company recruiter participate in the interview.

WP5 The company decides on the result of the interview and selection process.

WP6 The university decides to take different actions regarding the resolution of the complaint.

WP7 Universities monitor internships to ensure compliance with educational goals and prevent issues such as internships that do not meet academic standards or are exploitative.

1.2.2 Machine Phenomena

MP1 The system applies matching algorithms based on the analysis of students' CVs, skills, experiences, and the nature of internships (project description, company benefits).

MP2 The system uses keyword searches, statistical analysis, and machine learning to recommend relevant internships to students.

MP3 The feedback received from users on previous matches is used to improve future recommendations.

1.2.3 Shared Phenomena

World Controlled

SP1 The user (Student, Company, University) signs up to the S&C platform.

SP2 The students create their CV by filling out some fields regarding their experiences, technical skills, and soft skills.

SP3 The companies write about their internship and projects in the system by filling in some fields.

SP4 The user (student or company) accepts or rejects the recommended match.

SP5 The company creates a questionnaire for the selection process within the system.

SP6 The student answers the questionnaire within the system and submits their answers.

SP7 The user (student or company) inserts their available times in the calendar within the system.

SP8 After the interview, the company can update the finalize decision regarding selection of a student in the S&C system.

SP9 The user (student or company) gives feedback on the recommendation of the system by giving a number to it from 1 to 5 and answering specific questions on what went wrong or could have been better.

SP10 The user (student or company) clicks on the complaints button and there writes their complaint.

SP11 The university sees the complaint about which was notified.

SP12 The university sends a message to either one of the parties that they have something to say about the complaint.

Machine Controlled

SP1 The system gives suggestions to students on how to write a better CV.

SP2 The system gives suggestions to companies on how to write a better description of the internship.

SP3 The system notifies students and companies of the best matches made among internships/projects from the statistical analyses or keyword searching.

SP4 After both parties accept the recommendation, the system opens a messaging channel.

SP5 The system initiates the selection process and by that sends the company's questionnaire to the student.

SP6 The system provides a calendar to both the company and student to select respective available time.

SP7 After both parties insert their available times, the system suggests a time which is appropriate for both parties.

SP8 If there is no match made between the available times of company and the student, the system will notify both parties to consider other parties available times and try to work it out.

SP9 The system supports video-conferencing and creates a meeting link based on the decided date and time.

SP10 The system notifies both parties about the meeting link.

SP11 The system sends reminders about the interview meeting to both parties.

SP12 The system asks both parties about how they evaluate the recommendation of the system and asks them to rate it from 1 to 5 and give suggestions on what could have been improved.

SP13 The system notifies the university of the student about the complaint and its details.

1.3 Definitions, Acronyms, Abbreviations

In this section some information about terminology is provided, in order to clarify terms, acronyms, and abbreviations used in the document, ensuring easy understanding and reference for readers.

1.3.1 Definitions

- **Student:** Student is a type of user who is looking for an internship.

- **Company:** Company is a type of user which has internship positions available and searching for students to fill those positions.

- **University:** University is a type of user who monitors the ongoing selection process between a student and a company.

1.3.2 Acronyms

- **C&S:** Company & Students, that is the name of the platform.

1.3.3 Abbreviations

- **WPn:** n-th World Phenomena

- **SPn:** n-th Shared Phenomena

- **Gn:** n-th Goal

- **Dn:** n-th Domain Assumption

- **Rn:** n-th Requirement

1.4 Revision History

Revised On	Version	Description
22-Dec-2024	1.0	Initial Release of Document

Table 1: Revision History

1.5 Reference Documents

- Assignment document A.Y. 2024/2025
  (Requirement Engineering and Design Project: goal, schedule and rules)

- Software Engineering 2 A.Y. 2024/2025 Slides
  (Lecture slides provided during the course)

2   Overall Description

2.1   Product Perspective

The Students&Companies (S&C) platform is a web-based application designed to bridge the gap between university students seeking internships and companies offering them. It serves as a central hub for both parties to connect, collaborate, and manage internship opportunities efficiently. The platform is built around a dynamic matching system that leverages students' profiles, including skills, experiences, and preferences, and pairs them with internships based on the specific needs of the companies.

The platform operates within the broader context of academic institutions, employers, and career services, providing a seamless integration between students' academic backgrounds and companies' internship requirements. For companies, S&C offers tools to post internship opportunities, review applications, and manage the selection process. For students, it facilitates an intuitive search and application process, along with notifications for new internships that match their profile.

Additionally, the platform incorporates a recommendation engine that uses algorithms ranging from simple keyword matching to more sophisticated statistical analyses to ensure the best possible fit between students and internships. By providing an organized environment for companies, students, and universities, the S&C platform helps streamline the often complex process of internship placement, improving the overall experience for all parties involved. Through feedback systems and monitoring tools, it ensures continuous improvement and responsiveness to user needs.

2.1.1   Scenarios

- **Scenario 1 : Signing up and logging in -** User ("S", "C", "U" [1]) creates an account in the S&C platform by providing necessary details such as name, email and setting up of password. After successfully completing the registration the user logs in into the platform.

- **Scenario 2 : S creates their profile -** Once logged in, S creates a detailed profile by entering information such as skills, academic grades, relevant experience, and personal details. Additionally, S creates their CV in the platform. The systems gives recommendation to S on writing better CV to ensure the system can better match them with relevant internship opportunities.

- **Scenario 3 : S searches for internships -** S navigates to the search panel within the platform. S enters desired keywords related to job titles, roles, or skills (e.g., "data analysis", "software development", "marketing intern") to find relevant internship openings. The platform uses an intelligent recommendation engine to display internship openings that best match the keywords entered by S. The results are listed in order of the most relevant matches, based on S's profile data (skills, experience, etc.)

- **Scenario 4 : S applies to internships -** S clicks on a listed internship to open and view the full description. The internship page includes details such as project description, tasks, required skills, company benefits, work conditions (paid/unpaid), and duration. S can also see the company's name and location. S finds an suitable internship and apply directly through the platform by clicking on the "Apply" button. The application is sent to the corresponding company for review containing profile and CV of S.

- **Scenario 5 : C posts an internship -** After logging in the platform, to post an advertisement of an available position of an intern 'C' clicks on the 'Post a job' button and then fills out the form regarding the position details like job title, required skills, responsibilities, job location and duration. Once all the details are filled C clicks on the 'Submit' button to post it on the platform.

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[1]These represent, respectively, an instance of, Student, Company Recruiter, and University Administrator.

After posting C can quickly see a list of all students who are recommended by the system. On clicking of any of the students name C is transferred to the students profile containing the students information and CV. C can also create a questionnaire for the students to answer when their profile is shortlisted.

- **Scenario 6 : C notified of students who have applied -** Whenever any student applies to the position posted by 'C', 'C' is notified instantly in the C&S platform. On clicking of the students name C is transferred to the students profile containing the students information and CV.

- **Scenario 7 : S&C matches S and C -** S&C, the systems gathers information from the key words (skills, experiences) from students' profiles and company's job descriptions and feeds the data to its recommendation model and comes up with a match of S and C. The system then notifies both S and C of this match. Then S and C can either accept or reject the recommendation.

- **Scenario 8 : Selection Process**

  - **Scenario 8.a : C and S both accept S&C recommendation -** Once both C and S accept the recommendation a communication channel is opened between them where C can ask for additional information from S. The questionnaire is automatically forwarded by the system to S. S then can fill out the questionnaire and submit. Based on the S's answer C can decide to move forward or not with S.

  - **Scenario 8.b : C accepts S's direct application -** Once C accepts S's application the same process in 8.a happens.

- **Scenario 9 : C selects students for interview -** After reviewing the students, C selects those they want to interview and schedules interviews through the platform. Company C uses the platform's interview scheduling tool to set up a date and time for the interview. The tool integrates with calendar systems to avoid scheduling conflicts. The student receives an email or notification through the platform about the scheduled interview. The notification includes all relevant details such as date, time, and any specific instructions (e.g., virtual meeting link, required documents). C conducts the interview on decided date and time.

- **Scenario 10 : C finalizes recruitment decision -** After the interview, Company C decides whether to hire or reject S by updating on the S&C system. The student is notified and it is recorded on the system to be viewed by all the users.

- **Scenario 11 : Platform Feedback collects from C and S after interview -** After the selection process finishes S&C collects feedback from both S and C by asking them to fill out a feedback form and letting it know of any suggestion on how to improve the statical analysis and recommendation model. Also, C and S will rate the recommendation from 1 to 5 stars.

- **Scenario 12 : S&C Monitors Internship Progress -** Users can navigate to the monitoring section to view all internship details. S and C can give feedback and raise issues inside the system. U can monitor internship progress of all it's students along with details about the internships they have applied to and their current status (e.g., awaiting interview, accepted, in-progress).

- **Scenario 13 : U handles complaints -** If a student or company raises an issue that requires intervention (e.g., internship termination, disputes), U is notified and takes necessary actions. The decision is then updated in the system and forwarded to students and companies.

2.1.2 Class Diagram
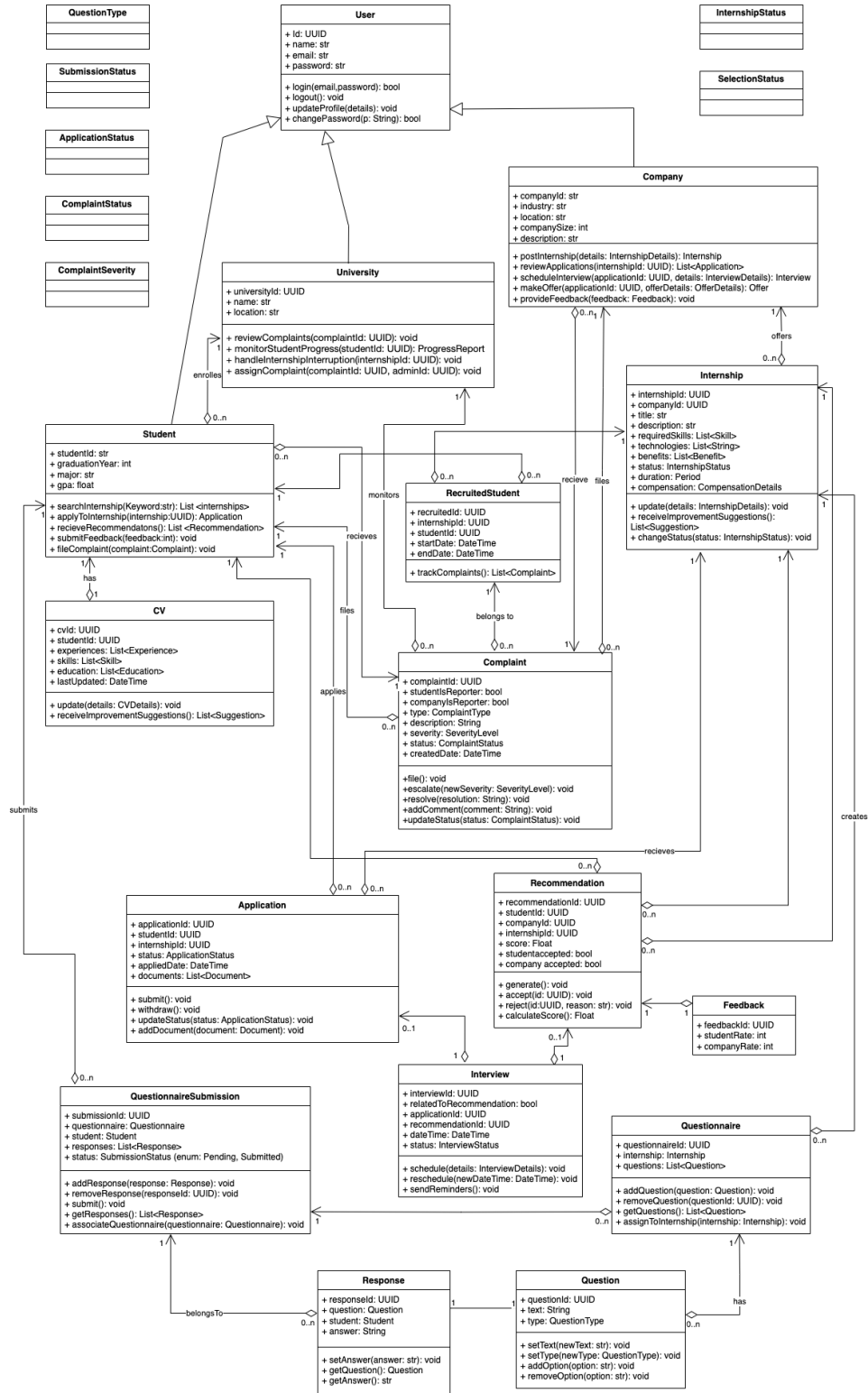
Figure 1: Class Diagram.

2.1.3 State Charts

In this section we present some state diagrams for the classes that their behavior goes through different states throughout their life cycle.
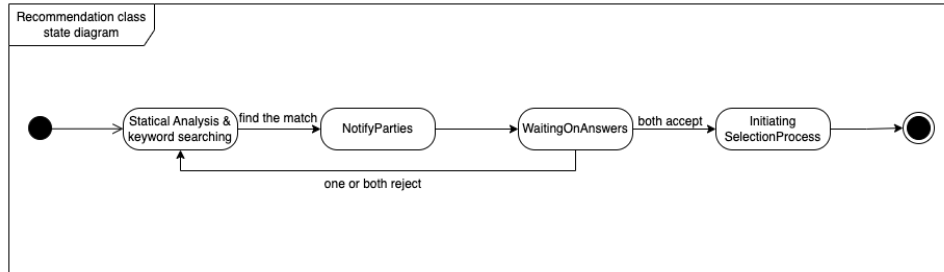
Figure 2: Recommendation class State Diagram.
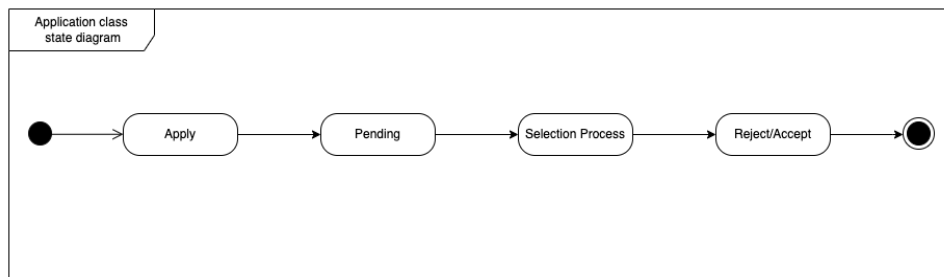
Figure 3: Application class State Diagram.
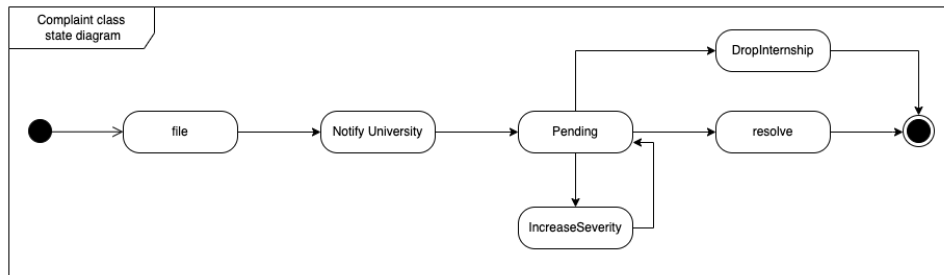
Figure 4: Complaint class State Diagram.

2.2 Product Functions

The platform C&S offers several key functions:

- **Student Profile Creation -** Students can create an account, log in, and set up a personalized profile by entering details such as skills, academic background, work experience, and creating their CVs. Recommendations for better CV is given by the C&S platform.

- **Internship Search & Application -** Students can search for internships based on various criteria, such as job title, skills required, project domain, location, and internship terms (paid/unpaid, benefits, etc.).The platform presents a list of available internships, ranked according to relevance, and allows students to apply directly through the system.

- **Company Internship Posting -** Companies can post internship opportunities, specifying the project details, required skills, benefits, and terms. Companies can edit, deactivate, or remove internship postings and view applications received from students. Recommendations for better job posting ideas are given by the C&S platform.

- **Matching Students and Internships -** The systems gathers information from the key words (skills, experiences) from students' profiles and company's job descriptions and feeds the data to its recommendation model and comes up with a match between students and internships.

- **Selection Process Support -** The platform supports the internship selection process, providing tools to schedule and manage interviews, track application statuses, and maintain communication between students and companies.

- **Interview Scheduling -** Companies can review student applications, shortlist candidates, and schedule interviews (either through integrated video calls or in-person meetings). Companies can use structured questionnaires or direct interviews to assess the suitability of candidates.

- **Feedback & Evaluation -** After an internship, both students and companies can provide feedback on the internship experience. This feedback is used for improving future recommendations and matching processes. Universities can monitor feedback to ensure academic standards are met and intervene if necessary.

- **Monitoring Progress -** Users can monitors the progress of an internship after the internship has started. Students can Companies can raise complaints.

- **Handling Complaints -** Universities can access a dashboard to track student internship placements, ensure compliance with academic requirements, and mediate any issues or complaints related to internships.

2.2.1 Requirements

R1 The S&C system allows new users (students, universities and companies) to register by giving their credentials (e.g., name, email address, password).

R2 The system allows users (students, universities and companies) to login.

R3 The system allows students to create and update their profile (experience, skills, CV).

R4 The system allows companies to create and update company's profile (about, field of work, achievements).

R5 The system allows universities to create and update their profile.

R6 The system helps students in creating their CVs by giving intelligent suggestion for making a stronger CV and pointing out mistakes.

R7 Students can search for internship opportunities clicking on "Search" button.

R8 Students can apply to desired internship by clicking on "Apply" button for an internship post.

R9 The system provides personalized recommendations to the students for internships based on students profiles and skills which matches with available internships.

R10 Students can automatically apply to any recommended internship by clicking on "Accept" button.

R11 Companies can post internship opportunities and description which includes application domain, tasks to be performed, skills required.

R12   The system can provide recommendations to improve the internship posts by companies.

R13   The companies can prepare a questionnaire in the system to be forwarded to the students to get additional information from them when the selection process starts.

R14   The system can recommend companies about available students who match the job description and skills by applying statical analysis based on the characteristics of students and internships.

R15   The system notifies students and companies once everyday to recommend new matches.

R16   Companies can track applications and review candidate CVs.

R17   Companies can accept or reject an application or a suggestion by the system by clicking on "Accept" or "Reject" buttons for each application.

R18   A messaging channel is opened when a recommendation is accepted by both student and company or an application by student is accepted by company.

R19   The prepared questionnaire is for forwarded to the student.

R20   The system helps in management of the selection process by scheduling of interview.

R21   The system sends interview link or interview location to both student and company.

R22   The system allows the company to update the interview results.

R23   Interview results are updated in the platform and users are notified.

R24   The system collects feedback from students and companies to then use the gathered data to better its analysis and recommendation algorithm.

R25   The system has a dedicated page to keep track and monitor all the ongoing search and selection processes for all three type of users (students, university, companies).

R26   During the selection process and during interview the involved parties can raise concerns or complains which will be monitored by the university.

R27   The system allows the university to decide on required actions to perform like warning to respective parties or interruption of internship and updates the same on the platform.

2.3   User Characteristics

- **Students -** The Students using the Students&Companies (S&C) platform are primarily university students. Students familiar with using online platforms for various purposes such as job searching, networking, and academic management. Students create detailed profiles on the platform, including their skills, experiences, and academic achievements, and regularly update their CVs. Their primary goal is to find internship opportunities that align with their academic background, career interests, and personal preferences. They use the platform's search features to explore available internships, apply directly through the system, and receive personalized recommendations based on their profile. Students are proactive in tracking application statuses and attending interviews, and they often seek guidance on improving their CVs and profiles to increase their chances of landing a suitable internship.

- **Companies -** Companies, ranging from small startups to large multinational corporations, use the S&C platform to find and recruit university interns. The companies have dedicated HR teams who uses different platforms to search for fresh talents. Their main goal is to attract qualified candidates

who possess the skills and attitudes needed to contribute to their organizations. Companies post internship opportunities on the platform, specifying the project details, required skills, and benefits offered. They then review student applications, shortlisting candidates for interviews, and use the platform to manage the interview process. Companies rely on the platform's recommendation system to help identify suitable candidates, and they track the progress of applications and selection procedures.

- **Universities -** Universities play a critical role in overseeing student internships. University administrators and career service staff use the S&C platform to track and manage student internship placements. Universities use the platform to ensure that internships meet academic standards and address any issues that may arise during the internship period. In case of disputes or complaints, universities mediate between students and companies to ensure that both parties fulfill their commitments.

2.4 Domain Assumptions

D1 Users have working internet connection.

D2 Student profiles are accurate and up-to-date.

D3 Internship availability is regularly updated.

D4 Internship descriptions are clear and comprehensive.

D5 Details provided by students and companies are true.

D6 Student's eligibility for an internship is supervised by university.

D7 Students and companies select their available times correctly during interview setup procedure.

D8 During complaint resolution process parties actually resolve the conflict.

2.5 Dependencies

For the registration process, a verification email must be sent by the system through to let Users successfully sign up, thus requiring the integration of an EmailService. Also during interview scheduling EmailService is used to notify students.

3 Specific Requirements

3.1 External Interface Requirements

3.1.1 User Interfaces
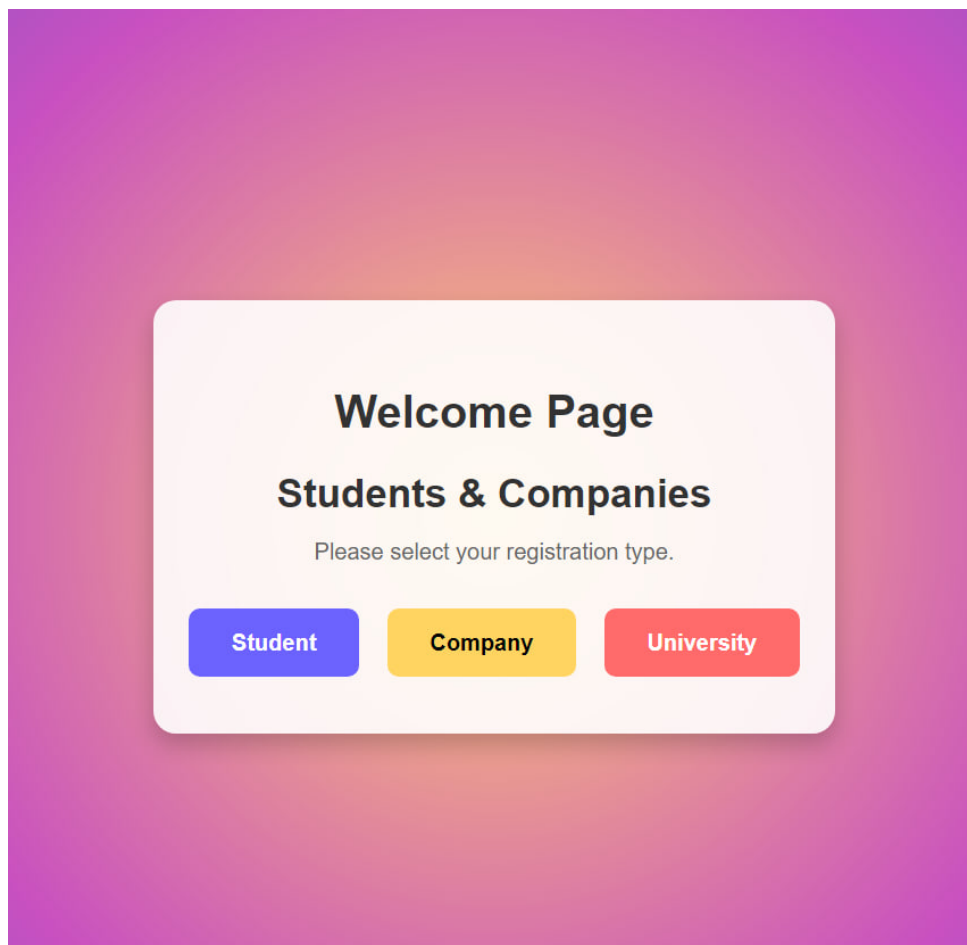
Figure 5: Welcome Page.
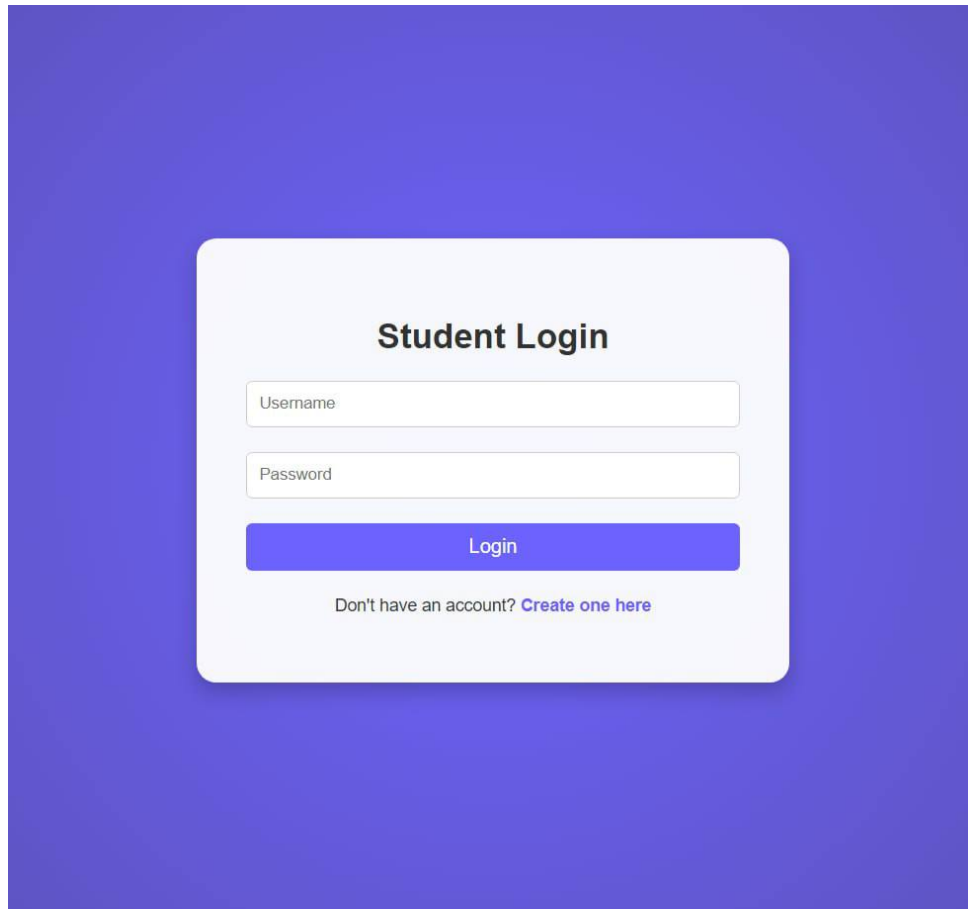
Figure 6: Student Login Interface: A user-friendly login form for students to access the platform, featuring fields for username and password with a prompt for account creation.
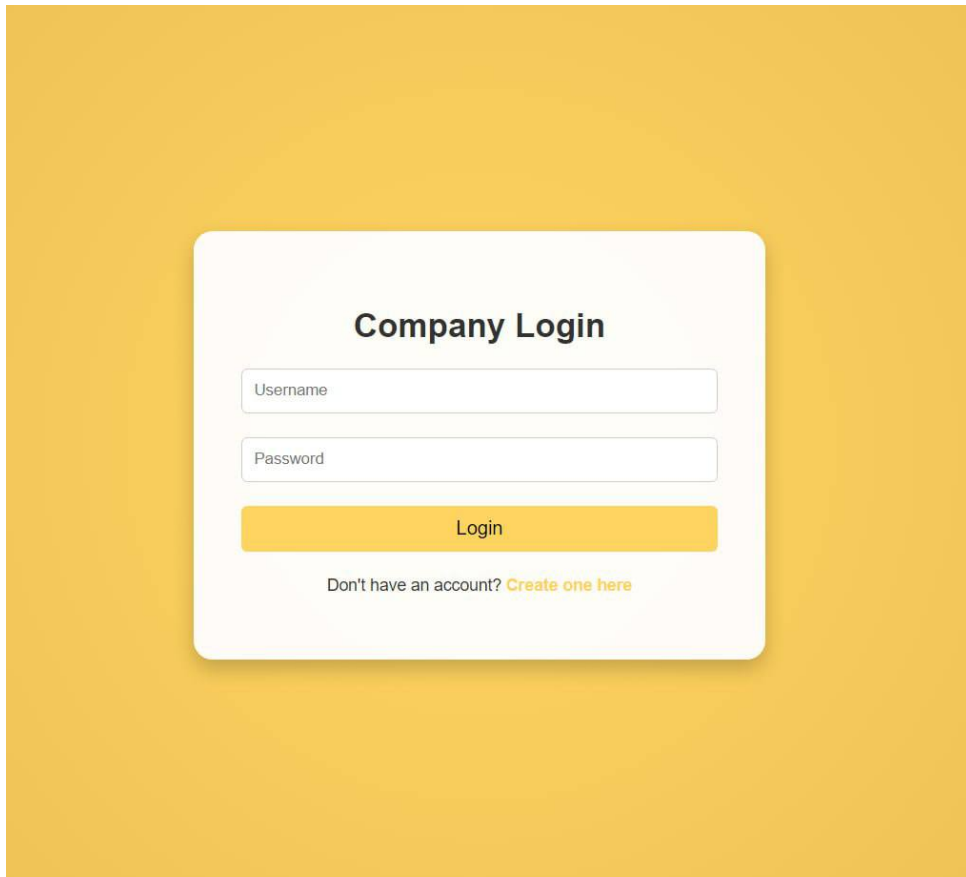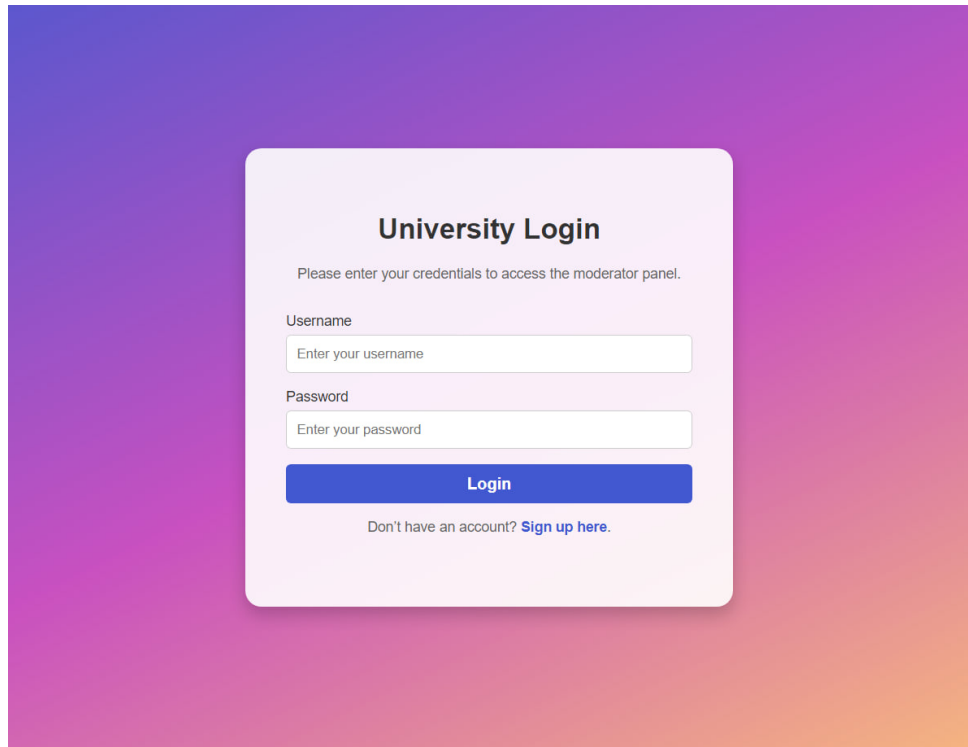
Figure 7: Company Login Interface: A dedicated login form for companies to access the platform, with fields for username and password and an option for account creation.

Figure 8: University Login Interface: A secure login form for university moderators to access the platform, featuring fields for username and password with an option for account registration.

Figure 9: Student Registration Form: A detailed form for students to create an account on the platform by providing personal, academic, and professional details, including uploading their CV.
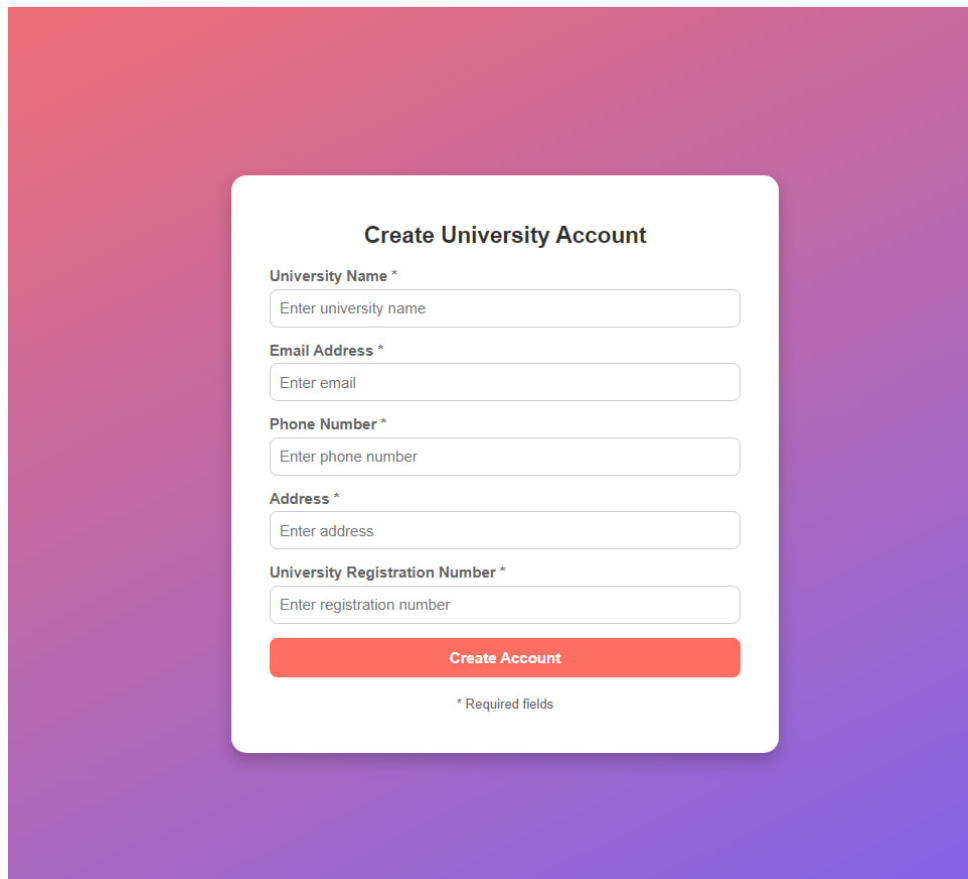
Figure 10: University Registration Form: A form for universities to create an account on the platform by providing essential details such as name, email, phone number, address, and registration number.

Figure 11: Company Registration Form: A form for companies to create an account on the platform by providing details such as name, email, phone number, address, industry, and registration number.
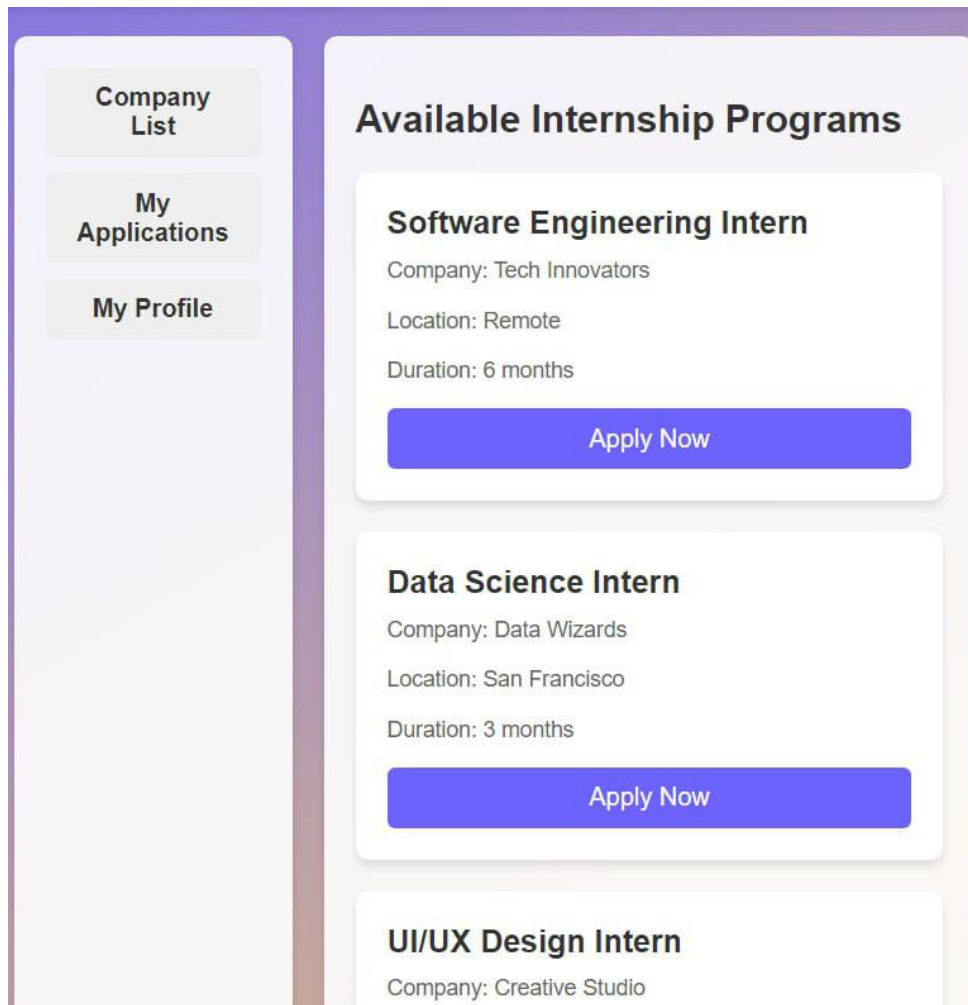
Figure 12: Available Internship Programs: A user interface showcasing a list of internship opportunities with details such as position, company, location, and duration, along with an option to apply directly.
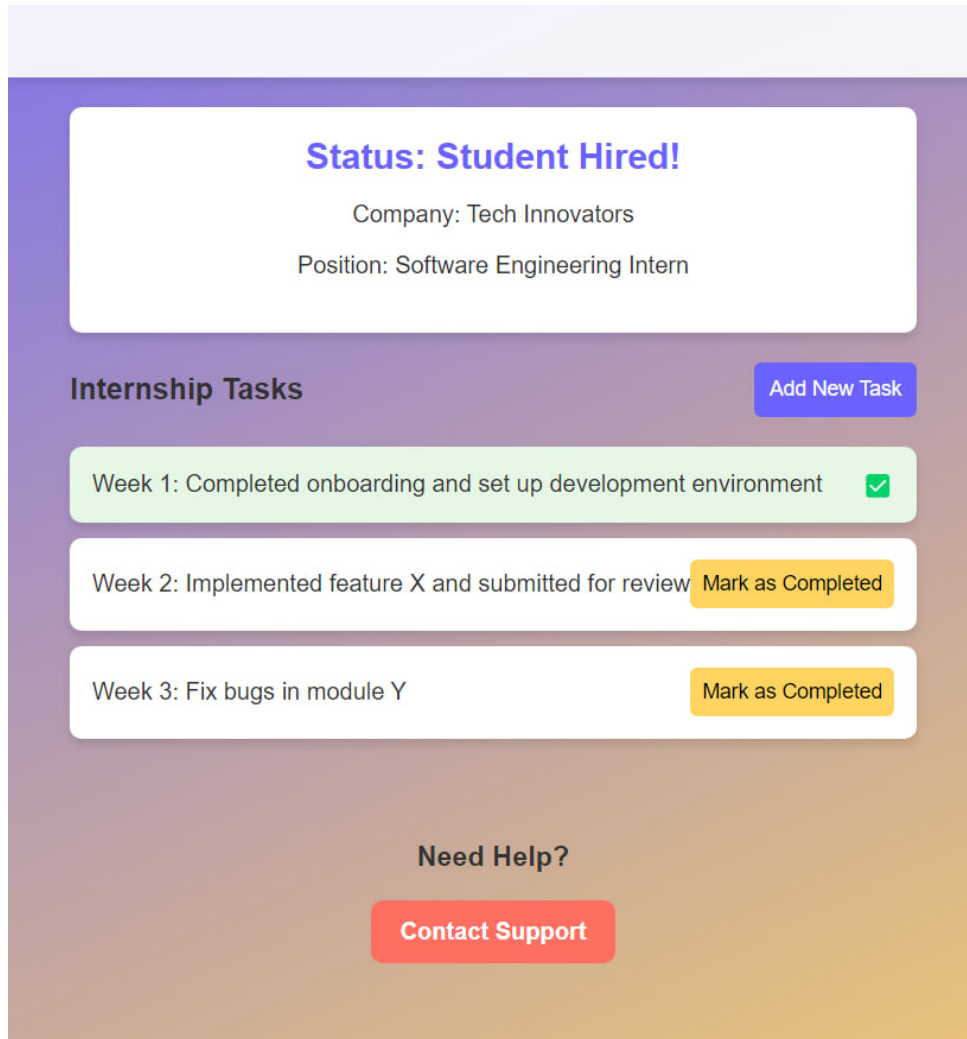
Figure 13: Internship Progress Dashboard: A detailed interface for tracking the progress of assigned internship tasks, with options to mark tasks as completed and add new tasks, along with a support contact feature, in which they can address their complaints.
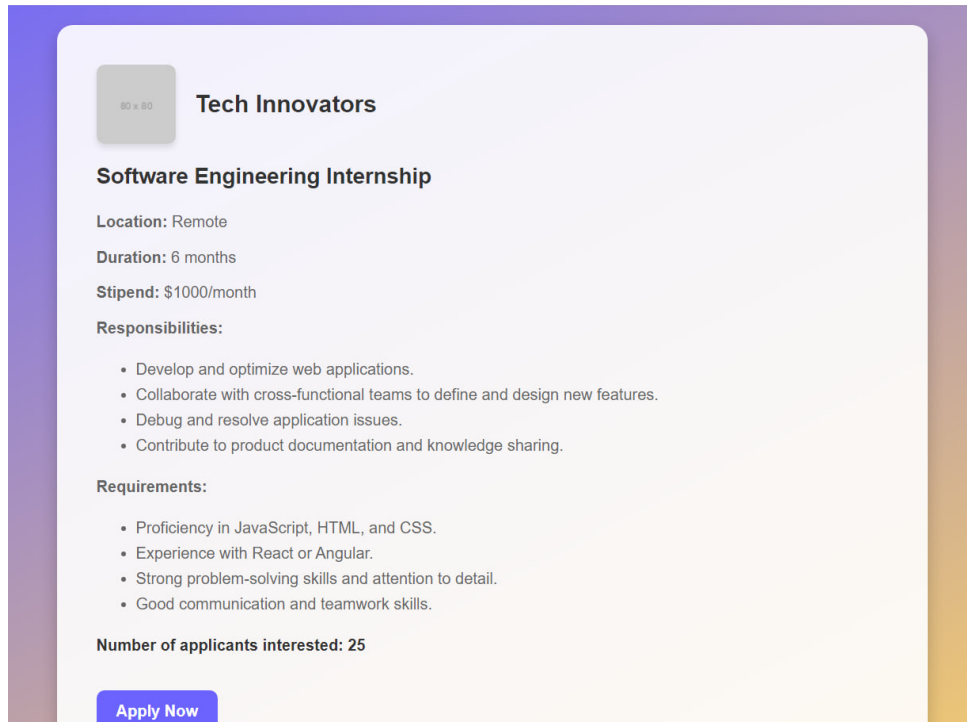
Figure 14: Internship Details Page: A detailed view of an internship posting, including position, location, duration, stipend, responsibilities, and requirements, with an option to apply directly.
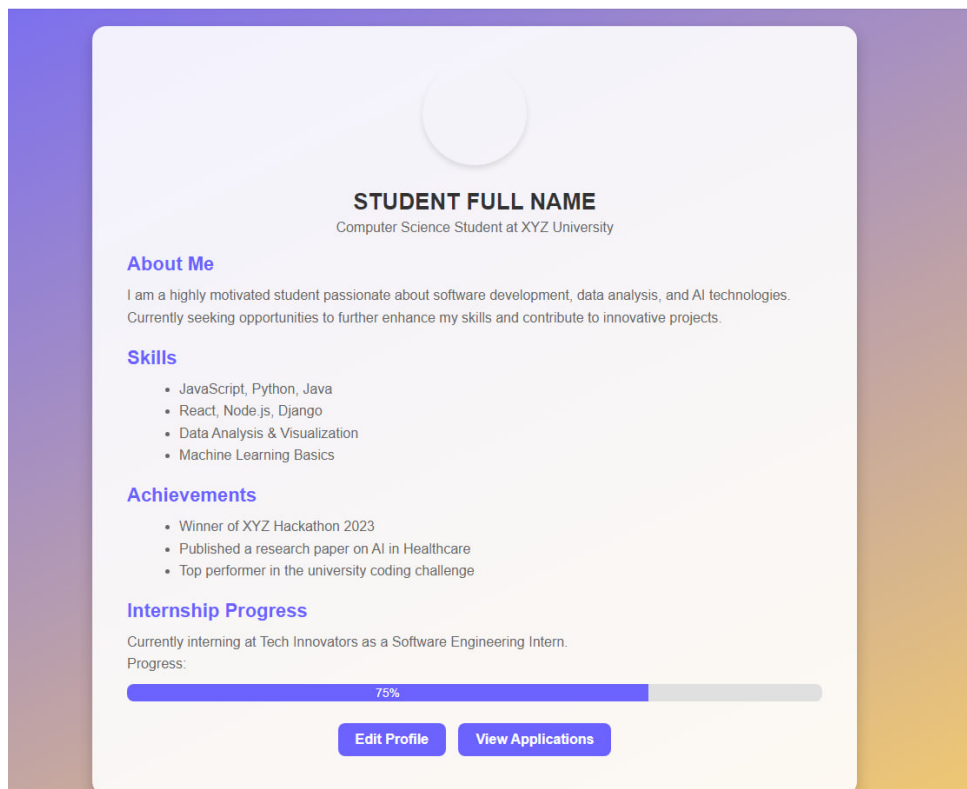
Figure 15: Student Profile Page: A comprehensive profile interface displaying the student's personal information, skills, achievements, and internship progress, with options to edit the profile and view applications.
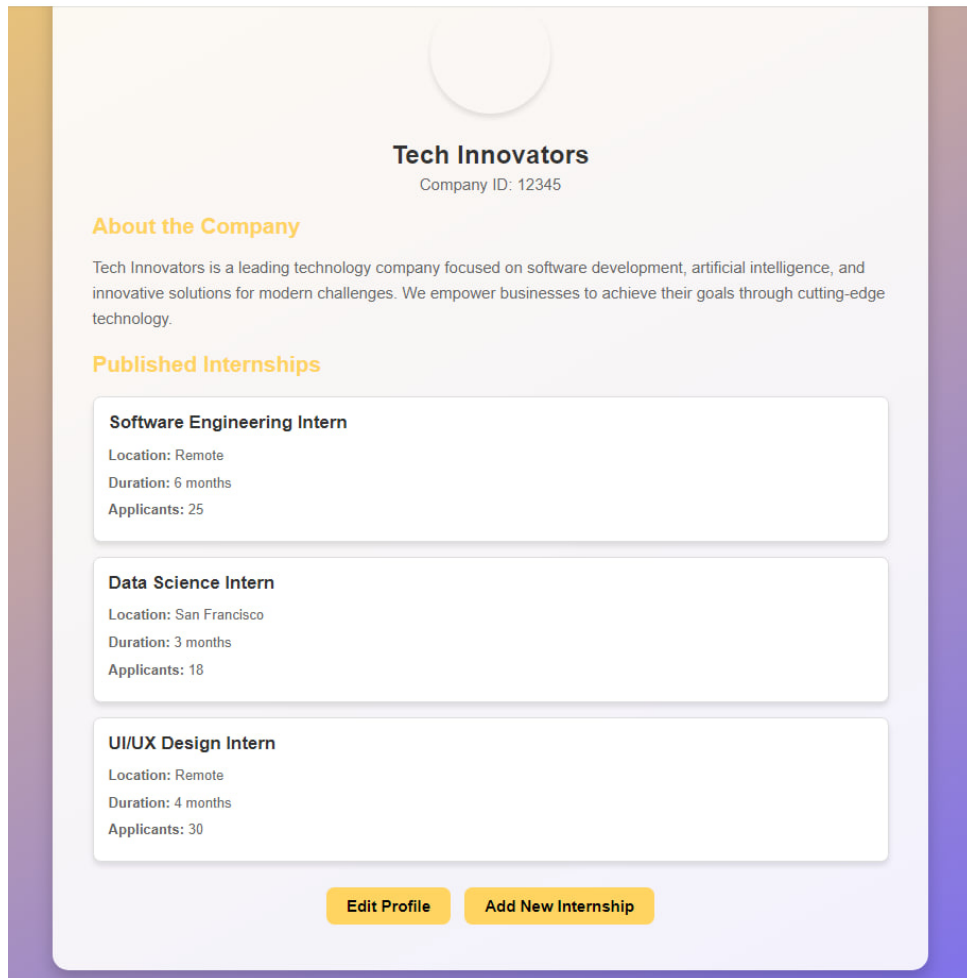
Figure 16: Company Profile Page: An interface displaying the company's details, including an about section, a list of published internships with applicant information, and options to edit the profile or add new internships.
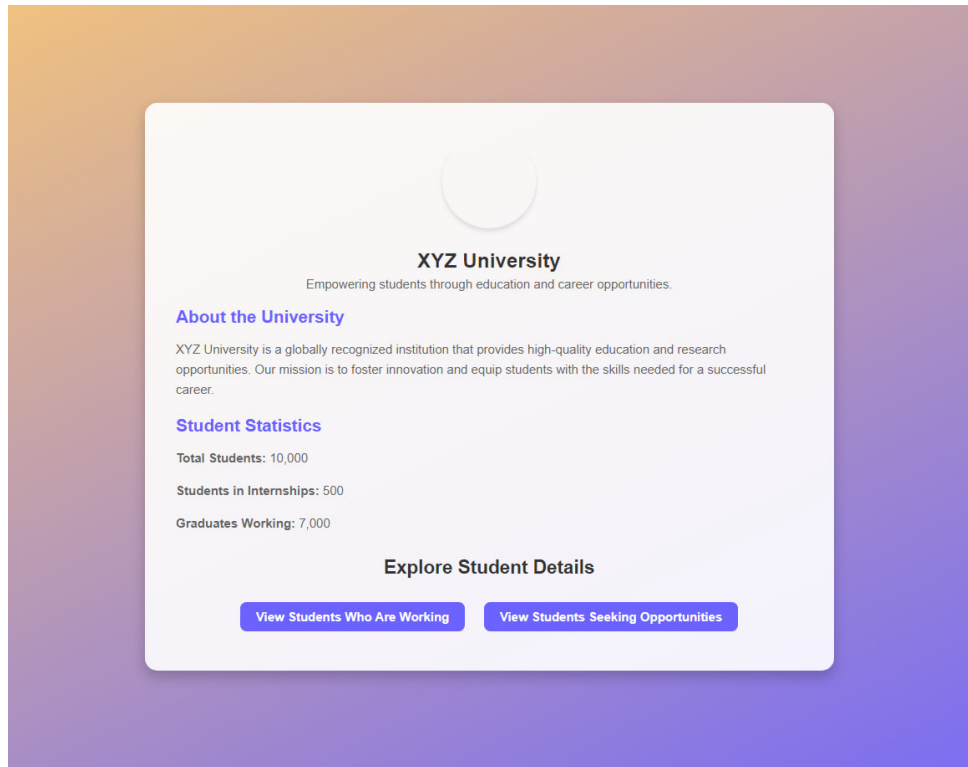
Figure 17: University Profile Page: An interface displaying university details, including an about section, student statistics, and options to explore details of students who are working or seeking opportunities.

3.1.2 Hardware Interfaces

To interact with the Students&Companies (S&C) platform, all users, including students, companies, and universities, must utilize suitable devices that support internet connectivity and web browsers. The system is designed to function on standard computing devices, such as personal computers, laptops, and tablets.

These requirements ensure smooth operation of the platform, especially during real-time activities such as interviews, feedback submissions, and monitoring processes.

3.1.3 Software Interfaces

The Students&Companies (S&C) platform includes several key software components: an in-app notification system keeps users informed about important events, like new internship postings or updates to their applications. An EmailService helps with registration and sends timely updates and confirmations. The RecommendationEngine matches students with internships by analyzing their profiles and preferences. A FeedbackSystem allows users to share their thoughts, improving the platform over time. Universities can also monitor and manage internships using built-in support and complaint-handling tools.

3.1.4 Communication Interfaces

The Students&Companies (S&C) platform requires a stable internet connection to function effectively. It enables students to browse internships, companies to post opportunities, and universities to monitor ongoing internships. Reliable communication is essential for real-time notifications, updates, and interactions between all parties involved.

3.2 Functional Requirements

In this section, we present Use Case Diagrams and all the corresponding Use Cases. Then, the mapping between Goals, Domain Assumptions and Requirements is provided.

3.2.1 Use Case Diagrams
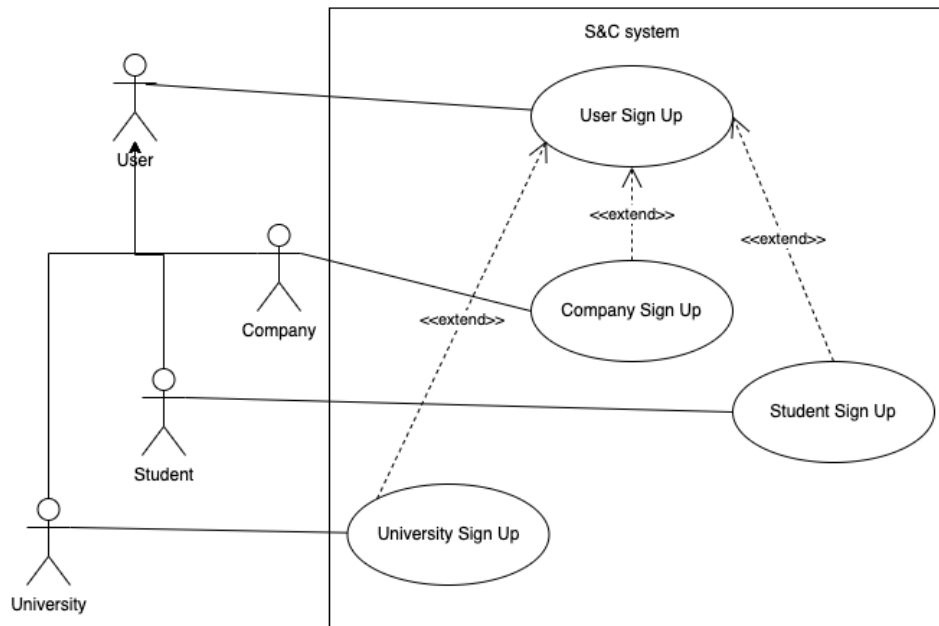
Figure 18: Sign Up Use Case Diagram.
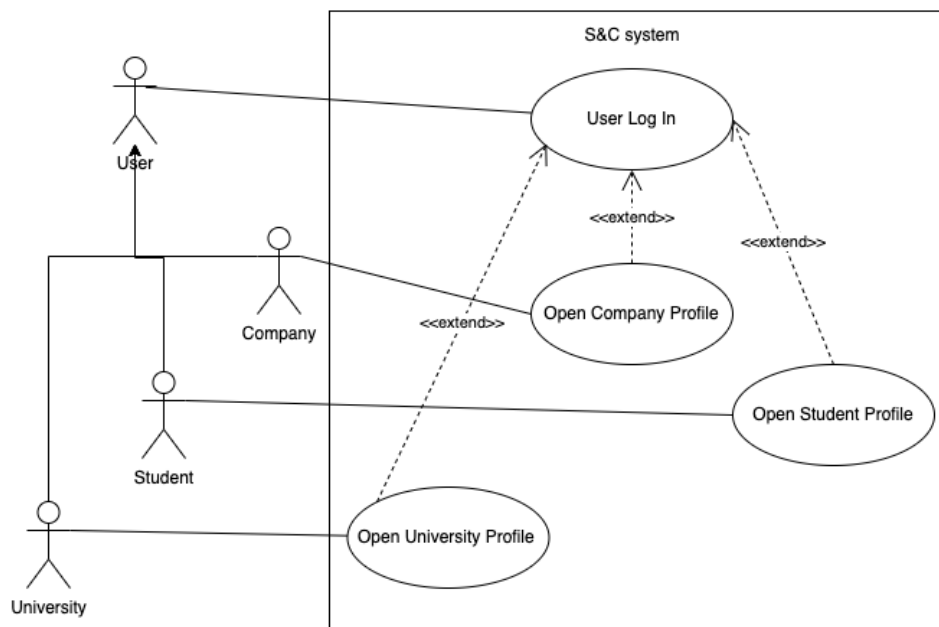
Figure 19: Log In Use Case Diagram.
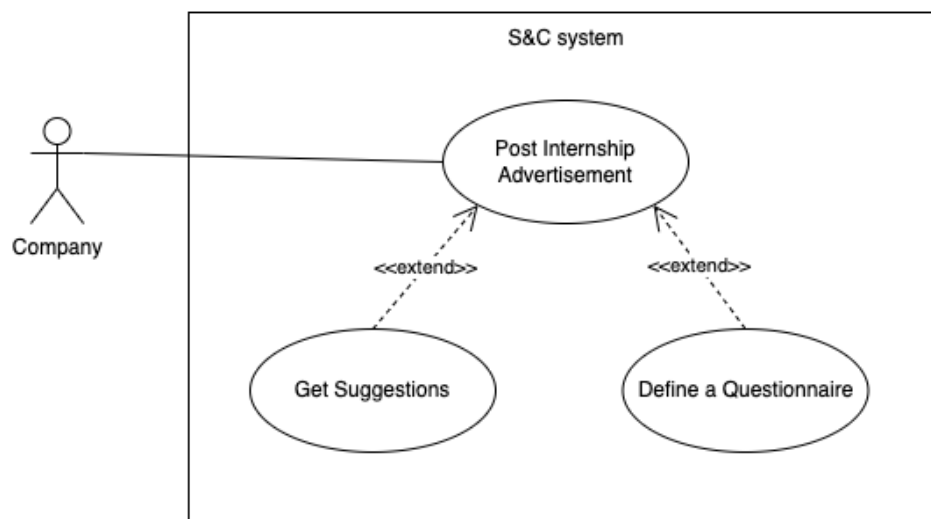
Figure 20: Posting Internship Advertisement Use Case Diagram.
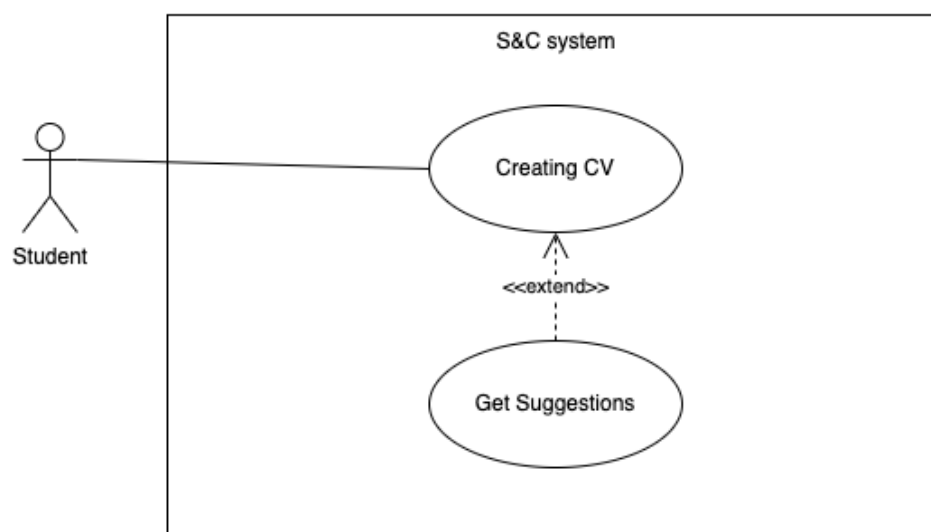
Figure 21: CV Creation Use Case Diagram.
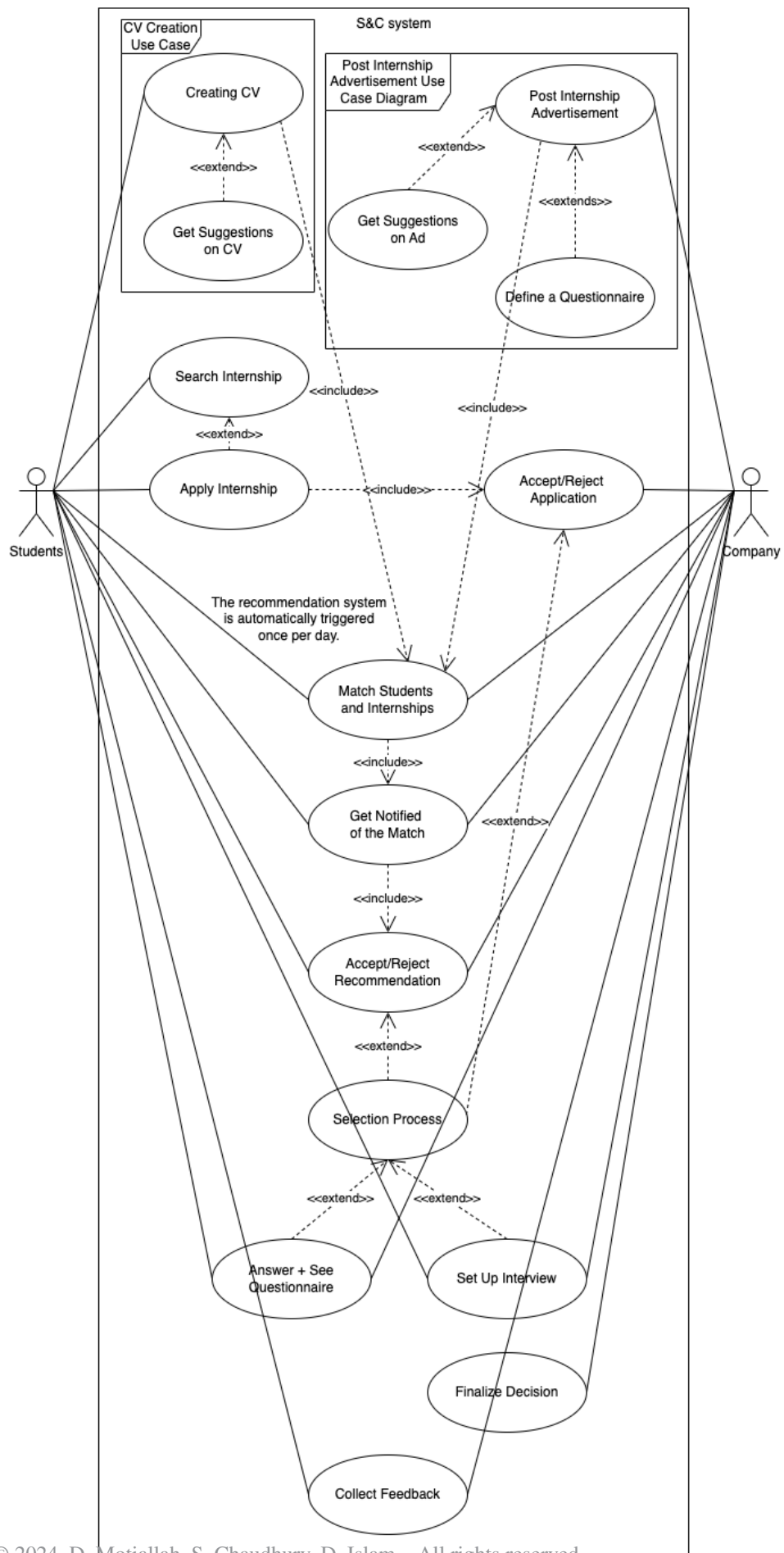
Figure 22: Main Use Case Diagram.
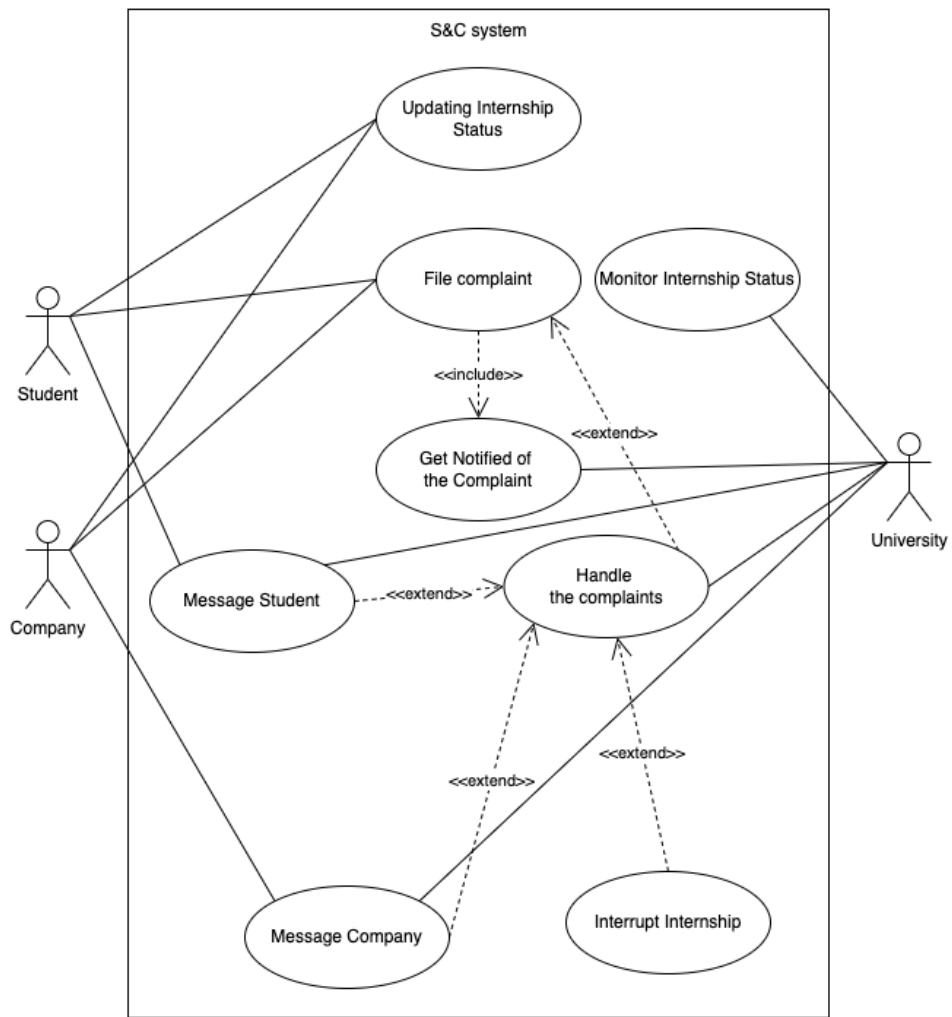
Figure 23: Complaint and Internship Status Use Case Diagram.

3.2.2 Use Cases

In this section we discuss the most important use cases from the diagrams.

Name	User Sign Up
Actor	User (General)
Entry Condition	The user accesses the S&C system and selects the sign-up option. The user has not already registered in the system.
Event flow	1. User opens the sign-up page. 2. User fills in basic information (e.g., name, email, password). 3. User selects the type of account (Company, Student, or University). 4. System validates the input. 5. User account is created.
Exit Condition	The user successfully registers and can log in to the system.
Exception	1. Input validation fails (e.g., invalid email or password criteria not met). 2. User already has an account.
Special Reqs	The system must ensure data security during registration. An email verification process may be required.
Inheritance Relationship	• Company Sign Up: Extends User Sign Up with additional fields for company details (e.g., registration number). • Student Sign Up: Extends User Sign Up with fields for educational details (e.g., student ID, degree program). • University Sign Up: Extends User Sign Up with institutional details (e.g., university name, accreditation).

Table 2: Use Case 1: User Sign Up

Name	User Log In
Actor	User (General)
Entry Condition	The user accesses the S&C system and navigates to the log-in page. The user already has a registered account.
Event flow	1. User opens the log-in page. 2. User enters their credentials (e.g., email and password). 3. System validates the credentials. 4. Upon successful validation, the system directs the user to their respective profile page (Company, Student, or University).
Exit Condition	The user successfully logs in and accesses their account dashboard.
Exception	1. Invalid credentials (e.g., incorrect email or password). 2. User account is not found in the database.
Special Reqs	The system must securely encrypt the user credentials during transmission and ensure compliance with data protection standards.
Inheritance Relationship	• Company Log In: Redirects to the Company Profile upon successful authentication. • Student Log In: Redirects to the Student Profile upon successful authentication. • University Log In: Redirects to the University Profile upon successful authentication.

Table 3: Use Case 2: User Log In

Name	Creating CV
Actor	Student
Entry Condition	The student logs into the system and selects the "Create CV" option.
Event Flow	1. User accesses the "Create CV" page. 2. User enters personal details, educational background, work experience, skills, certifications, soft skills, and other relevant information. 3. System auto-formats the provided details into a CV using a predefined template. 4. System automatically triggers the "Get Suggestions on CV" use case to evaluate the CV and provide feedback.
Exit Condition	The CV is successfully created, and the user can view, download, or Edit it.
Exception	1. Missing or invalid data entered by the user (e.g., empty mandatory fields like name or email). 2. System encounters formatting errors while generating the CV.
Special Reqs	The system must ensure seamless CV generation and provide a user-friendly interface for entering details.
Includes	• Get Suggestions on CV: The System automatically evaluates and provides feedback on the created CV.

Table 4: Use Case 3: Creating CV

Name	Get Suggestions on CV
Actor	System (AI module, triggered by the "Creating CV" use case)
Entry Condition	The "Creating CV" use case is completed, and the system has generated a formatted CV.

Event Flow	1. System receives the formatted CV from the "Creating CV" use case.
	
	2. AI module analyzes the CV based on predefined criteria, such as:
	  • Grammar and spelling accuracy.
	  • CV structure and formatting.
	  • Relevance and quality of content (e.g., measurable achievements in work experience).
	  • Suggestions tailored to the user's industry or role.
	
	3. AI generates actionable, section-specific feedback (e.g., "Use bullet points to highlight key skills in the Skills section").
	
	4. System displays the AI-generated suggestions to the user in the "Creating CV" interface.

Exit Condition	The AI provides clear and actionable suggestions for improvement, and the user can revise their CV accordingly.
Exception	1. AI module fails to analyze the CV due to parsing or formatting issues. 2. Feedback is incomplete or generic due to insufficient CV content.
Special Reqs	• The AI must use reliable natural language processing (NLP) models for analysis. • The AI model can be also interactive and take into account the user's preferences.

Table 5: Use Case 4: Get Suggestions (AI-Powered)

Name	Post Internship Advertisement
Actor	Company
Entry Condition	The company logs into the system and selects the "Post Internship Advertisement" option.

Event Flow	1. Company accesses the "Post Internship Advertisement" page.
	
	2. Company enters details such as:
	
	   • Internship conditions (e.g., eligibility criteria, duration, location).
	   • Project information (e.g., application domain, tasks to be performed, adopted technologies).
	   • Terms offered (e.g., paid internships, benefits like mentorship, training, etc.).
	
	3. System validates the provided information.
	
	4. System saves the internship advertisement.
	
	5. System automatically triggers the AI-powered "Get Suggestions on Ad" and "Match Students and Internships" use cases.
	
	6. Company can decide to extend the advertisement by creating a questionnaire for applicants ("Define a Questionnaire").

Exit Condition	The internship advertisement is successfully posted, and related use cases are triggered.
Exception	1. Invalid or incomplete input from the company (e.g., missing mandatory fields). 2. System error in saving the advertisement or triggering subsequent processes.
Special Reqs	1. The system must provide an intuitive interface for entering advertisement details. 2. The system should ensure data security and privacy.
Includes	• Get Suggestions on Ad: Automatically analyzes and provides feedback on the advertisement using AI. • Match Students and Internships: Automatically matches posted internships with suitable students based on their profiles and preferences.
Extended by	• Define a Questionnaire: Companies can add a custom questionnaire for applicants after posting the advertisement.

Table 6: Use Case 5: Post Internship Advertisement

Name	Get Suggestions on Ad
Actor	System (AI module)
Entry Condition	The "Post Internship Advertisement" use case is completed, and the advertisement details are saved.

Event Flow	1. System (AI module) analyzes the posted advertisement based on:
	
	   • Completeness and clarity of details.
	   • Alignment with common standards for internships.
	   • Potential industry-specific improvements.
	
	2. AI suggests:
	
	   • Revisions to improve clarity or attractiveness of the advertisement.
	   • Additional details to enhance applicant understanding (e.g., elaboration on benefits or tasks).
	
	3. Suggestions are interactive, allowing the company to provide preferences or constraints.
	
	4. Company can choose to make the changes suggested by the AI model or not.

Exit Condition	The company receives actionable, AI-generated suggestions for improving the advertisement.
Exception	1. AI module fails to analyze due to missing or poorly formatted input. 2. Suggestions fail to reflect relevant industry standards due to insufficient training of the AI.
Special Reqs	1. The AI module must use reliable NLP and domain-specific models. 2. Feedback must be clear, actionable, and aligned with the company's preferences.
Included By	• **Post Internship Advertisement:** Automatically triggers this use case upon posting the advertisement.

Table 7: Use Case 6: Get Suggestions on Ad

Name	Define a Questionnaire
Actor	Company
Entry Condition	The "Post Internship Advertisement" use case is completed, and the company has decided to create a questionnaire for applicants.

Event Flow	1. Company selects the "Define a Questionnaire" option for a specific internship advertisement.
	
	2. Company creates a questionnaire by:
	
	   • Adding questions relevant to the internship role (e.g., technical knowledge, situational questions).
	   • Choosing question types (e.g., multiple-choice, open-ended, rating scale).
	   • Setting criteria for evaluation, such as scoring weightage or mandatory responses.
	
	3. System validates the questionnaire for completeness (e.g., no missing question fields, proper format).
	
	4. System saves the questionnaire and links it to the corresponding internship advertisement.
	
	5. Company can edit or update the questionnaire before publishing it for applicants.

Exit Condition	The questionnaire is successfully created, validated, and linked to the internship advertisement for applicant use.
Exception	1. Company provides incomplete or invalid inputs (e.g., missing question text, improper formats). 2. System encounters errors while saving or linking the questionnaire to the advertisement.
Special Reqs	1. The system must allow easy customization of questionnaires, including different question types and evaluation criteria. 2. The system should validate and ensure completeness and consistency of the questionnaire. 3. Questionnaires must be securely saved and accessible only to authorized users (company and relevant applicants).
Extends	• Post Internship Advertisement: Extends this use case by enabling additional applicant evaluation functionality.

Table 8: Use Case 7: Define a Questionnaire

Name	Search Internship
Actor	Student
Entry Condition	The student logs into the system and selects the "Search Internship" option.

Event Flow	1. Student accesses the "Search Internship" module.
	
	2. Student enters search criteria, such as:
	
	   • Skills and qualifications.
	   • Location preferences.
	   • Internship type (e.g., paid, remote).
	
	3. System retrieves and displays a list of internships matching the criteria.
	
	4. Student reviews the results and selects an internship for further details.
	
	5. If the student finds a suitable internship, they can proceed to "Apply Internship."

Exit Condition	The student either reviews a list of matching internships or proceeds to apply for a specific one.
Exception	1. No internships match the provided criteria. 2. System error in retrieving or displaying internship details.
Special Reqs	1. The system must allow filtering and sorting of search results. 2. The system should ensure real-time updates on available internships.
Extended by	• Apply Internship: Extends this use case if the student chooses to apply for an internship.

Table 9: Use Case 8: Search Internship

Name	Apply Internship
Actor	Student
Entry Condition	The student finds a suitable internship during the "Search Internship" use case and decides to apply.
Event Flow	1. Student selects the "Apply" option for a specific internship. 2. System prompts the student to upload or confirm their application materials (e.g., CV, cover letter). 3. System validates the completeness of the application. 4. System submits the application and notifies the corresponding company.
Exit Condition	The student's application is successfully submitted to the company for review.
Exception	1. Application materials are incomplete or invalid. 2. System encounters an error in submitting the application.
Special Reqs	Notifications must be sent to the company upon successful submission.
Extends	• **Search Internship:** This use case is triggered when a student decides to apply for an internship found during the search.
Includes	• **Accept/Reject Application:** Automatically triggers this use case for the company after submission.

Table 10: Use Case 9: Apply Internship

Name	Accept/Reject Application
Actor	Company
Entry Condition	The company receives a notification that a student has applied for an internship.

Event Flow	1. Company accesses the "Accept/Reject Application" module from the sent notification.
	
	2. Company reviews the student's application materials (e.g., CV, cover letter).
	
	3. Company evaluates the application based on their initial criteria.
	
	4. Company either:
	
	    • Accepts the application, triggering the "Selection Process" use case.
	    • Rejects the application, sending a notification to the student.

Exit Condition	The company either accepts or rejects the application, and the corresponding actions are triggered.
Exception	1. Application materials are incomplete or corrupted. 2. System error in notifying the company or processing the decision.
Special Reqs	1. Notifications must be sent to the student upon decision. 2. The system must ensure secure access to application materials.
Included By	• Apply Internship: Automatically triggers this use case when a student submits an application.
Includes	• Selection Process: Automatically triggered when an application is accepted.

Table 11: Use Case 10: Accept/Reject Application

Name	Match Students and Internships
Actor	Student, Company
Entry Condition	The profile of the student and job listing by the company is available
Event flow	1. Students have uploaded provife and created CV.
	2. Companies have posted internship roles.
	3. S&C gathers available student information and internship listings
	4. S&C applies matching algorithm based on student details and internship requirements like technical skills, soft skills, experience needed, grades.
	5. S&C platform identifies company and student matches based on highest recommendation percentage.
	6. Both matched student and company are then notified and the recommendation is shown in respective dashboards.
	7. Both parties then can accept or reject the project by clicking the respective buttons.
Exit Condition	Recommendations shown and notified to students and companies
Exception	1. No matches are found.
	2. The system waits for new or changes in profiles or listings.
Special Reqs	The system must ensure accurate analysis of data for correct and meaningful results. A notification provider may be required.

Table 12: Use Case 11: Match Students and Internships

Name	Selection Process
Actor	Student, Company
Entry Condition	1. The student has applied for the internship and has been selected to go through more evaluations. 2. The student and company both have accepted the systems recommendation to match.
Event flow	1. The system opens a communication channel between the student and company. 2. The system notify both the student and the company that the selection process for that specific internship has started and now then can contact each other. 3. If a questionnaire is already created for the internship, the system shows that to the student and prompt them to fill the questionnaire out. 4. If a questionnaire is not already created by the company, the system sends a notification to them to remind them that they still can create a questionnaire from the internship dashboard. 5. After the student submits the answers to the questionnaire, the company is notified instantly. 6. The company then reviews the answers by the student and accordingly decides to interview or not by clicking on "Select for Interview" or "Reject" buttons. 7. A notification is sent to the student instantly. 8. If selected, the student is added to the list of students shortlisted for interview for that role. 9. The system initiates the "Set Up Interview" process.
Exit Condition	Student is selected for an interview
Exception	1. Technical issues prevent the communication channel from initializing. 2. The student fails to complete the questionnaire before the deadline. 3. The student is unreachable and does not respond to notifications. 4. Notifications fail to reach either the student or the company.

Table 13: Use Case 12: Company finalize student for interview

Name	Set Up Interview (S&C Platform Manage Interview Process)
Actor	Student, Company
Entry Condition	The selection process has started and the company has decided to take an interview from the student.
Event flow	1. The platform prompts the company to select available time slots for the interview from the calender system in the platform. 2. The platform then prompts the student to select a suitable slot from the ones provided by company. 3. The system sends a confirmation to both the student and company with the scheduled date, time, and interview format. 4. The system generates a unique interview link (if video interview) or location (if in-person) 5. Notifications are sent instantly sharing the info with both the company and student. 6. The platform sets up reminders for both parties, notifying them 24 hours and 1 hour before the interview. 7. The interview takes place as per the scheduled time. 8. The system updates the status of the interview (e.g., "Scheduled," "Completed," "Pending Feedback"). 9. After the interview, the company can decide to go for a "Second Round Interview" by clicking the button or move forward to finalizing the decision on the student in the internship dashboard("Finalize Decision").
Exit Condition	1. The interview is set and takes place.
Exception	1. Interview link/Location not accessible. 2. No response from company or student. 3. Platform failure during interview.
Special Reqs	Secure Video Conferencing Integration

Table 14: Use Case 13: Set Up Interview

Name	Finalize Decision (company finalize the decision for selection process)
Actor	Student, Company
Entry Condition	The company has reviewed the student profile and questionnaire's answers and is interested in recruiting the student for the internship
Event flow	1. Company opens the internship page. 2. Company clicks "show interviewed students" and reviews the list of students whom undergone interviews for the specific internship position either from applications or system match recommendations. 3. If the company chooses to recruit a student, clicks on the "Accept" button for that student. 4. If the company chooses to reject a student, clicks on the "Reject" button for that student. 5. A notification is sent to the student instantly informing the student of the final decision. 6. The system records this decision in the student's profile and updates the status of the internship application.
Exit Condition	The final decision on the recruitment of a student for an internship is made.
Exception	1. No student listed for the position. 2. The student has already accepted another internship offer but remains on the list. 3. The system fails to log the company's decision (accept or reject).

Table 15: Use Case 14: Company finalize student for interview

Name	Collect Feedback
Actor	Student, Company
Entry Condition	Both the student and the company have gone through selection process and now know each other better.
Event flow	1. The system collects application data and also takes into account the final decision on the recommendation. 2. The system asks both parties to fill out a "feedback form" on the match that was made between them. 3. Students and companies rate the service by the S&C platform between 1 to 5 stars and answer relevant questions related to the process and give suggestions on what could be better. 4. The system analyses the collected data using statistical analysis and natural language processing. 5. Based on the analysis the recommendation system is adjusted and improved recommendation are shown to users
Exit Condition	1. The systems recommendation system is updated based on feedback provided 2. Future recommendations are improved in terms of quality and relevance
Exception	1. Either one of the parties don't cooperate in giving feedback. 2. Incomplete or unclear feedback

Table 16: Use Case 15: Collect Feedback

Name	Monitor Internship Status
Actor	University
Entry Condition	Students from the university are registered int the S&C platform looking for internship and have landed internships.
Event flow	1. University logs into platform. 2. University views internship progress of student which includes where a student is doing internship and what tasks they are assigned and how much they have completed. 3. University follows up as necessary.
Exit Condition	Internship status is monitored and tracked.
Exception	No progress updates are available.

Table 17: Use Case 16: University Monitors Internship Status

Name	Handle Complaints and Issues
Actor	University
Entry Condition	A complaint has been reported by a student or company.
Event flow	1. University logs into platform. 2. University views pending complaints. 3. University takes action as deemed right by the university. 4. University can warn the involved parties or interrupt the internship. 5. The decision taken by university is forwarded to the student and company.
Exit Condition	Complaint is resolved or flagged for further action.
Exception	No pending complaints.

Table 18: Use Case 17: University handles Complaints and Issues

3.2.3 Sequence diagrams
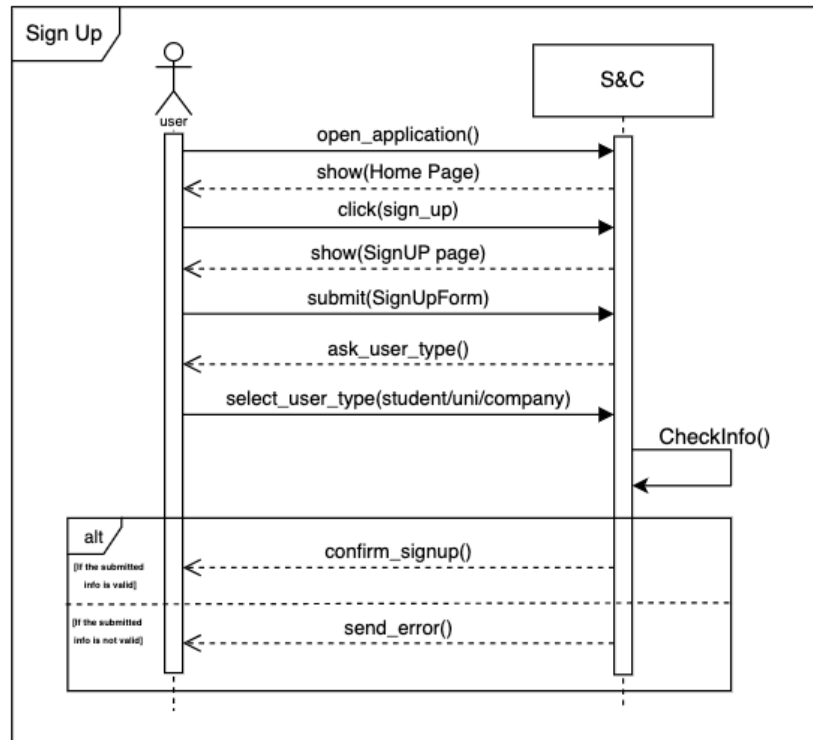
Figure 24: Sign Up Sequence Diagram.
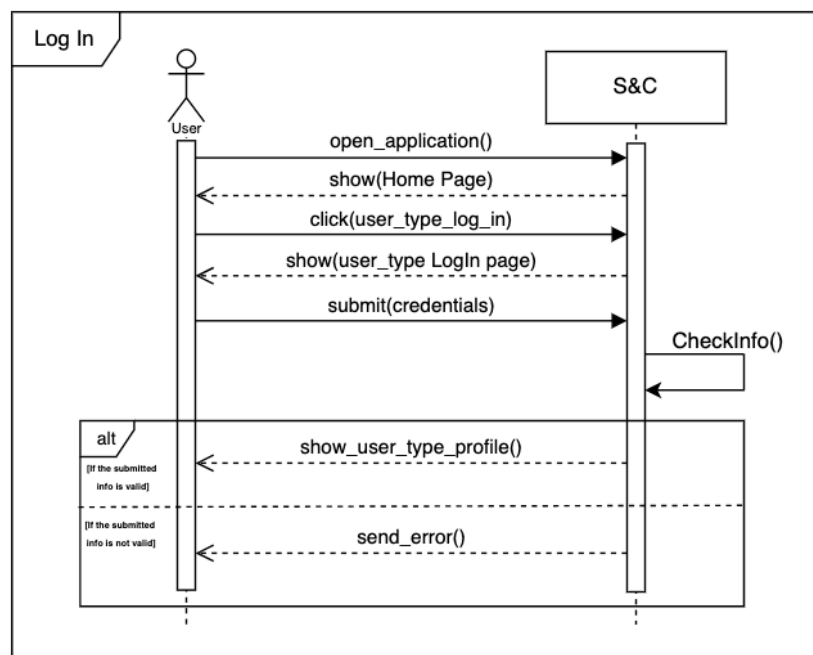
Figure 25: Log In Sequence Diagram.
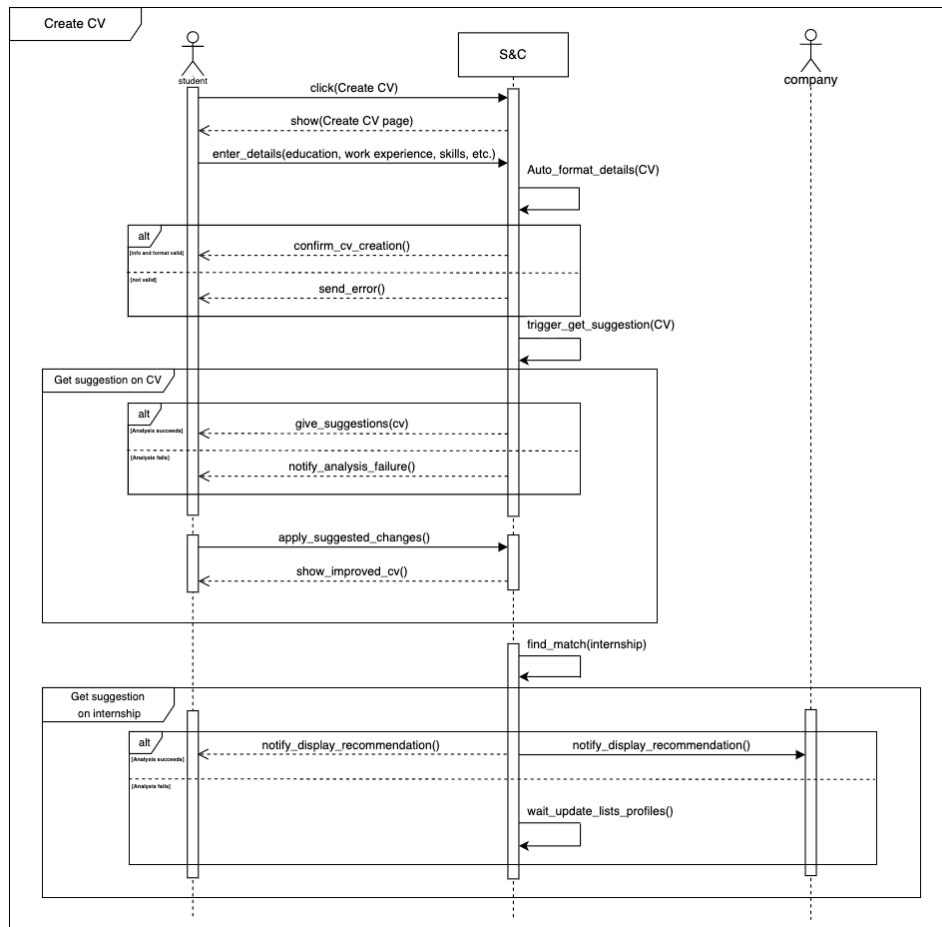
Figure 26: Create CV Sequence Diagram.
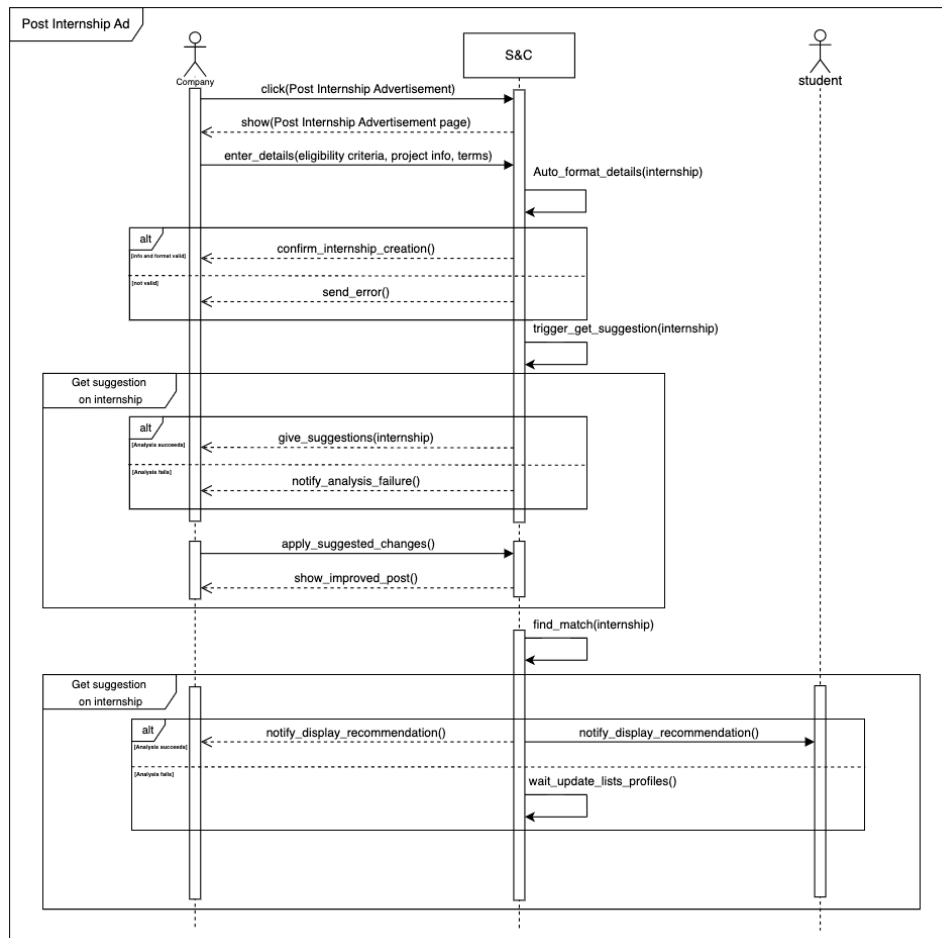
Figure 27: Post Internship Advertisement Sequence Diagram.
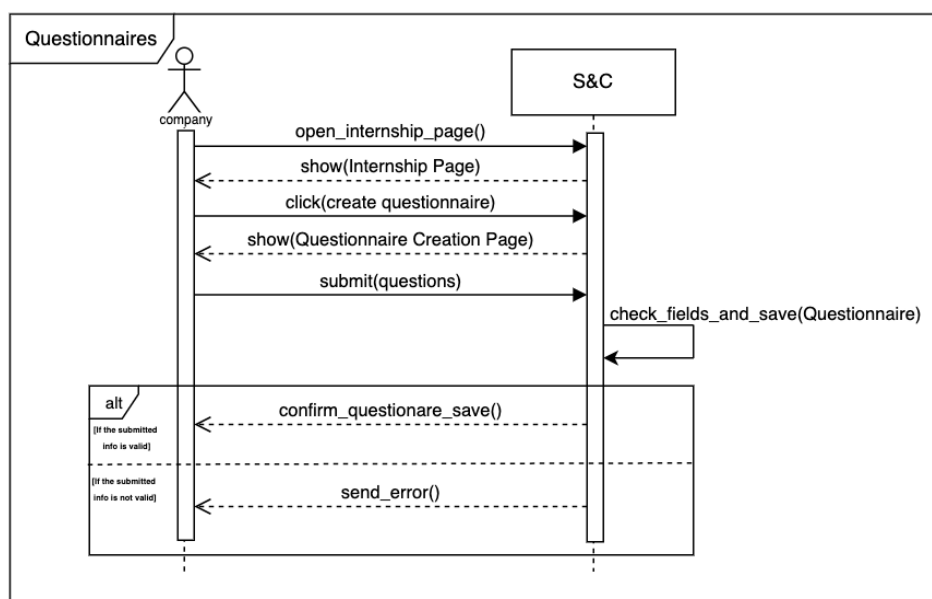
Figure 28: Questionnaire Creation Sequence Diagram.
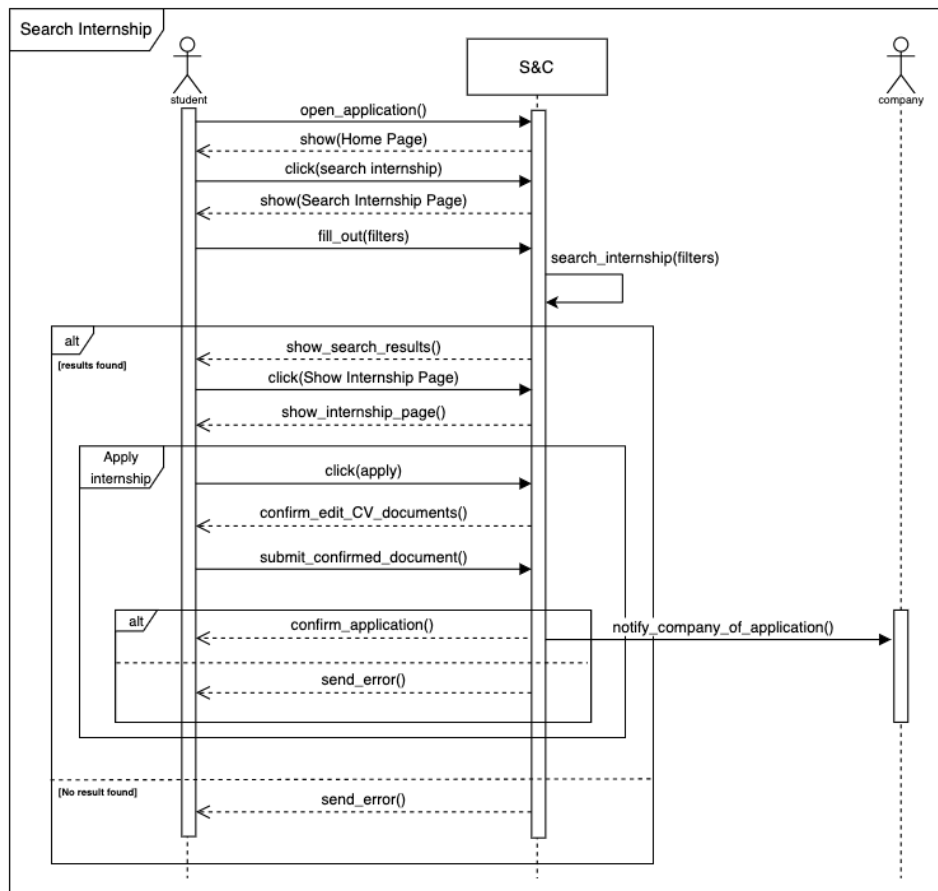
Figure 29: Internship Search and Application Sequence Diagram.
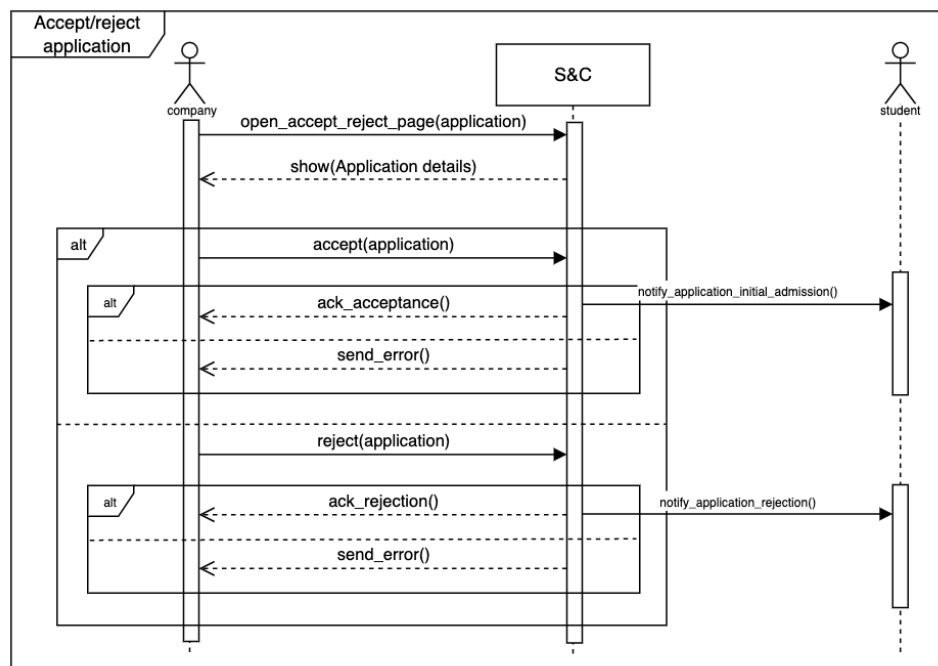
Figure 30: Accept or Reject Application Sequence Diagram.
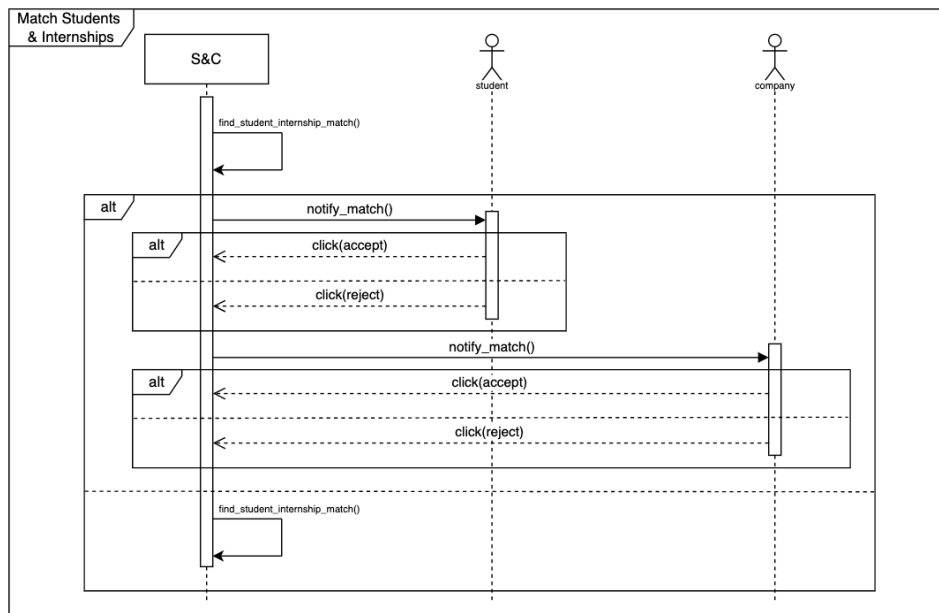
Figure 31: Match Student and Internship Sequence Diagram.
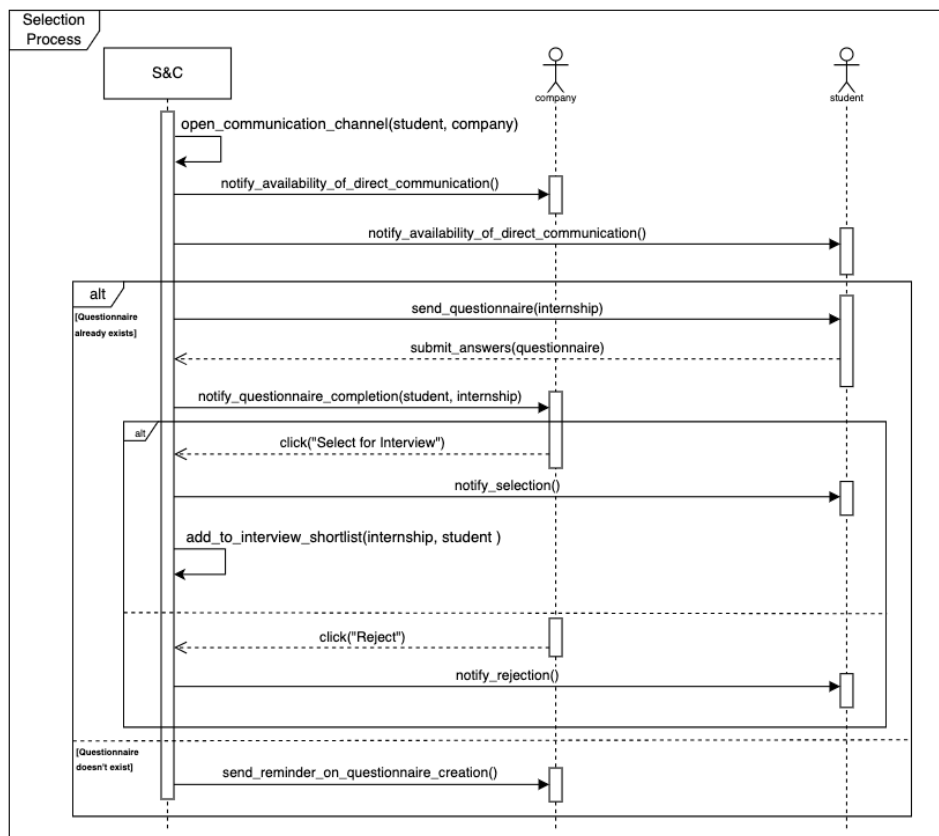
Figure 32: Selection Process Sequence Diagram.
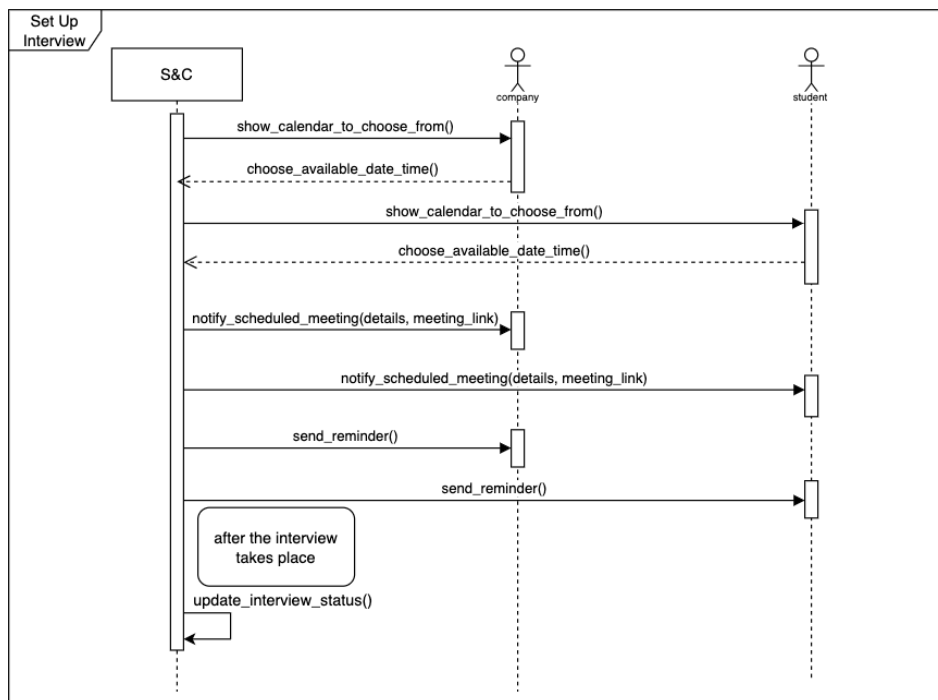
Figure 33: Set Up Interview Sequence Diagram.
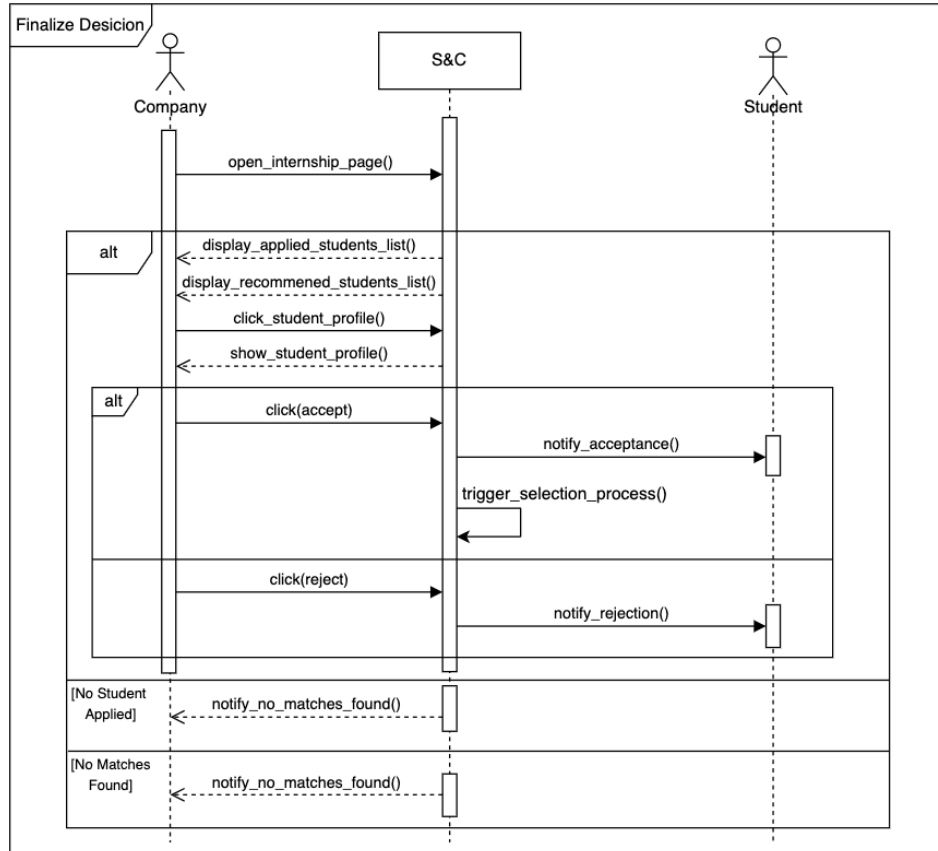
Figure 34: Company Finalizing the decision on recruiting the student Sequence Diagram.
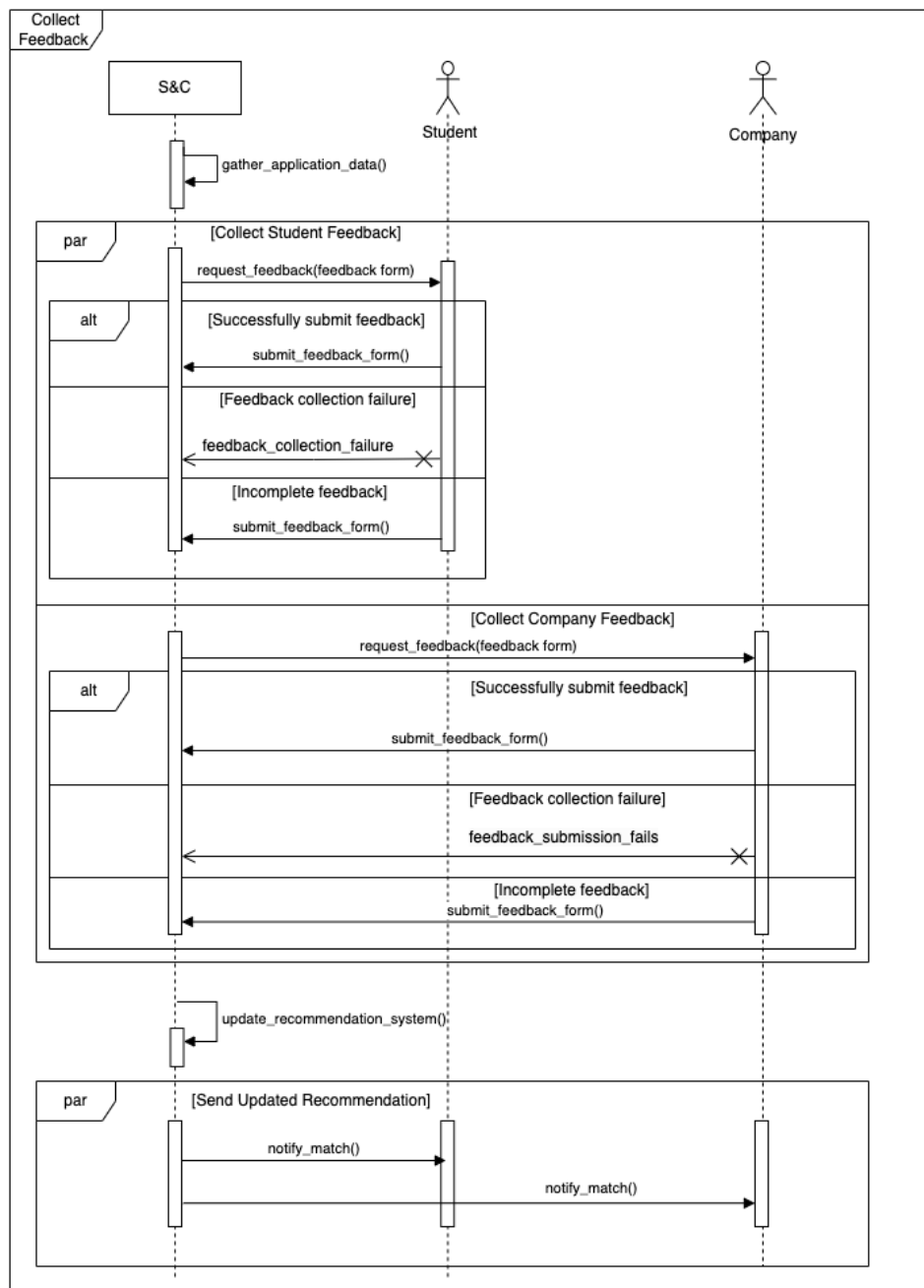
Figure 35: Collect Feedback Sequence Diagram
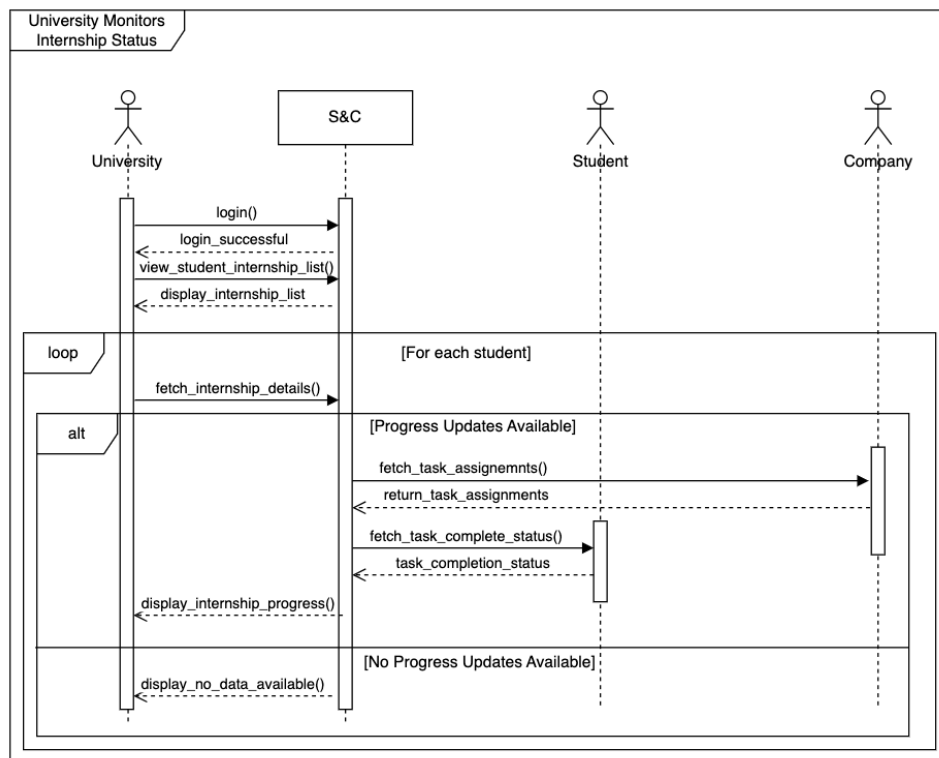
Figure 36: University Monitors Internship Status Sequence Diagram
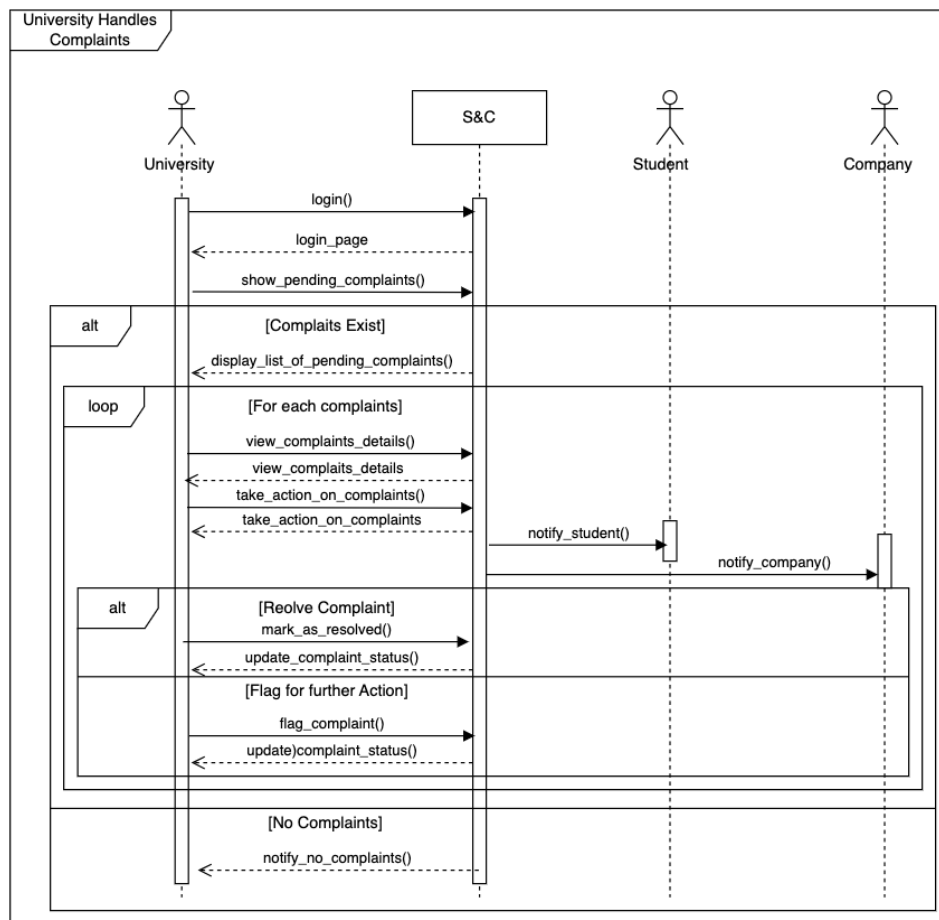
Figure 37: University Handles Complaints Sequence Diagram

3.2.4 Requirement mapping

G1	
G1	**Allows registered students to create their profile and CV and search for internships and apply to them.**
D1	The User must have a working Internet connection.
D2	Student profiles are accurate and up-to-date.
D3	Internship availability is regularly updated.
D4	Internship descriptions are clear and comprehensive.
D5	Details provided by students and companies are true.
R1	The S&C system allows new users (students, universities and companies) to register by giving their credentials (e.g., name, email address, password).
R2	The system allows users (students, universities and companies) to login.
R3	The system allows students to create and update their profile (experience, skills, CV).
R6	The system helps students in creating their CVs by giving intelligent suggestion for making a stronger CV and pointing out mistakes.
R7	Students can search for internship opportunities clicking on "Search" button.

R8	Students can apply to desired internship by clicking on "Apply" button for an internship post.
R9	The system provides personalized recommendations to the students for internships based on students profiles and skills which matches with available internships.
R10	Students can automatically apply to any recommended internship by clicking on "Accept" button.

G2	
G2	**Allows registered companies to create and post advertisement for available internship roles and select suitable candidate.**
D1	The User must have a working Internet connection.
D2	Student profiles are accurate and up-to-date.
D3	Internship availability is regularly updated.
D4	Internship descriptions are clear and comprehensive.
D5	Details provided by students and companies are true.
D6	Student's eligibility for an internship is supervised by university.
R1	The S&C system allows new users (students, universities and companies) to register by giving their credentials (e.g., name, email address, password).
R2	The system allows users (students, universities and companies) to login.
R4	The system allows companies to create and update company's profile (about, field of work, achievements).
R11	Companies can post internship opportunities and description which includes application domain, tasks to be performed, skills required.
R12	The system can provide recommendations to improve the internship posts by companies.
R13	The companies can prepare a questionnaire in the system to be forwarded to the students to get additional information from them when the selection process starts.
R14	The system can recommend companies about available students who match the job description and skills by applying statical analysis based on the characteristics of students and internships.
R15	The system notifies students and companies once everyday to recommend new matches.
R16	Companies can track applications and review candidate CVs.
R17	Companies can accept or reject an application or a suggestion by the system by clicking on "Accept" or "Reject" buttons for each application.
R18	A messaging channel is opened when a recommendation is accepted by both student and company or an application by student is accepted by company.
R19	The prepared questionnaire is for forwarded to the student.
R20	The system helps in management of the selection process by scheduling of interview.
R21	The system sends interview link or interview location to both student and company.
R22	The system allows the company to update the interview results.
R23	Interview results are updated in the platform and users are notified.

G3	
G3	**Provide an efficient and intelligent matchmaking process between students and companies based on the students' skills and preferences, the companies' internship descriptions.**
D1	The User must have a working Internet connection.
D2	Student profiles are accurate and up-to-date.
D3	Internship availability is regularly updated.
D4	Internship descriptions are clear and comprehensive.
D5	Details provided by students and companies are true.
D6	Student's eligibility for an internship is supervised by university.
D7	Students and companies select their available times correctly during interview setup procedure.
R1	The S&C system allows new users (students, universities and companies) to register by giving their credentials (e.g., name, email address, password).
R2	The system allows users (students, universities and companies) to login.
R3	The system allows students to create and update their profile (experience, skills, CV).
R4	The system allows companies to create and update company's profile (about, field of work, achievements).
R7	Students can search for internship opportunities clicking on "Search" button.
R9	The system provides personalized recommendations to the students for internships based on students profiles and skills which matches with available internships.
R10	Students can automatically apply to any recommended internship by clicking on "Accept" button.
R11	Companies can post internship opportunities and description which includes application domain, tasks to be performed, skills required.
R14	The system can recommend companies about available students who match the job description and skills by applying statical analysis based on the characteristics of students and internships.
R15	he system notifies students and companies once everyday to recommend new matches.
R17	Companies can accept or reject an application or a suggestion by the system by clicking on "Accept" or "Reject" buttons for each application.

G4	
G4	**Support both students and companies during the selection process, including interview scheduling, questionnaire, feedback collection, and facilitating communication.**
D1	The User must have a working Internet connection.
D2	Student profiles are accurate and up-to-date.
D3	Internship availability is regularly updated.
D4	Internship descriptions are clear and comprehensive.
D5	Details provided by students and companies are true.
D6	Student's eligibility for an internship is supervised by university.
D7	Students and companies select their available times correctly during interview setup procedure.

R1	The S&C system allows new users (students, universities and companies) to register by giving their credentials (e.g., name, email address, password).
R2	The system allows users (students, universities and companies) to login.
R13	The companies can prepare a questionnaire in the system to be forwarded to the students to get additional information from them when the selection process starts.
R18	A messaging channel is opened when a recommendation is accepted by both student and company or an application by student is accepted by company.
R19	he prepared questionnaire is for forwarded to the student.
R20	The system helps in management of the selection process by scheduling of interview.
R21	The system sends interview link or interview location to both student and company.
R22	The system allows the company to update the interview results.
R23	Interview results are updated in the platform and users are notified.
R24	The system collects feedback from students and companies to then use the gathered data to better it's analysis and recommendation algorithm.

G5	
G5	**Allows registered universities to monitor the internship statuses of their students and take action on any issues or complaints.**
D1	The User must have a working Internet connection.
D2	Student profiles are accurate and up-to-date.
D3	Internship availability is regularly updated.
D4	Internship descriptions are clear and comprehensive.
D5	Details provided by students and companies are true.
D6	Student's eligibility for an internship is supervised by university.
D7	Students and companies select their available times correctly during interview setup procedure.
D8	During complaint resolution process parties actually resolve the conflict.
R1	The S&C system allows new users (students, universities and companies) to register by giving their credentials (e.g., name, email address, password).
R2	The system allows users (students, universities and companies) to login.
R3	The system allows students to create and update their profile (experience, skills, CV).
R4	The system allows companies to create and update company's profile (about, field of work, achievements).
R5	The system allows universities to create and update their profile.
R25	The system has a dedicated page to keep track and monitor all the ongoing search and selection processes for all three type of users (students, university, companies).
R26	During the selection process and during interview the involved parties can raise concerns or complains which will be monitored by the university.
R27	The system allows the university to decide on required actions to perform like warning to respective parties or interruption of internship and updates the same on the platform.

3.3 Performance Requirements

The system shall ensure good performance in service of all kinds of users, including students, companies, and universities, efficiently. For usability, it shall meet the following minimum performance criteria:

The system should respond to user actions such as navigation or form submission in less than 1 second under normal conditions. The system should support up to n users' concurrent access without significant degradation of performance, based on the number of students.

3.4 Design Constraints

3.4.1 Standards compliance

The Students&Companies (S&C) platform is conscious of and fully respects all data protection and security policies in light of the General Data Protection Regulation, otherwise known as the GDPR, along with assurances that guarantee data protection within the EU and EEA territories. It uses the modern international standard for date and time formatting.

3.4.2 Hardware limitations

The following hardware requirements are to be met by the user in order for the platform to work:

- The devices should facilitate stable internet connectivity, ensuring at least one of the following standards: 3G, 4G, 5G, IEEE 802.11, or IEEE 802.3. The connections can be wired or wireless but reliable and maintain connectivity with the use of a modem, router, or any related device. - The hardware specifications of the devices need to be up-to-date, with a processor at least like Intel i5 or i7 and a display resolution not lower than Full HD. Besides, a minimum of 8 GB RAM is also essential for a smooth performance.

3.4.3 Any other constraint

The platform should be easy to handle by students and companies alike. The interface must support users at any level of technical skill so that searching for internships, submitting CVs, and tracking applications would be smooth and fast.

3.5 Software System Attributes

This section defines the non-functional requirements and software quality attributes that the Students&Companies (S&C) platform must meet to ensure reliability, security, and maintainability.

3.5.1 Reliability

The system should support offline backups to recover from potential data loss and minimize disruption.

3.5.2 Availability

The system should be available to provide its functionalities with a minimum of 99.5% uptime, meaning that the downtime is less than two days annually. Therefore, the platform should ensure redundancy for the critical components and perform scheduled maintenance during periods of low traffic.

3.5.3 Security

The platform should securely store user data, including the encryption of sensitive information like passwords and personal details. It shall use secure communication protocols, such as SSL/TLS, for securing data in transit from client to server. Then again, protection against internal and external threats should

be good enough, with firewalls and intrusion detection systems amongst others. Besides, sensitive operations shall be restricted based on user role and permission.

3.5.4 Maintainability

The platform's codebase should be modular, well-documented, and easy to update. Clear comments and proper version control practices must be applied throughout the development lifecycle.

3.5.5 Portability

Being a web-based application, the platform should support the use of popular browsers like Google Chrome, Firefox, and Safari. It is also expected to be accessible via different devices: smartphones, tablets, and desktops.

4 Formal Analysis Using Alloy

4.1 Objectives of the analysis

The analysis checks that students are matched with internships based on their skills and the requirements of the internship, making sure each student is only assigned to one internship. It also ensures that both students and companies are available at the same time for interviews and that no student is assigned to more than one internship. The internships follow a set process from creation to completion, and students' complaints and company details are kept confidential.

4.2 Alloy Code

module StudentsAndCompanies

```
-- Entities
```

sig Student {
skills: set Skill, // Skills that the student has
availability: set TimeSlot,

```
-- Time slots when the student is available
```

complaints: set Complaint

```
-- Complaints filed by the student
```

}

sig Company {
requirements: set Skill,

```
-- Skills required by the company for internships
```

internships: set Internship,

```
-- Internships offered by the company
```

availability: set TimeSlot

```
-- Time slots when the company is available
```

}

sig Internship {
requiredSkills: set Skill,

```
-- Skills required for the internship
```

assigned: lone Student

```
-- Student assigned to the internship
```

}

sig University {
complaintsReceived: set Complaint

```alloy
-- Complaints received by the university

}

    sig Skill { }
sig TimeSlot { }
sig Complaint {
student: one Student,

-- Student who filed the complaint

company: one Company

-- Company related to the complaint

}


-- Predicates for checking conditions

pred validMatch[s: Student, i: Internship] {
some s.skills & i.requiredSkills

-- Ensure student's skills match internship requirements

}

    pred uniqueMatch[s: Student, i: Internship] {
i.assigned = s and no other: Internship | other.assigned = s

-- Ensure no student is assigned to multiple internships

}

    pred validAvailability[s: Student, c: Company] {
some s.availability & c.availability

-- Ensure there's an overlap in available time slots

}

    pred validComplaintHandling[c: Complaint] {
c in University.complaintsReceived

-- Ensure complaints are received and handled by the university

}


-- Integrity constraints

fact Integrity {


-- Students cannot be assigned to multiple internships simultaneously
```

all s: Student | lone i: Internship | i.assigned = s => uniqueMatch[s, i]

```
-- Internships should have required skills
```

all i: Internship | some i.requiredSkills

```
-- All complaints should be handled by the university
```

all c: Complaint | validComplaintHandling[c]

```
-- Availability for interviews should be agreed upon by both student and company
```

all s: Student, c: Company | validAvailability[s, c]
}

```
-- Internship lifecycle stages
```

abstract sig InternshipStage { }
one sig Created, Matched, Interviewed, Completed extends InternshipStage { }

    sig InternshipLifecycle {
internship: one Internship,

```
-- Internship related to the lifecycle stage
```

stage: one InternshipStage

```
-- Current stage of the internship
```

}

    fact LifecycleOrder {

```
-- Ensure that the internship lifecycle follows the correct order: Created -> Matched -> Int
```

all lc: InternshipLifecycle |
lc.stage = Completed => lc.stage in Interviewed + Matched + Created
}

```
-- Data confidentiality checks
```

fact Confidentiality {

```
-- Ensure students' complaints are not accessible by other students
```

all s1, s2: Student | s1 != s2 => no s1.complaints & s2.complaints

```
-- Ensure companies cannot access each other's internships
```

all c1, c2: Company | c1 != c2 => no c1.internships & c2.internships
}

-- Interviewing stage ensures that both the company and the student are available

sig Interview
{ student: one Student,
company: one Company,
timeSlot: one TimeSlot
}

-- Predicates to validate each process

pred ValidMatching {
all s: Student, i: Internship | validMatch[s, i]

-- Check that all student-internship matches are valid

}

    pred UniqueAssignment {
all s: Student | lone i: Internship | (i.assigned = s) implies uniqueMatch[s, i]

-- Ensure no student is assigned to more than one internship

}

    pred ScheduleConflict {
all s: Student, c: Company | validAvailability[s, c]

-- Ensure no scheduling conflicts between student and company

}

    pred ComplaintHandling {
all c: Complaint | validComplaintHandling[c]

-- Ensure all complaints are handled

}

-- Running checks to validate the system

run ValidMatching for 5
run UniqueAssignment for 5
run ScheduleConflict for 5
run ComplaintHandling for 5

Figure 38: Alloy solver visualization for the ValidMatching predicate.

Figure 39: Alloy solver visualization for the UniqueAssignment predicate.
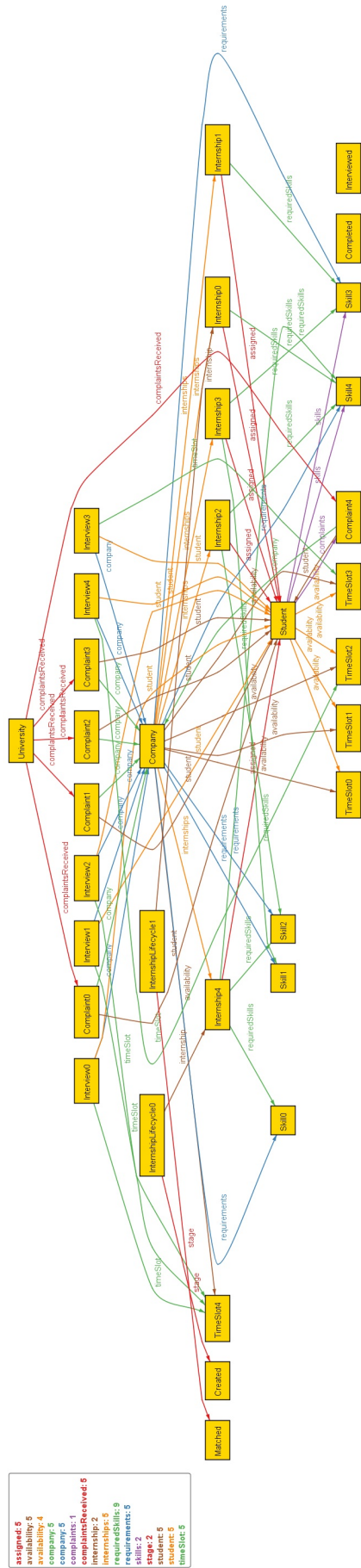
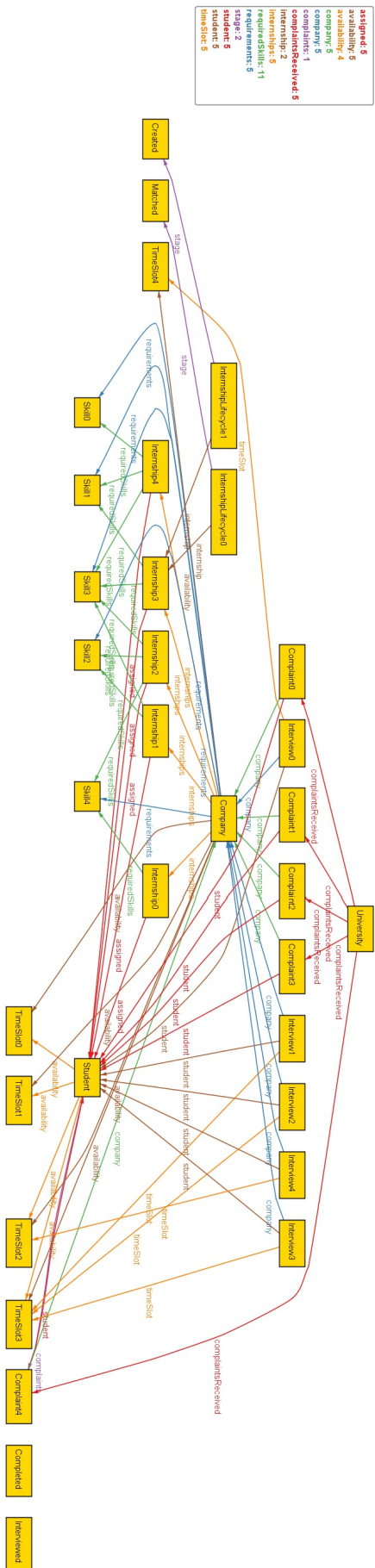Figure 40: Alloy solver visualization for the ScheduleConflict predicate.

Figure 41: Alloy solver visualization for the ComplaintHandling predicate.

5 Effort Spent

This section shows the amount of time that each member has spent to produce the document. Please notice that each unit is the result of coordinated work among all the members.

UNIT	MEMBERS	HOURS
Chapter 1 except phenamenas	S. Chaudhury	2h
World and Machine Phenomenas	D. Motiallah & S. Chaudhury	2h
Class Diagrams	D. Motiallah	6h
State Charts	D. Motiallah	1h
Requirements	S. Chaudhury & D. Motiallah(helped on decisions)	2h
Domain assumption	Mainly S. Chaudhury but D. Motiallah(added last two ones)	1h
Scenarios	S. Chaudhury	3h
Product Functions	S. Chaudhury	2h
Use Case Diagrams	D. Motiallah	8h
Use Cases	D. Motiallah(first half) & S. Chaudhury (second half)	10h
Sequence diagrams	D. Motiallah & S. Chaudhury	12h
User Interfaces, Software Interfaces and Communication Interfaces	Darkhan Islam	6h
Functional Requirements	Darkhan Islam	2h
Requirement mapping	S. Chaudhury	2h
Performance Requirements, Design Constraints and Software System Attributes	Darkhan Islam	2h
Formal Analysis Using Alloy	Darkhan Islam	8h
Final Review and Redaction	S. Chaudhury & D. Motiallah & D. Islam	7h

6 References and Tools

1. GitHub: https://www.github.com

2. GitHub Actions: https://github.com/features/actions

3. The UI have been made with:

   - JavaScript documentation:https://developer.mozilla.org/en-US/docs/Web/JavaScript

   - Node.js documentation: https://nodejs.org/api/all.html

   - HTML documentation: https://html.spec.whatwg.org/

   - Bootstrap CSS framework: https://getbootstrap.com/docs/5.3/getting-started/introduction/

4. Alloy Language Reference: https://alloytools.org/download/alloy-language-reference.pdf

5. Alloy Tools: https://alloytools.org

6. Sequence Diagrams have been made with draw.io: https://app.diagrams.net/

7. Use Case Diagrams have been made with draw.io: https://app.diagrams.net/

8. Class Diagrams have been made with draw.io: https://app.diagrams.net/

9. State Charts have been made with draw.io: https://app.diagrams.net/