

RASD Document

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1 Introduction

1.1 Purpose

Students&Companies (S&C) is a dynamic platform designed to connect university students seeking internships with companies offering valuable opportunities. By leveraging students' skills, experiences, and career interests alongside the specific needs and offerings of companies, S&C aims to create seamless matches. The platform provides a recommendation system that notifies students about relevant internships and informs companies of suitable candidates. It also facilitates the selection process, supports feedback exchange, and helps both parties refine their profiles for better alignment. S&C results useful thanks to the offered tools for monitoring internship progress and resolving issues collaboratively.

1.1.1 Goals

The goals specify what the platform will allow users to achieve in the real world, everything else will not be allowed.

All the starred words will be defined in section 1.3 to avoid any ambiguity.

- **G1** Allows registered companies to post and advertise* the available internships that they offer.
- **G2** Allows registered students to proactively and autonomously search and apply* to advertised internships.
- **G3** Helps registered students and registered companies by suggesting them appealing templates for their CVs and internship projects drafts.
- **G4** Allows a registered student to be recommended a list of advertised internships that might be of interest to him/her with respect to: his/her uploaded CV, the internships descriptions and users'* feedbacks.
- **G5** Allows a registered company to be recommended a list of registered students who might be of interest for one of its advertised internships with respect to: their uploaded CVs, the internship description and users' feedbacks.
- **G6** Allows a registered company to view the list of all the students who applied to one of its advertised internships.
- **G7** Allows a company to manage the selection process* of the candidates* to one of its internships.
- **G8** Allows registered companies and students that are taking part in an ongoing internship to comment about it.
- **G9** Allows a registered university to view the comments about an ongoing internship, written either by its interning students or by the host company.
- **G10** Allows a registered university to interrupt an ongoing internship involving one its

students.

- **G11** Allows companies and students to provide feedback about a recommended or past internships according to the likings.

1.2 Scope

In this section, the aim is to discuss the objectives the system intends to achieve, the scopes it will focus on, the types of users it is designed for, and finally, the boundaries of the system.

The system is primarily designed to facilitate access for three distinct categories of users: students, university administrators, and company representatives, each of whom interacts with the system based on their specific roles and responsibilities.

In addition, the main features which should be provided in order to achieve the aim of the project are:

- **Posting Internship Advertisement:** Registered companies can post and advertise internship opportunities and select the potential candidates for it.
- **Proactive Search and Application:** Registered students are able to search for and apply to advertised internships.
- **Candidate Selection:** Companies will be facilitated in managing the selection process of candidates for their internships, and organize the entire hiring process workflow.
- **Template Suggestions:** The system supports both students and companies by offering appealing templates for CVs and internship project descriptions.
- **Ongoing Internship Interaction:** Companies and students participating in ongoing internships will be able to comment on their experiences, and universities will be given access to these comments to monitor their students' ongoing internships.
- **Feedback:** Students and companies will have access to a feedback mechanism where they can share their experiences after the completion of the internship process. Internship Interruption:
- **Interruption mechanism:** Universities can oversee ongoing internships involving their students and, if necessary, interrupt these internships, and thus universities can promptly address any circumstances where the internship conditions are deemed inappropriate.

1.2.1 World Phenomena

- **W1** A company wants to advertise an internship.
- **W2** A student wants to find an interesting company or internship opportunity.
- **W3** A company wants to interview the internship candidate and select them.
- **W4** A student wants to comment an internship process.

- **W5** A company and a student want to improve the internship advertisement and the CV, respectively.
- **W6** A University wants to shrek an internship process.

1.2.2 Shared Phenomena

Controlled by World

- **S1** A student searches for internships on the platform.
- **S2** A registered company advertises an internship opportunity on S&C.
- **S3** A student selects and accepts internships he wants to make contact with.
- **S4** A company selects and accepts a number between all the interested and recommended students as candidates for the given internship.
- **S5** A Student or a Company sends information of any type about the state of an on-going internship, like complaining or providing general information.
- **S6** A University interrupts an internship of a student after some complaints from the company or from the student.
- **S7** A user registers either as Student, Company or University.
- **S8** A registered student submit their resumes on the S&C.
- **S9** A student selects the internship they want to apply for through the S&C.
- **S10** A company schedules interview time slots through the S&C after the deadline, giving a room link for the interview.
- **S11** A student and a company can provide feedback on their experiences throughout the process.
- **S12** A company offers the internship position to the selected student through the S&C.
- **S13** A student decides if to confirm its participation to the offered internship position through the S&C.
- **S14** A student's university follows up on comments about the internship process through the S&C and is able to interrupt the internship if necessary.
- **S15** A student updates their resume, based also on the suggestions received from the S&C.
- **S16** A company updates their advertisement, based also on the suggestions received from the S&C.

Controlled by Machine

- **S17** The system notifies a company about an interesting student resume.

- **S18** The system notifies to a student an internship that might interest him is available.
- **S19** The system starts a contact process when both an internship and a student confirm an interest in each other.
- **S20** The system notifies a student when the interview date is scheduled.
- **S21** The system recommends interesting student profiles and shows to the company.
- **S22** The system recommends interesting internship advertisements and shows to the student.
- **S23** The system notifies a student when the company has selected him for the internship.

1.3 Definitions, Acronyms, Abbreviations

1.3.1 Definitions

- : User: with User we refer to an active individual that can be either a Student, a Company or a University.
- Advertise: An Internship is advertised only if it has been posted and its application deadline is not yet expired.
- Recommendation: It's a platform feature that starts a matching between a company and a student. If both parties accept the recommendation, the student is taken for the selection process
- Applying: a student applies for an internship if he/she manually searches for it and applies for it and the internship was not recommended to him/her.
- Accepting: The act of students or companies, who got recommended to each other, to confirm their interest.
- Contact: The mutual acceptance of recommendation between student and company on the same internship.
- Selection: It's the process that starts after the expiration date of applying for the internship. The company interviews every accepted student and picks the best one(s) for their needs.
- Selected student: He is the student who has been chosen for the internship by the company.
- Candidate: he is a Student that has passed to the selection phase of an internship.
- Feedback: Consists of two separate moments. The first round of feedback is when the users likes/dislikes the recommendation given by the system. The second type of feedback is submitted after the end of the internship, where students and companies rate the experience through a 5 star review form.

- Comment: Is anything written in the dedicated Comments section. Serves the student or the company currently engaged, to highlight something about the experience with each other. If that's a complaint from either, the University of the student will manage the situation.
- Complaint: It's a specific type of Observation, where the University of the student can manage the situation between the parties.
- Observation: It's a type of comment that is not a complaint. It could just report some good or neutral facts about the experience.

1.3.2 Acronyms

- S&C: "Students&Companies", the name of the platform

1.3.3 Abbreviations

- Wn: n-th World Phenomena
- Sn: 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 the document

1.5 Reference Documents

- Software Engineering 2 A.Y. 2024/2025 Slides (course material)
- Assignment RDD A.Y. 2024/2025 (Requirement Engineering and Design Project: goal, schedule, and rules)

1.6 Document Structure

This document is composed of six sections:

- **1st Chapter:** We begin by presenting the problem statement and outlining the system's objectives. In the scope subsection, we offer insights into the various real-world and shared phenomena that the system addresses. Finally, we provide essential resources for readers,

including definitions and abbreviations, to facilitate a comprehensive understanding of this document.

- **2nd Chapter:** We offer a comprehensive overview of the system, including insights into User profiles and their primary functions. We also establish the key domain assumptions underpinning the system's operation.
- **3rd Chapter:** We delineate the system's requirements, encompassing both functional and non-functional aspects. In addition, we present Use Case Diagrams that illustrate system interactions, accompanied by detailed descriptions of each use case and related Sequence Diagrams. Lastly, we establish a clear mapping of these requirements to both system goals and use cases for comprehensive understanding.
- **4th Chapter:** We provide a formal analysis of the system to be with Alloy.
- **5th Chapter:** We provide an estimate of the effort spent by each group member.
- **6th Chapter:** We provide a list of the references used in this document.

2 Overall Description

2.1 Product Perspective

The Students&Companies (S&C) platform is designed to streamline the process of connecting university students with companies offering internships. It facilitates the matchmaking process by analyzing students' CVs, which detail their skills, experiences, and attitudes, and aligning them with the project descriptions and terms of internships offered by companies. In addition to this, the platform supports proactive search by students.

On the other hand, S&C aids in managing subsequent stages, including the selection process, interviews, and finalizing agreements. It also gathers feedback from both parties to refine its services. Universities, as stakeholders, can monitor the status of internships, addressing complaints if needed. The platform aims to foster transparency, communication, and satisfaction for all participants while ensuring a smooth execution and monitoring of the internship lifecycle.

2.1.1 Scenarios

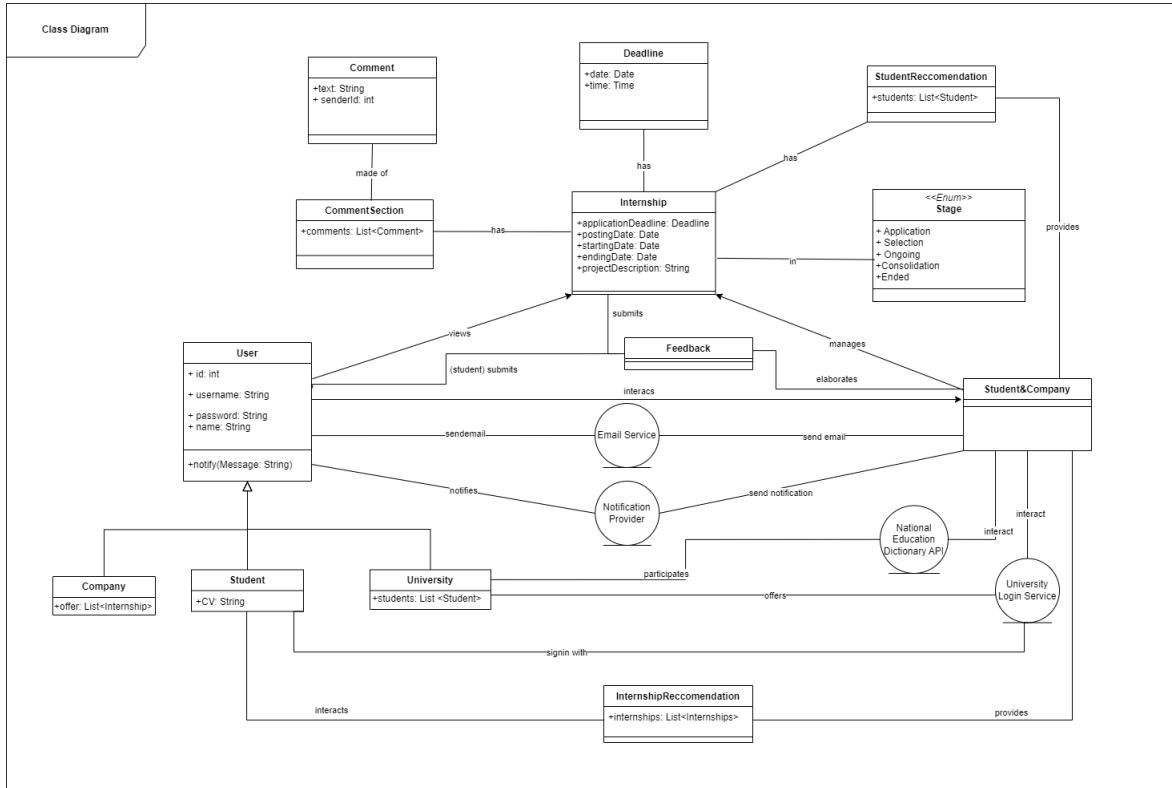
- 1st Scenario: Signing up. User John has accessed the opening page; he registers into the site as a student, filling the required data, like CV and university information, and is sent back to the opening page.
- 2nd Scenario: Logging in. User John is in the opening page; he logs into the site using his credentials, and can now access to his possible operations.
- 3rd Scenario: CV Update. John is in the profile page, and he is suggested a proper template for creating a CV. He modifies his CV and updates the new file into the site.

- 4th Scenario: Starting an offer. The company Emazon posts an internship offer on the platform, deciding the expiration date and the duration of it. Then Emazon lists the tasks the student will have to perform, the application domain and other relevant things regarding the internship.
- 5th Scenario: Platform recommendation. After registration, the platform analyzes John's CV and automatically suggests him all the current potential interesting internship offers. After Emazon has posted its internship offer, it gets notified to him as well.
- 6th Scenario: Searching Internships. John opens the page of the available internships. He manually searches for the internships or the companies that could interest him. He applies for Guggl's offer.
- 7th Scenario: Student evaluates recommendations. John gets recommended some internships, and he likes them all. He sends positive feedback using the thumbs up button.
- 8th Scenario: Student accepts recommendation. John likes the Emazon internship the best. He decides to accept it.
- 9th Scenario: Company accepts students. After Emazon posted the internship offer, it gets recommended some students by the platform, while some other students found the internship by manual searching. Emazon accepts John and some other students.
- 10th Scenario: Entering the selection. After the expiration date passes, the company starts the selection process. Emazon proposes the interviews dates and time schedules through the dedicated interface to all the candidates.
- 11th Scenario: Candidate chooses interview day. Since John has established contact with Emazon, he selects the time and day of the interview through the dedicated interface.
- 12th Scenario: Student joins the interview. When the scheduled day for the interview comes, John can meet the interviewer using the link posted by the company on the platform. After some time, the platform officially notifies him that he was selected.
- 13th Scenario: Writing Comments. Emazon writes a complaint in the provided space about John's current behaviour.
- 14th Scenario: University acts. The University Polime gets a complaint from Emazon about John's behaviour. Polime decides to interrupt his internship.
- 15th Scenario: Giving Feedback. At the end of the internship, John and Emazon submit a five star form about their experience.

2.1.2 Class Diagram

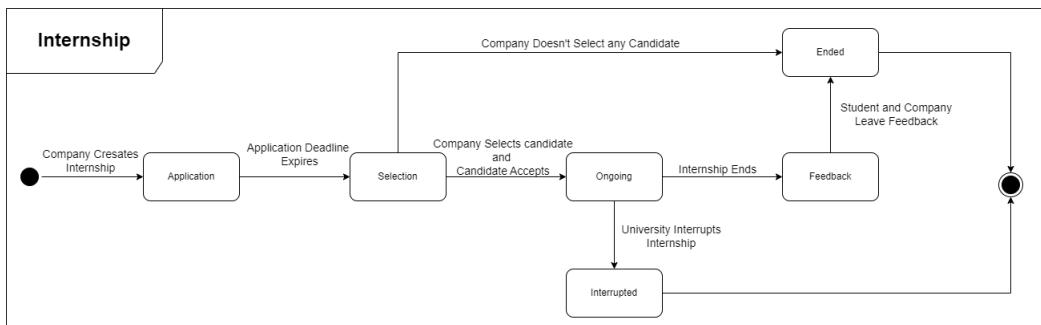
The UML Class Diagram shown below provides a conceptual, high-level representation of the intended software. At this stage, it may include entities that will not necessarily be part of the final system. Additionally, this diagram intentionally omits methods and other detailed elements that will be addressed in the design phase.

The three main components are User, Internship and Student&Company (which represents the software itself). They are connected with arrows in order to recreate the interactions between one another. The User views the Internship according to his granted permissions. Then he/she interacts with the platform (i.e. accepts a recommendation, submits feedback...) and eventually the system accordingly manages the Internship.



2.1.3 State Charts

The following section outlines the key component (Internship) of the Student&Company (S&C) system and its evolution across different phases. To illustrate this, the UML State Chart is presented.



The diagram in question outlines the potential phases of an Internship. Posted by a Company,

the Internship promptly enters the "Application" state, allowing Students to apply and Companies/Students to accept recommendations; in this state the company and the recommended students can provide feedback about the recommendation.

Following the closure of the application window, the system transitions the Internship to the "Selection" state, in which the Candidates are interviewed, selected and confirmed.

In case no Candidate is confirmed, the Internship is archived and transitioned to the "Ended" state. Otherwise, the selected Candidate starts the interning period and the Internship is changed into the "Ongoing" state.

While the Internship is "Ongoing" and the University responsible for the Student receives complaints, it may decide to terminate the Internship. In such cases, the Internship is moved to the "Interrupted" state and archived as is.

If the Internship ends without interruptions, before being archived, it waits for both the selected Candidate and the host Company to provide a feedback about the interning experience. The Internship is therefore placed in its "Feedback" state.

Only afterwards, the system closes the Internship, transitioning it in the "Ended" state and archiving it.

2.2 Product Functions

The platform **Students&Companies** offers several key functions:

- **Internship Advertisement:** Companies can create and manage internship opportunities, specifying details such as descriptions and requirements .
- **Application Management:** Students can browse internships and apply to those matching their skills and interests. Companies will review the applications based on the students' CV.
- **Recommendation System:** The platform matches internships with students, facilitating the process for both sides.
- **Feedback Collection:** Both Companies and Students can provide feedback, enabling continuous improvement of the platform.
- **Comments system:** Both Companies and Students can write comments about the state of the on-going internship.
- **Interview Scheduling:** Companies can schedule interviews with Students directly on the platform.
- **University Supervision:** Universities can monitor their students' internship and can interrupt them if necessary.

2.2.1 Requirements

- **Requirement**
- **R1** The system must allow a student who wants to register to sign up.

- **R2** The system must allow a company who wants to register to sign up.
- **R3** The system must allow a university who wants to register to sign up.
- **R4** The system must allow registered users to sign in using their credentials.
- **R6** The system must be able to send notifications to all users.
- **R7** The system must allow registered students to upload their CVs on the platform.
- **R8** The system must allow registered companies to post internship advertisements.
- **R9** The system must allow companies to review students' CVs and select candidates who meet their internship requirements.
- **R10** The system must allow students to review internship advertisements and select them if they wish to apply.
- **R11** The system must allow students to manually search for internship opportunities and save them to their favorites.
- **R12** The system must notify students when there are updates regarding the internships they applied for or accepted.
- **R13** The system must notify a student and a company that accept each other.
- **R14** The system must allow companies to choose a suitable date for the interview, but only after a match is done.
- **R15** The system must schedule an interview at the date and time specified by the company and notify the selected students.
- **R16** The system must recommend a student and an internship to each other if the student's profile matches the needs of the company.
- **R17** The system must allow companies to offer internship proposals to selected students after the interview process is completed.
- **R18** The system must allow companies and students to give feedback at the end of the internship in which they took part.
- **R19** The system must allow the student and company who got recommended to each other to give feedback about the recommendation.
- **R20** The system must provide a suggested template to users for improving their CV or project description.
- **R21** The system must notify students when there are updates regarding the results of the internships they have applied for.
- **R22** The system must allow selected students to accept or decline internship proposal sent by companies.

- **R24** The system must allow companies to view and manage applications for the internships they have posted.
- **R25** The system must allow students to view all details about the internships they have applied for, such as completion status, and deadlines.
- **R27** The system must allow universities to follow internship processes, handle complaints raised by students, and interrupt an internship if necessary.

2.3 User characteristics

A User can be one of three types: Student, University, Company. Each role has access to distinct functionalities and is driven by different motivations.

- Students: They are students of some university; they want to apply for internships, either helped by the recommendations from the platform or by looking for internship themselves. If they have something to say about their on-going internship, they can make observations or complaints in the platform.
- Companies: They want to recruit students for their internship projects. They are aided in the selection process from the platform. They might want to make observations or complaints about the hired student.
- Universities: They want to manage their students' on-going internship, handling their complaints or the ones coming from the company of the internship.

2.4 Assumptions, dependencies and constraints

This section serves as a comprehensive overview of critical factors which must be considered during the implementation of the platform. It consolidates the foundational assumptions made during project planning and highlights eventual dependencies.

2.4.1 Domain Assumptions

- D1 The User must have a working Internet connection.
- D2 Students are enrolled in a registered university as students of any kind.
- D3 The User registering is either a student, a university or a company.
- D4 A university needs to be registered for its students to link their accounts and start applying for internships.
- D5 The university profiles are registered using the university email from the ones of the specialized staff (like career centers, internship coordinators, etc.) for the task.
- D6 The student registers using his university mail.

2.4.2 Dependencies

An EmailService is needed, because in the registration process a verification email must be sent by the system to let Users successfully sign up.

A UniversityLoginService is needed for creating a connection between the university students' profiles and the university profile.

A NotificationProvider is needed, either implemented or integrated.

A NationalEducationDictionaryService is needed to check if the university registering actually exists or not.

3 Specific Requirements

3.1 External Interface Requirements

In this section, the system aims to develop a user-friendly interface that aligns with the goals, requirements, and scenarios outlined in Sections 1.1.1, 2.2.1, and 2.1.1, respectively. In addition, the system enables users to access the interface through any web browser on personal computers and utilize the general functions specified in section 2.2.

3.1.1 User Interfaces



Figure 1: Entrance

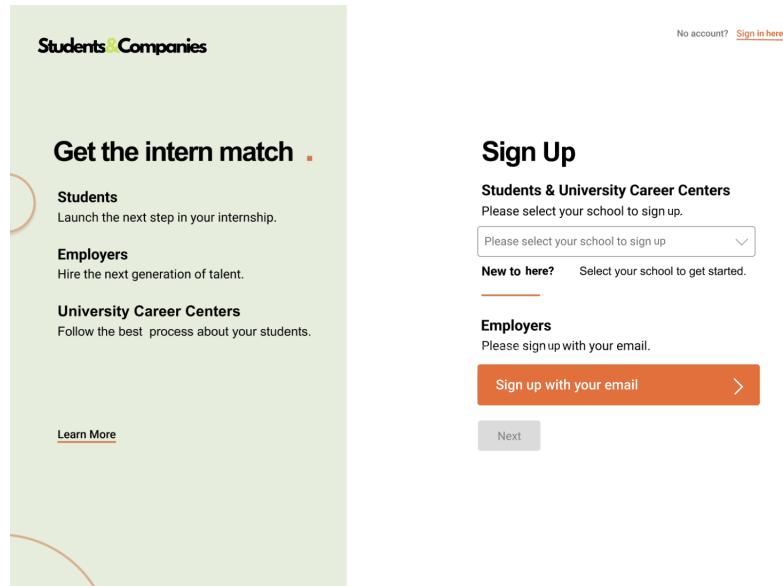


Figure 2: Home Sign Up Page

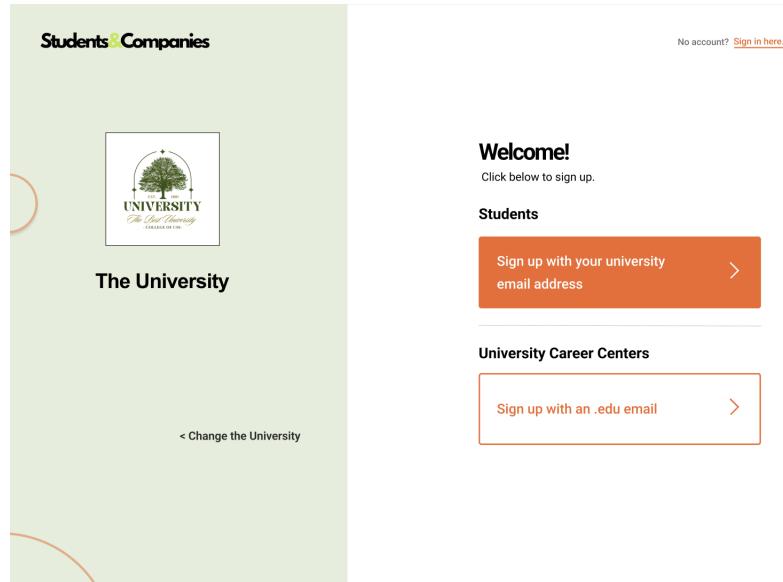


Figure 3: Student & University Sign Up

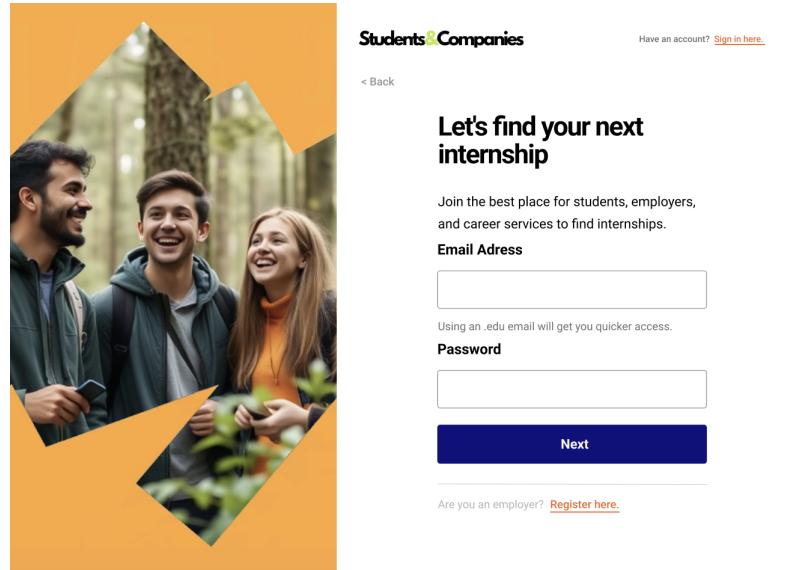


Figure 4: Student Sign Up Page

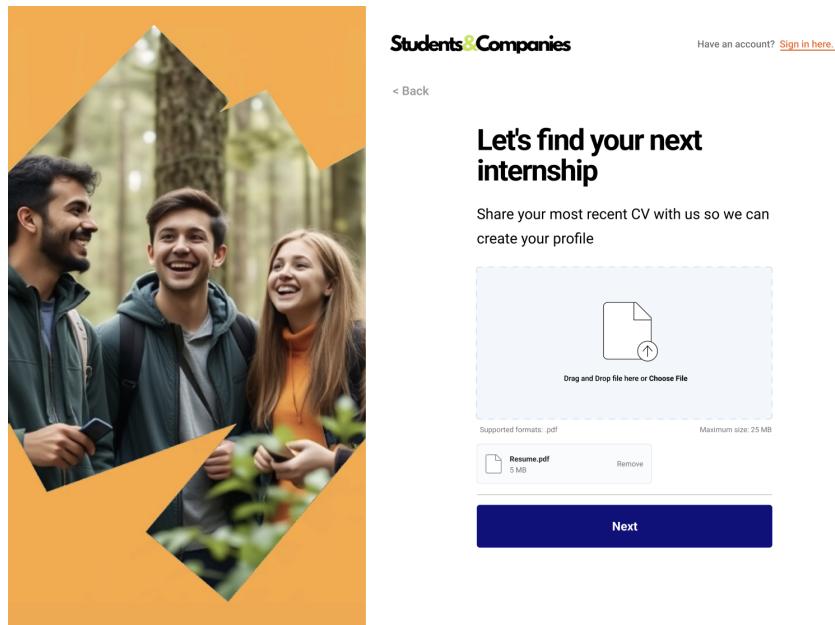


Figure 5: Student Upload CV

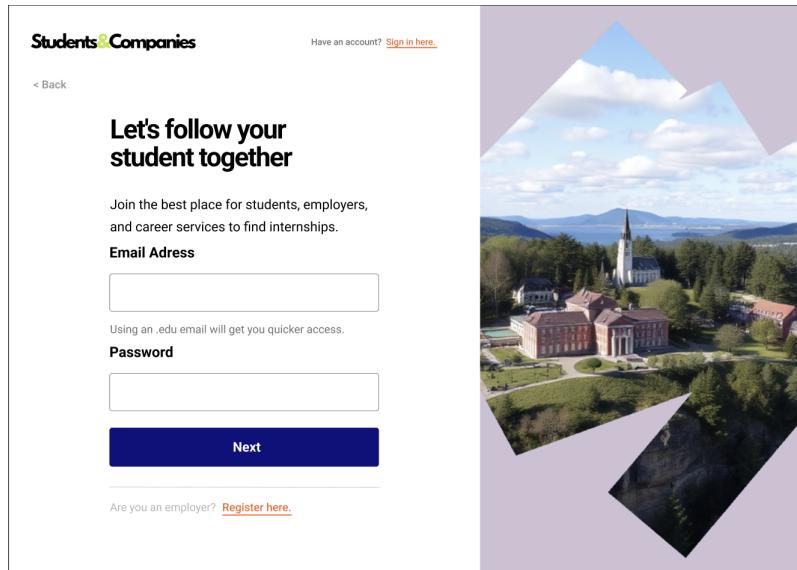


Figure 6: University Sign Up Page

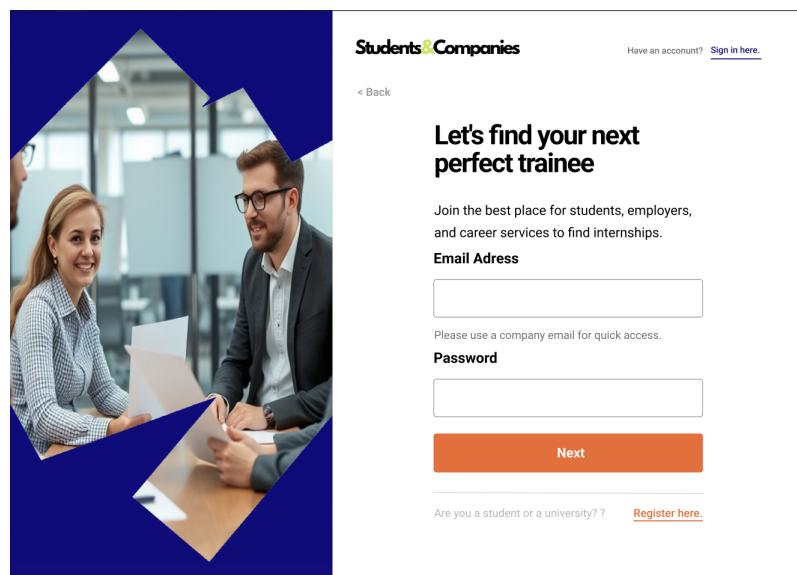


Figure 7: Employer Sign Up Page

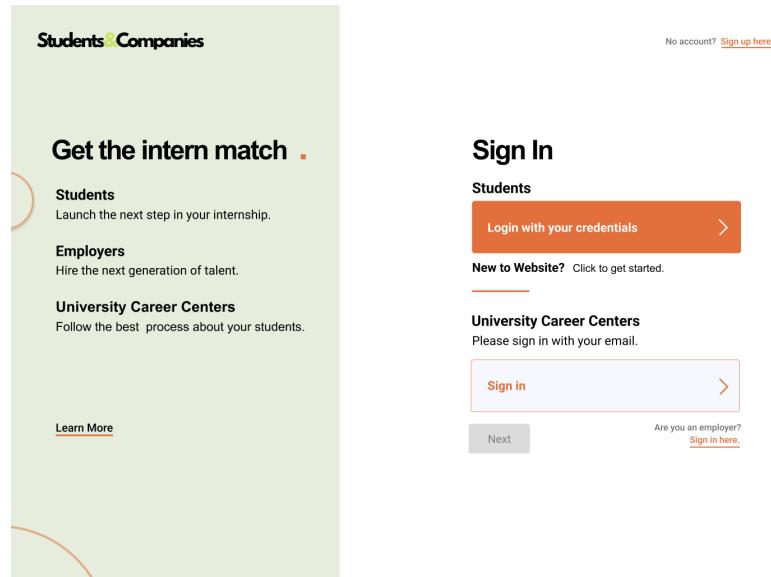


Figure 8: Student & University Home Sign In

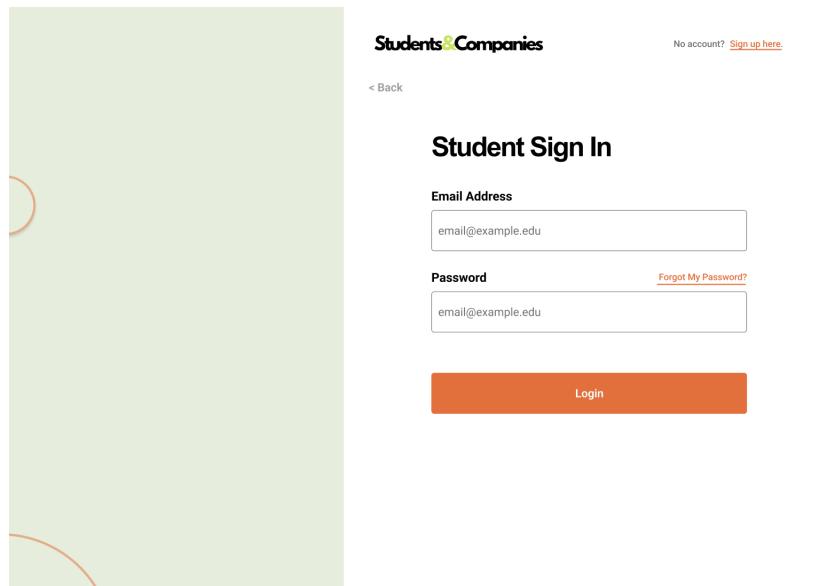


Figure 9: Student Sign In

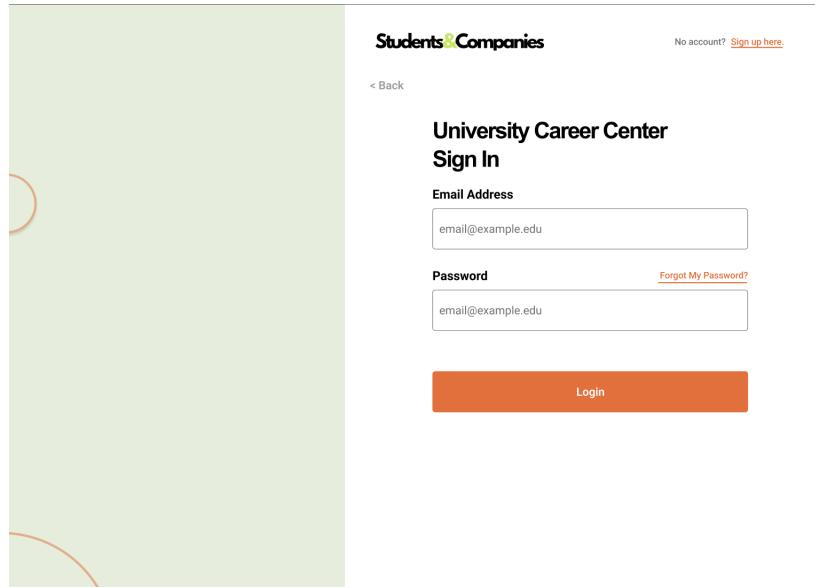


Figure 10: University Sign In

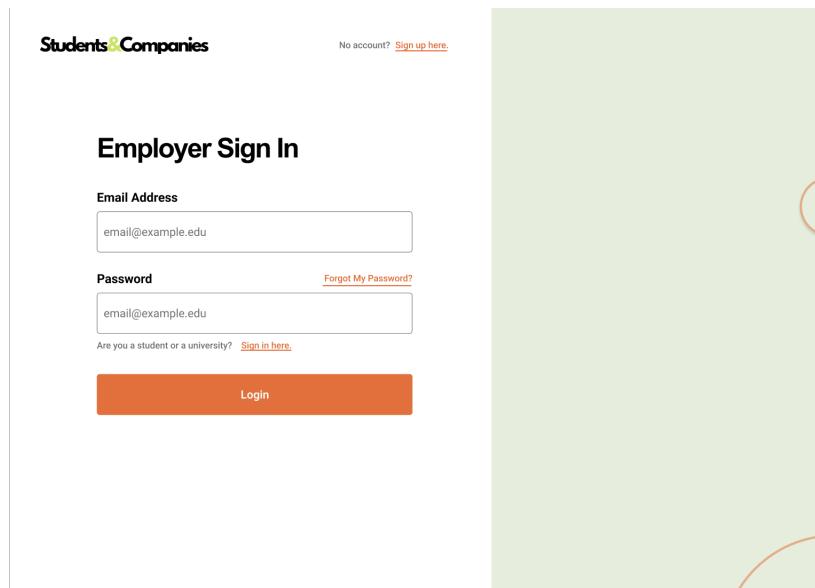


Figure 11: Employer Sign In

About

Education

The University

Education level: Bachelor of Science
Course: Computer Science
Starting year: September - 2022
End year (or Expiring): June - 2025
GPA: 3.92

Work Experience

The Company

Title: Data Analyst Intern
Description: -
Starting year: May - 2023
End year (or Expiring): August - 2023

Project

Project information is not added.

Volunteer Experience

Volunteer experience information is not added.

Languages

English	Italian	Turkish
Full professional proficiency	Native or bilingual proficiency	Native or bilingual proficiency

Certification

Certification information is not added.

Figure 12: Student Profile Details

Discover the Internships

Search For Your Dream Internship

Recommended Internships

We are Hiring IT Trainee

The Hiring Company 2

We are Hiring IT Trainee

The Hiring Company 3

All Internships

We are Hiring IT Trainee

The Hiring Company 4

We are Hiring IT Trainee

The Hiring Company 5

We are Hiring IT Trainee

The Hiring Company 6

Figure 13: Student Home Page 1

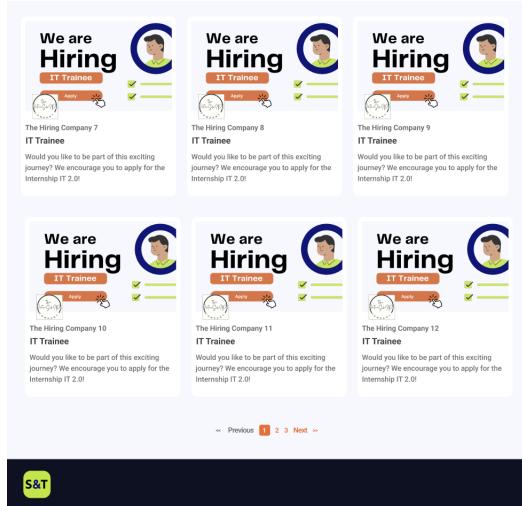


Figure 14: Student Home Page 2

Figure 15: Student Notifications

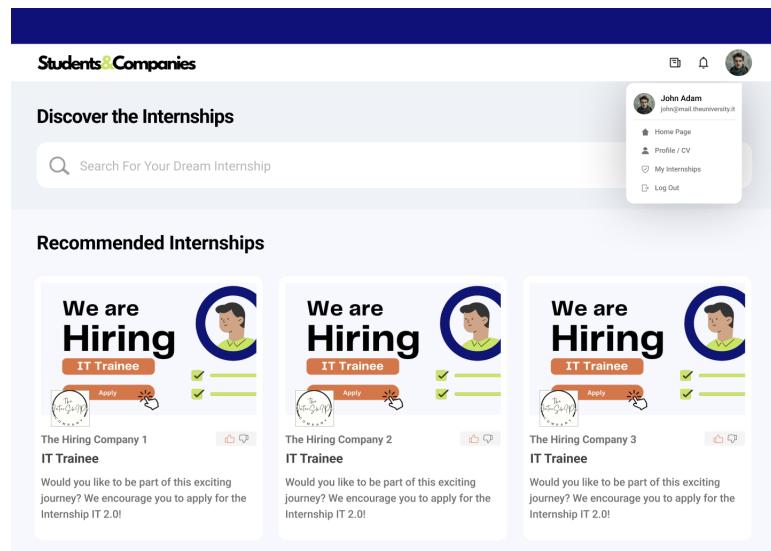


Figure 16: Student Profile Menu

Students&Companies

The Hiring Company 7
IT Trainee

Deadline: 30 Aug,2024

We are Hiring
IT Trainee

We are Hiring
IT Trainee

Location: Online | Duration: 6 Months | Start Date: 07 Oct, 2024

Internship Description

Would you like to be part of this exciting journey? We encourage you to apply for the Internship IT 2.0! If you think you have the following skills and are looking for a unique experience, we look forward to welcoming you.

Required Skills & Qualifications

- Experience programming in Java, C++, Python or related language
- Speak, write, and read fluently in English
- Enrolled in a PhD or Master's degree in Computer Science or related fields
- Good motivation, autonomy, teamwork, and ingenuity

Intern Responsibilities

- Collaborate with experienced cross-disciplinary peers to conceive, design, and bring to market innovative products and services.
- Design and build innovative technologies in a large distributed computing environment and help lead fundamental changes in the industry.
- Create solutions to run predictions on distributed systems with exposure to innovative technologies at incredible scale and speed.
- Build distributed storage, index, and query systems that are scalable, fault-tolerant, low cost, and easy to manage/use.
- Work in an agile environment to deliver high quality software.

Benefits

- Mentorship from experienced researchers and engineers.
- Access to state-of-the-art resources and tools.
- Networking opportunities within the industry.
- Competitive internships salary

Figure 17: Advertisement Details Page

The screenshot shows the 'My Internships' section of the Students&Companies platform. At the top, there are three tabs: 'Accepted Proposals' (selected), 'Matched Internships' (highlighted in blue), and 'Applied Positions'. Below the tabs is a search bar and a sorting option 'Sort by: Newest'. Two internship proposals are listed:

- IT Trainee**: Status: In progress. Company: The Hiring Company 7. Location: Italy. Note: The process still in progress.
- ML Intern**: Status: Process Completed. Company: The Hiring Company 35. Location: Italy. Note: The experience is awaiting a feedback.

Figure 18: Student Accepted Internships

The screenshot shows an 'Application Result' dialog box overlaid on the 'My Internships' section. The dialog box contains the following text:

Congratulations!!! We want to inform you that you have reached the best part of the process. **The Hiring Company 7** company is offering you an internship. Please let us know your answer.

At the bottom of the dialog box are two buttons: 'Accept the position 😊' (in a blue gradient background) and 'Reject the position 😞' (in a dark grey background).

Figure 19: Accepting the position

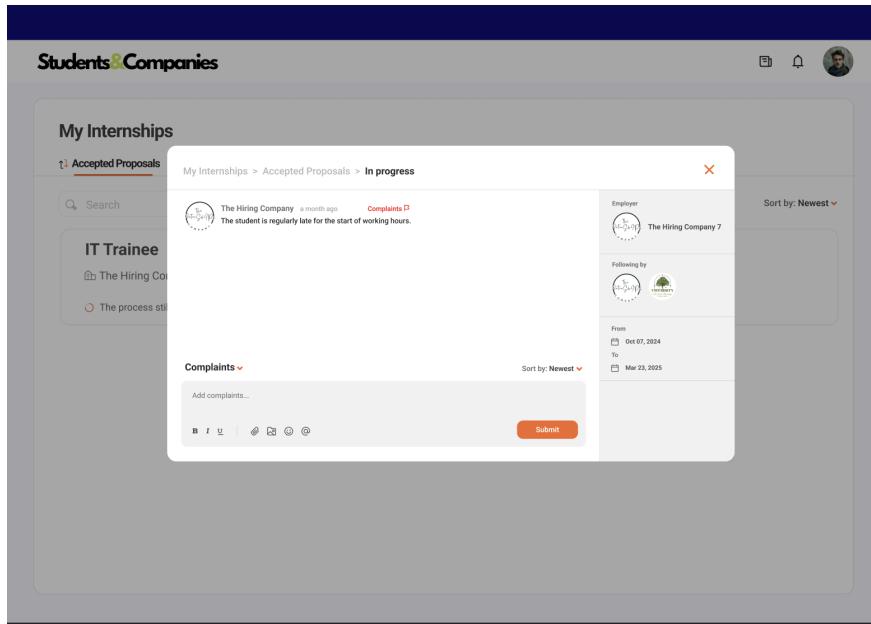


Figure 20: Student Ongoing Internship Complaints

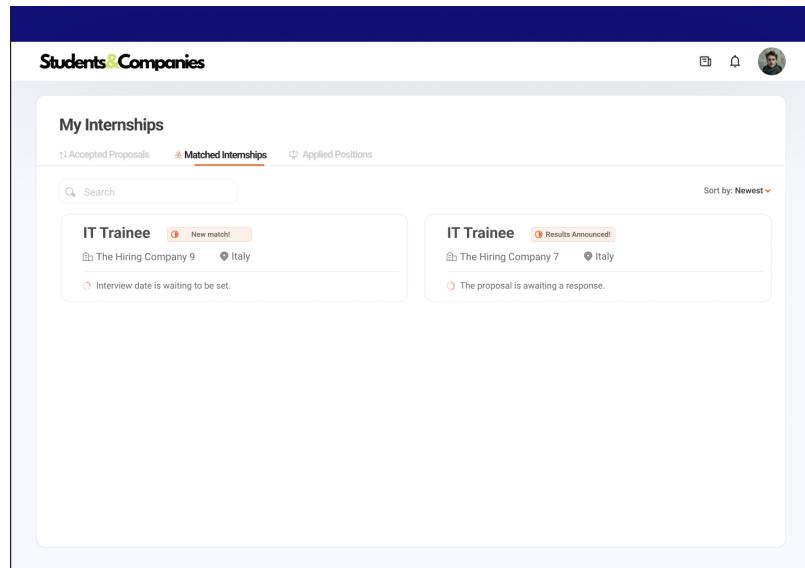


Figure 21: Student Matched Internships

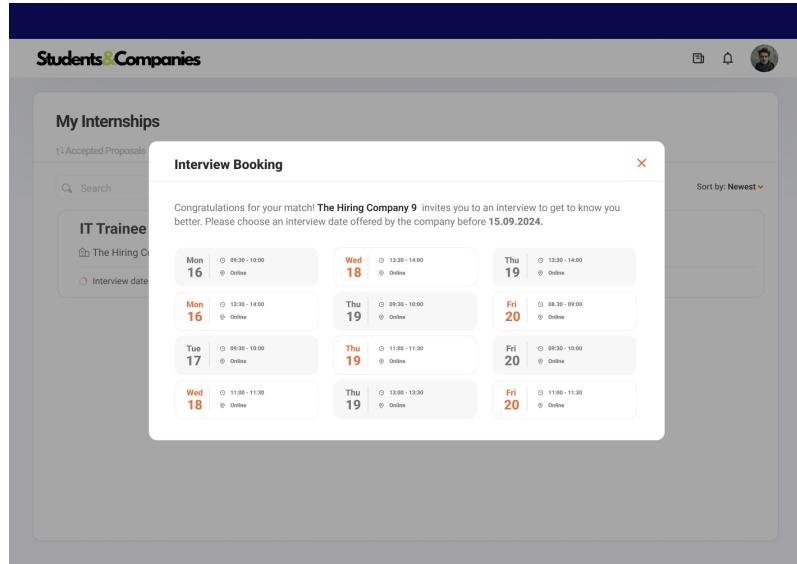


Figure 22: Student Interview Schedule

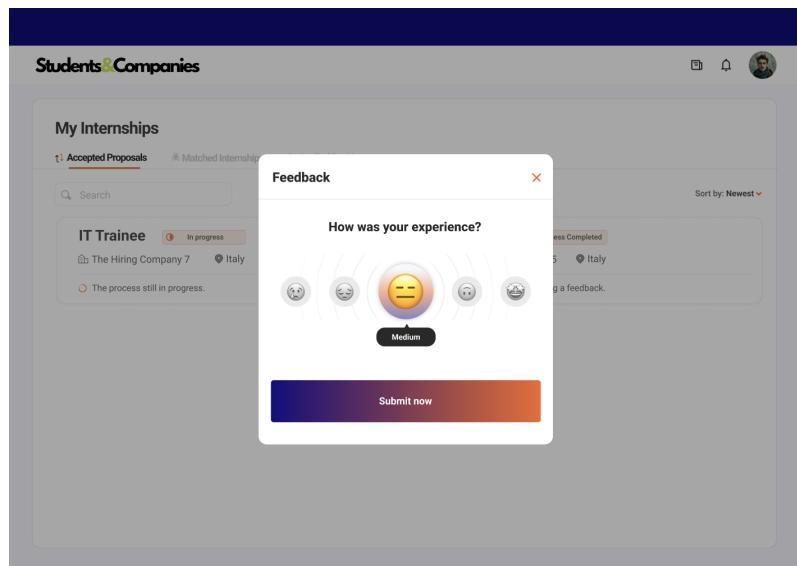


Figure 23: Student Feedback

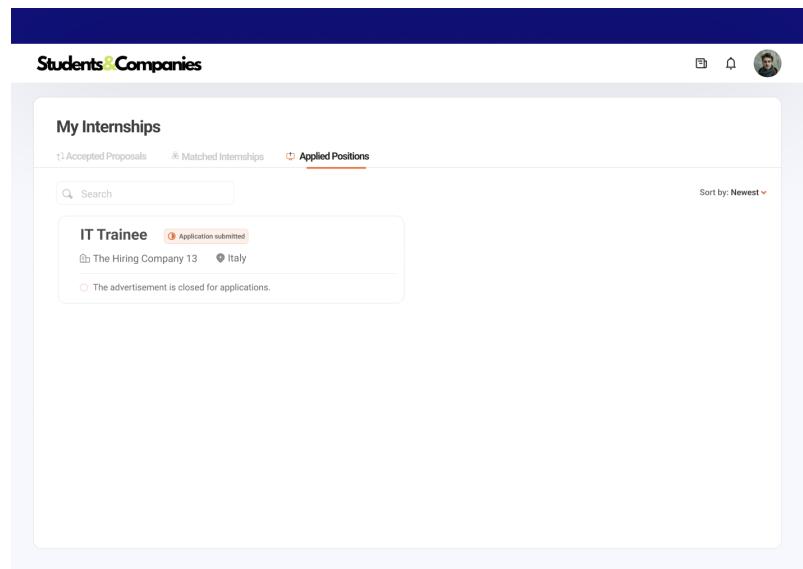


Figure 24: Student Applied Internships

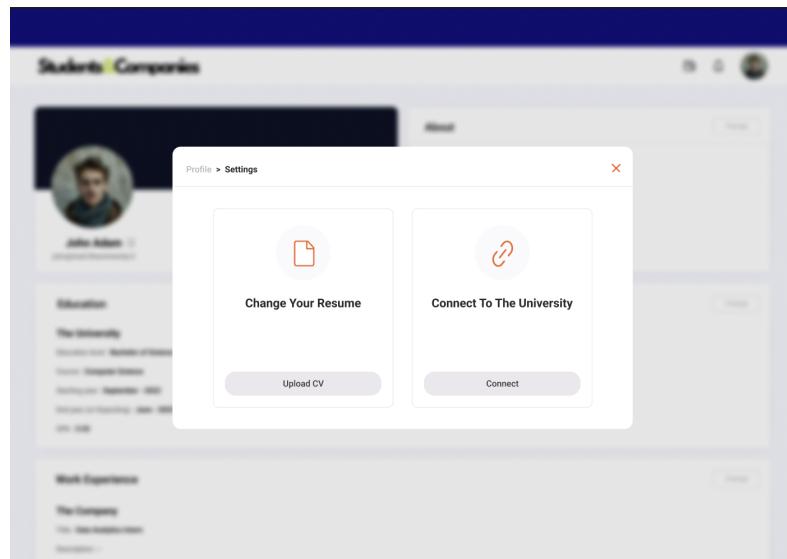


Figure 25: Student Settings

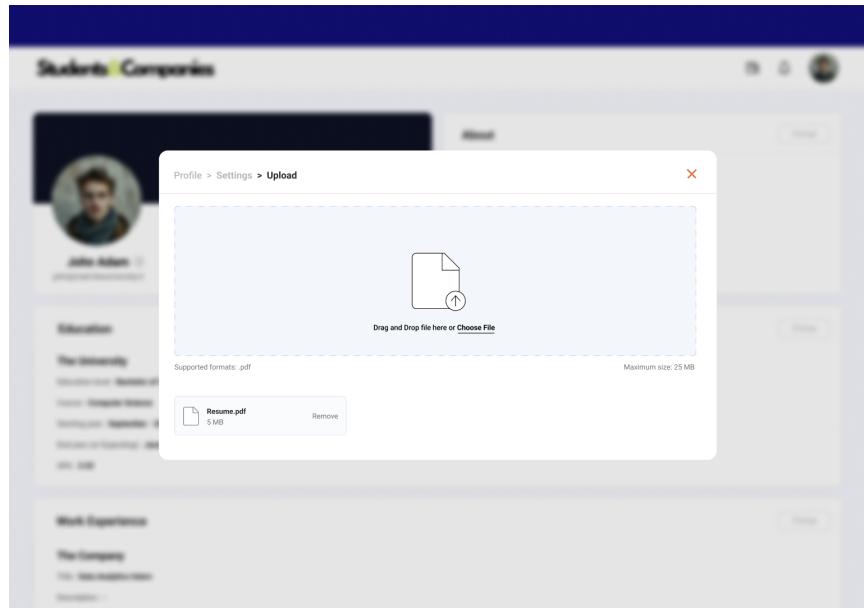


Figure 26: Student Update CV

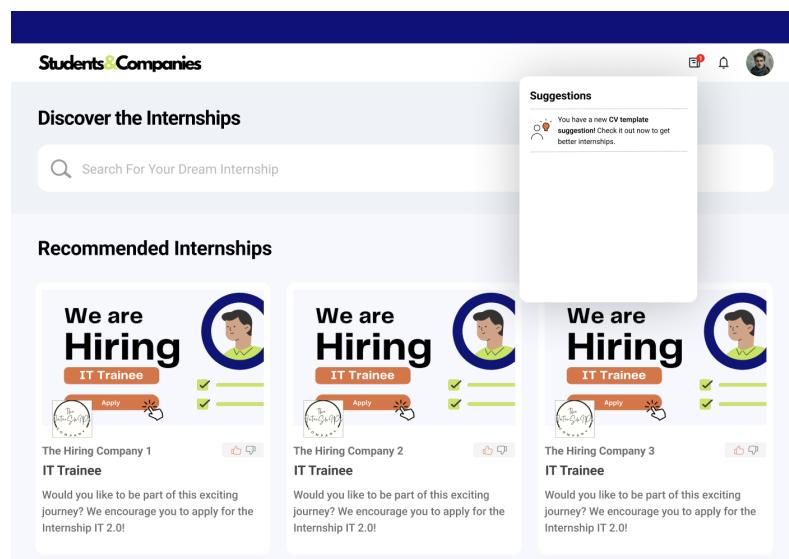


Figure 27: Student Suggestions Notification

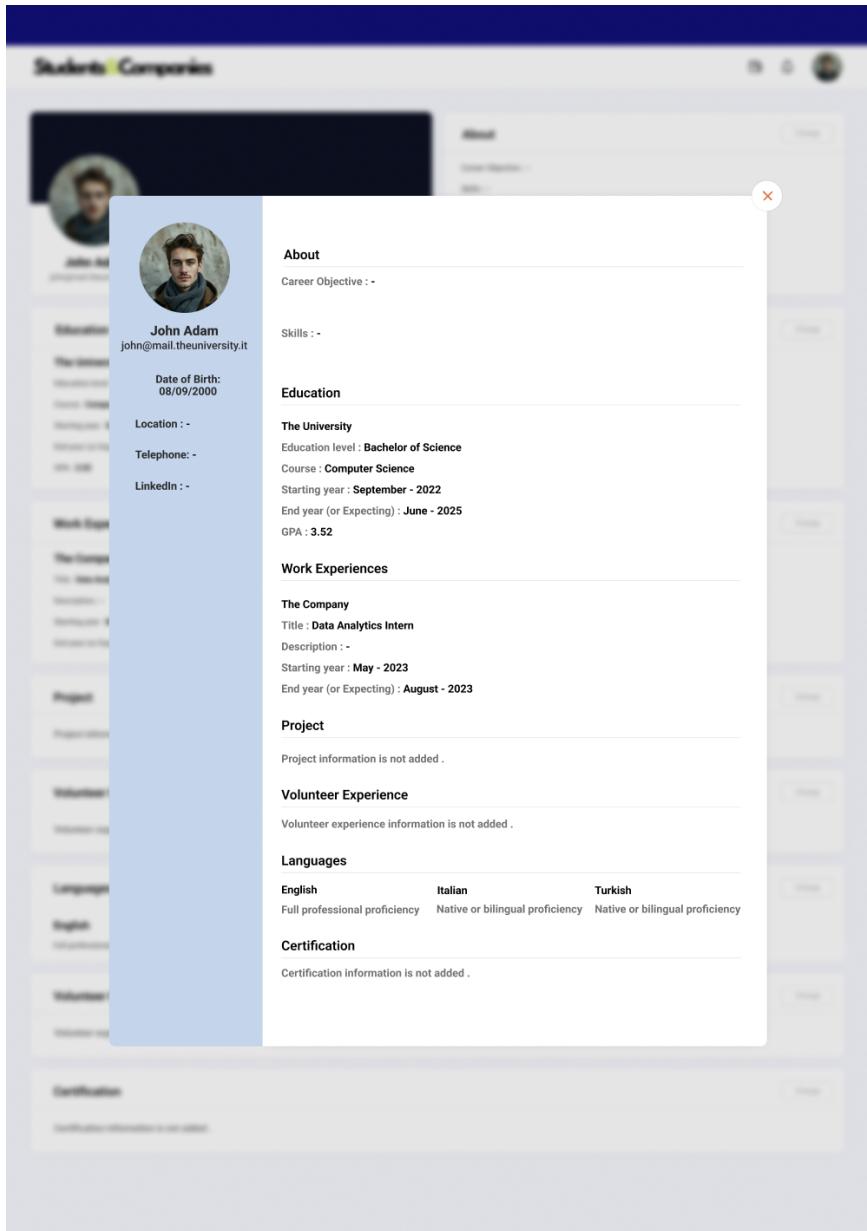


Figure 28: Student CV Suggestion Template

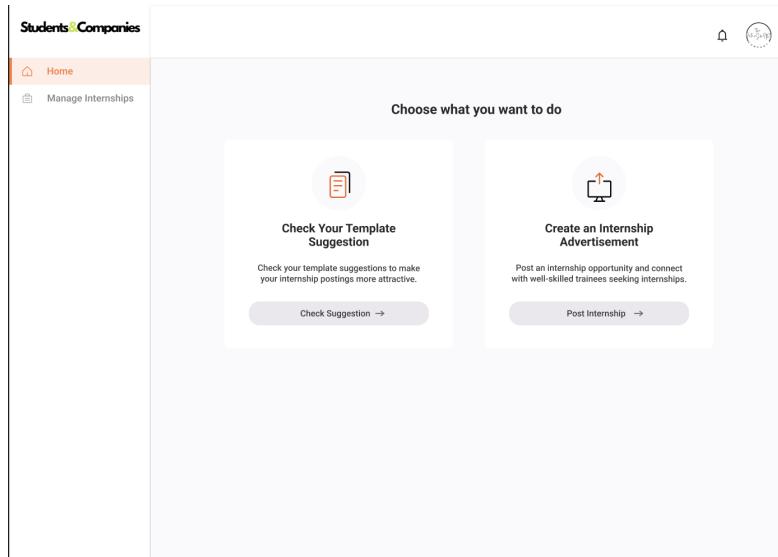


Figure 29: Company Home Page

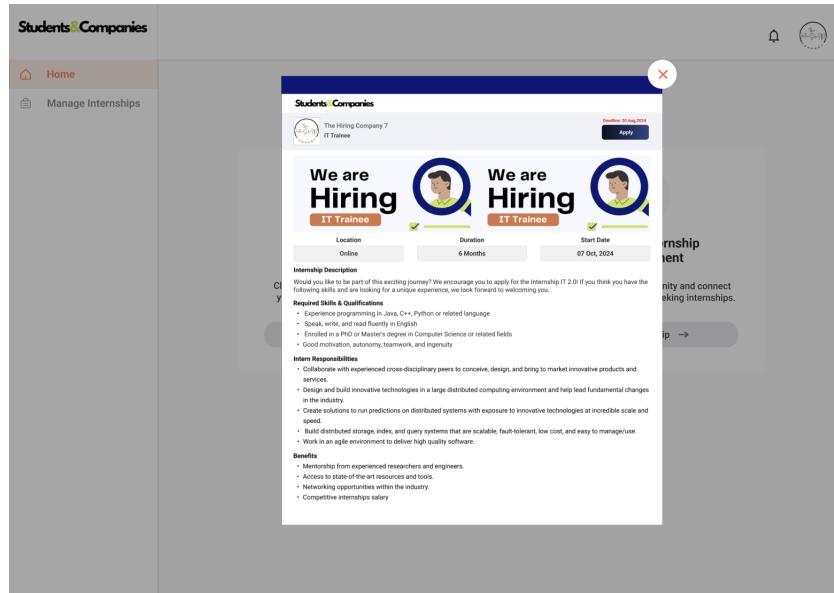


Figure 30: Company Advertisement Suggestion Template

Create an Internship Advertisement

Basic Details

Internship Title: IT Trainee

Internship Sector: Computer Science **Location**: Online

Duration: 6 Months **Start Date**: 07/10/2024

Application Deadline: 30/08/2024 **Benefits**: Mentorship, Salary

Cancel **Next**

Figure 31: Create Internship Page 1

Create an Internship Advertisement

Basic Details **Requirements** **Review and Submit**

Requirements

Internship Description

Would you like to be part of this exciting journey? We encourage you to apply for the internship IT 2.0! If you think you have the following skills and are looking for a unique experience, we look forward to welcoming you.

Required Skills & Qualifications

1. Experience programming in Java, C++, Python or related language
2. Speak, write, and read fluently in English
3. Enrolled in a PhD or Master's degree in Computer Science or related fields
4. Good motivation, autonomy, teamwork, and ingenuity

Intern Responsibilities

1. Collaborate with experienced cross-disciplinary peers to conceive, design, and bring to market innovative products and services.
2. Design and build innovative technologies in a large distributed computing environment and help lead future research in the industry.
3. Create solutions to run predictions on distributed systems with exposure to innovative technologies at incredible scale and speed.
4. Build distributed storage, index, and query systems that are scalable, fault-tolerant, low cost, and easy to manage/use.
5. Work in an agile environment to deliver high quality software.

Benefits

1. Mentorship from experienced researchers and engineers.
2. Access to state-of-the-art resources and tools.
3. Networking opportunities within the industry.
4. Competitive internship salary.

Cancel **Next**

Figure 32: Create Internship Page 2

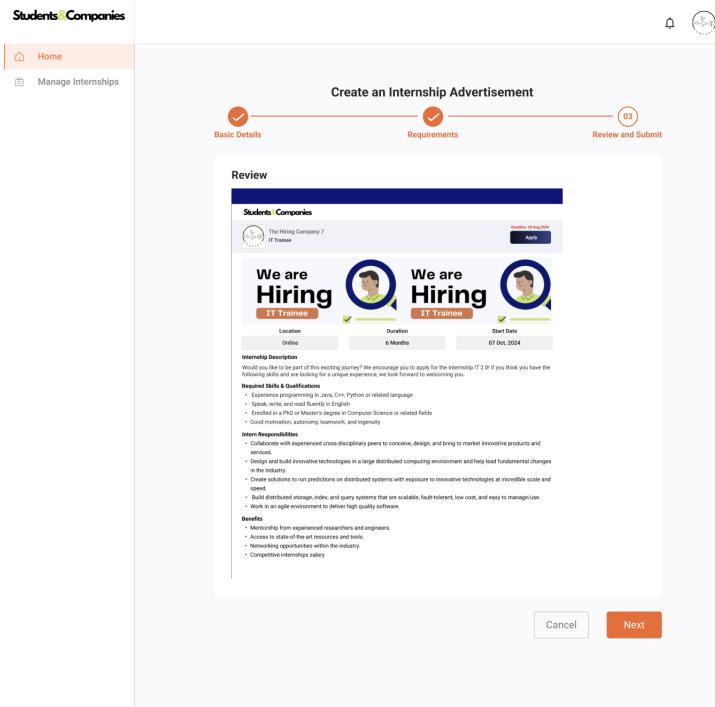


Figure 33: Create Internship Page 3

Figure 34: Manage Internships Page

The screenshot shows the 'Manage Internships' section of the application. The top navigation bar includes links for 'Home', 'Manage Internships' (which is highlighted in orange), and 'Advertisements'. Below the navigation is a search bar labeled 'Search by name'. The main content area displays a table of 13 student profiles for an 'IT Trainee #1' position. Each row contains the student's name, a status indicator ('Recommended'), a profile picture, a resume PDF link, and two action buttons (orange thumbs-up and magnifying glass icons). The columns are labeled: 'Applicant Name', 'Status', 'Profile', 'CV', and 'Approve Profile'.

Applicant Name	Status	Profile	CV	Approve Profile
Student 13	Recommended		resume.pdf	
Student 123			resume.pdf	
Student 131			resume.pdf	
Student 133			resume.pdf	
Student 14	Recommended		resume.pdf	
Student 19			resume.pdf	
Student 21	Recommended		resume.pdf	
Student 221			resume.pdf	
Student 101	Recommended		resume.pdf	
Student 1222	Recommended		resume.pdf	
Student 135			resume.pdf	
Student 130			resume.pdf	

Figure 35: All Candidates Page

The screenshot shows the 'Manage Internships' section of the application. The top navigation bar includes links for 'Home', 'Manage Internships' (highlighted in orange), and 'Advertisements'. Below the navigation is a search bar labeled 'Search by name/role'. The main content area displays a table of student proposals for an 'IT Trainee' position. Each row contains the student's name, their current status (e.g., 'Feedback', 'Inactive', 'In progress'), the date they were contacted, a resume PDF link, and a profile picture. The columns are labeled: 'Applicant Name', 'Status', 'Contacted Date', 'CV', and 'Profile'. A 'Sort by: Newest' dropdown is visible on the right side of the table.

Applicant Name	Status	Contacted Date	CV	Profile
Student 4	Feedback	Aug 21, 2024	resume.pdf	
Student 5	Inactive	Aug 29, 2024	resume.pdf	
Student 7	In progress	Aug 13, 2024	resume.pdf	
Student 8	In progress	Aug 28, 2024	resume.pdf	
Student 10	In progress	Aug 28, 2024	resume.pdf	
Student 11	In progress	Aug 11, 2024	resume.pdf	
Student 12	In progress	Aug 10, 2024	resume.pdf	

Figure 36: Company Accepted Proposals Page

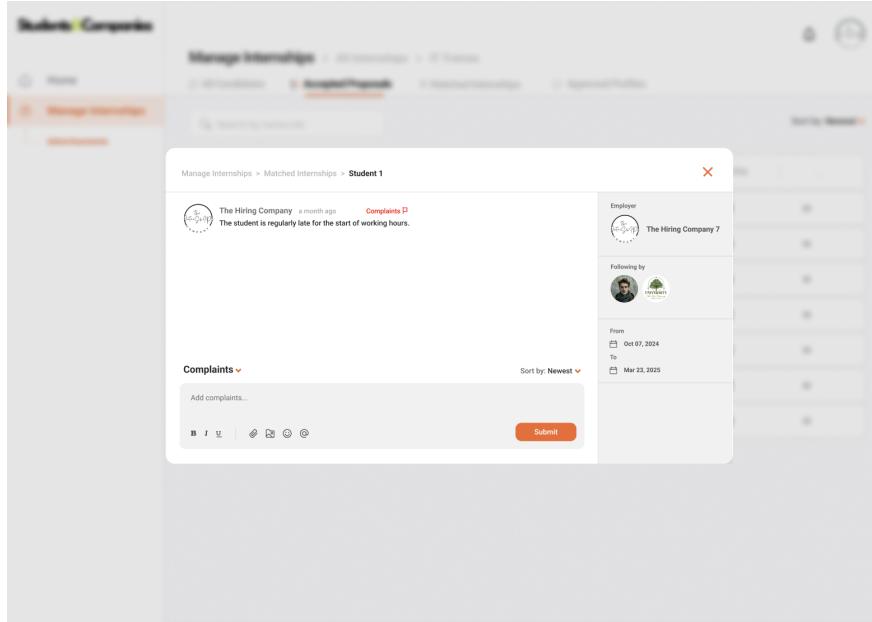


Figure 37: Company Ongoing Internship Complaints Page

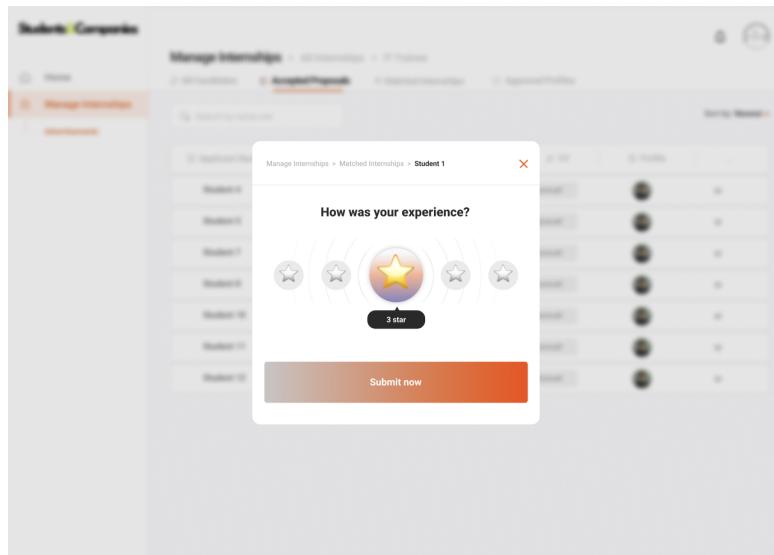


Figure 38: Feedback

The screenshot shows the 'Matched Internships' section of the Students&Companies platform. At the top, there are navigation links: 'Home', 'Manage Internships' (which is highlighted in orange), and 'Advertisements'. Below the navigation is a search bar labeled 'Search by name, role'. To the right of the search bar is a dropdown menu set to 'Sort by: Newest'. The main area displays a table of matched internships. The columns are: 'Applicant Name', 'Status', 'Contacted Date', 'CV', 'Profile', and '...'. The data rows are as follows:

Applicant Name	Status	Contacted Date	CV	Profile	...
Student 1	Scheduling	Aug 01, 2024	resume.pdf		
Student 2	Interview	Aug 15, 2024	resume.pdf		
Student 3	Rejected	Aug 07, 2024	resume.pdf		
Student 6	Proposed	Aug 26, 2024	resume.pdf		
Student 9	Rejected	Aug 05, 2024	resume.pdf		

Figure 39: Company Matched Internships Page

The screenshot shows the 'Scheduling Dates' section of the platform. The title is 'Manage Internships > Matched Internships > Student 1'. The main content is a table titled 'Scheduling Dates' showing interview times for different dates. The table has columns for date, time range ('from' and 'to'), and a delete icon ('X'). The data is as follows:

Date	Time Range
16/09/2024	from 09.30 to 10.00
16/09/2024	from 13.30 to 14.00
17/09/2024	from 09.30 to 10.00
18/09/2024	from 11.00 to 11.30
18/10/2024	from 13.30 to 14.00

At the bottom of the table is a 'Send' button.

Figure 40: Company Interview Scheduling

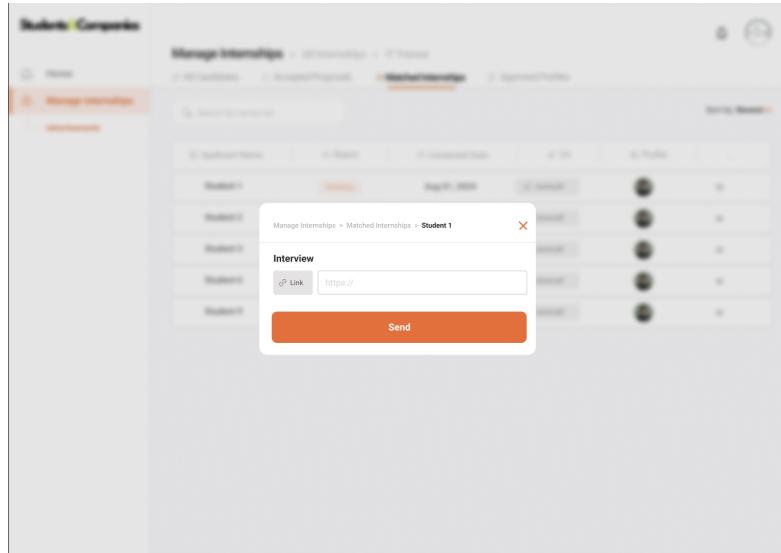


Figure 41: Interview Link

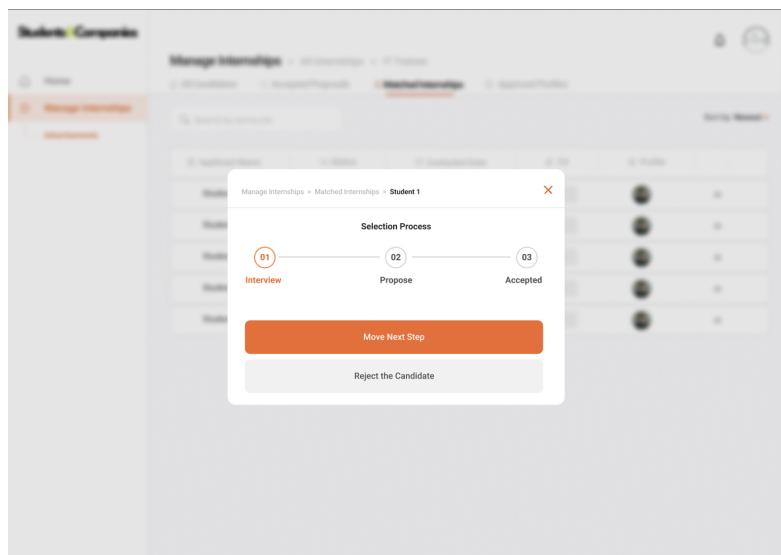


Figure 42: Student Selection Process Pop-Up

The screenshot shows the 'Approved Profiles' section of the 'Manage Internships' page. The top navigation bar includes 'Home', 'Manage Internships' (which is highlighted in orange), and 'Advertisements'. Below the navigation is a search bar labeled 'Search by name/role'. A table lists two approved profiles:

Applicant Name	Status	Contacted Date	CV	Profile	...
Student 13	Approved	-	resume.pdf		
Student 14	Approved	-	resume.pdf		

Sort by: Newest

Figure 43: Company Approved Profiles Page

The screenshot shows the 'Notifications' section of the 'Manage Internships' page. The top navigation bar includes 'Home', 'Manage Internships' (highlighted in orange), and 'Advertisements'. On the right, there is a sidebar titled 'Notifications' with two items:

- Student 1 who applied for IT Trainee #1 has set a date for interview. Click for details!
- Congrat! Student 6 who applied for IT Trainee #1 position, has accepted your offer!

Sort by: Newest

The main content area displays three advertisement cards for 'IT Trainee' positions:

- IT Trainee #1:** 'We are Hiring' IT Trainee. Includes an 'Apply' button and a small image of a person.
- IT Trainee #2:** 'We are Hiring' IT Trainee. Includes an 'Apply' button and a small image of a person.
- IT Trainee #3:** 'We are Hiring' IT Trainee. Includes an 'Apply' button and a small image of a person.

Figure 44: Company Notifications

Students & Companies				
<input type="button" value="Students"/> <input type="button" value="Companies"/> Logout				
<input type="text" value="Search by name,role"/> Sort by: Newest				
Student Name	Position	Company Name	Profile	...
Student 1	IT Trainee	The Hiring Company 1		
Student 109	IT Trainee	The Hiring Company 1		
Student 902	Marketing Intern	The Hiring Company 167		
Student 120	Finance Intern	The Hiring Company 34		
Student 121	Research Intern	The Hiring Company 54		
Student 1223	ML Trainee	The Hiring Company 44		
Student 145	AI Research Intern	The Hiring Company 90		
Student 112	Software Intern	The Hiring Company 1		
Student 134	Ios Developer Trainee	The Hiring Company 1		
Student 546	Human Resources Intern	The Hiring Company 154		
Student 502	Fintech Trainee	The Hiring Company 334		
Student 232	UX/UI Intern	The Hiring Company 166		
Student 675	IT Trainee	The Hiring Company 1		

Figure 45: University Home Page

Students > Student 1

The Hiring Company 4 month ago **Concerned** The student is regularly late for the start of working hours.

The Hiring Company 4 month ago The student successfully demonstrates adaptability and willingness to learn throughout the internship.

Employer The Hiring Company 7

Following by

From Oct 07, 2024 To Mar 23, 2025

Cancel Interrupt The Internship

Figure 46: University Interrupt Page

The screenshot shows a user interface for managing student internships. On the left, a sidebar has tabs for 'Students' and 'Companies'. The 'Students' tab is selected, showing a search bar and a table of student records. The table columns are 'Student Name', 'Position', and 'Company Name'. The data includes:

Student Name	Position	Company Name
Student 1	IT Trainee	The Hiring Company 1
Student 109	IT Trainee	The Hiring Company 1
Student 902	Marketing Intern	The Hiring Company 167
Student 120	Finance Intern	The Hiring Company 34
Student 121	Research Intern	The Hiring Company 54
Student 1223	ML Trainee	The Hiring Company 44
Student 145	AI Research Intern	The Hiring Company 90
Student 112	Software Intern	The Hiring Company 1
Student 134	Ios Developer Trainee	The Hiring Company 1
Student 546	Human Resources Intern	The Hiring Company 154
Student 502	Fintech Trainee	The Hiring Company 334
Student 232	UX/UI Intern	The Hiring Company 166
Student 675	IT Trainee	The Hiring Company 1

To the right, a 'Notifications' sidebar displays a message: 'Student 1 has a new situation. Check it out now!' with a 'Newest' dropdown. It also shows a list of notifications with small profile icons and red dots indicating unread status.

Figure 47: University Notifications

3.1.2 Hardware Interfaces

The user, whether a student, university, or company, must use a suitable device to access the system, like a personal computer.

3.1.3 Software Interfaces

The system should integrate a NotificationService to keep users updated about any interesting event on the platform, an EmailService for the registration process, and a proper University Dictionary to ensure the existence of the university.

3.1.4 Communication Interfaces

The system requires a stable internet connection to work properly. This connection is used to exchange data between the Users and the central database which contains all the information that is needed for the application to work properly.

3.2 Functional Requirements

In this section, all the Use Cases are listed attached to their corresponding Use Case Diagram. Then, the mapping between Goals, Domain Assumptions and Requirements is provided.

3.2.1 Use Case Diagrams

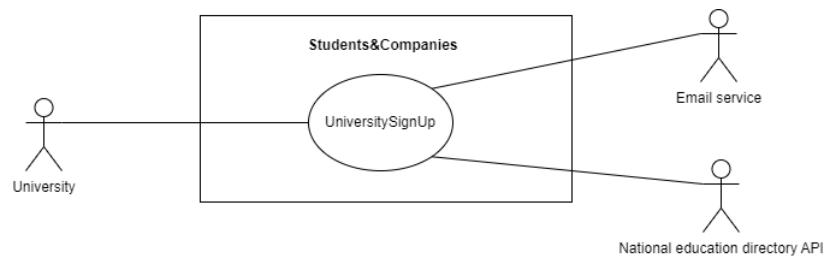


Figure 48: UniversitySignUp

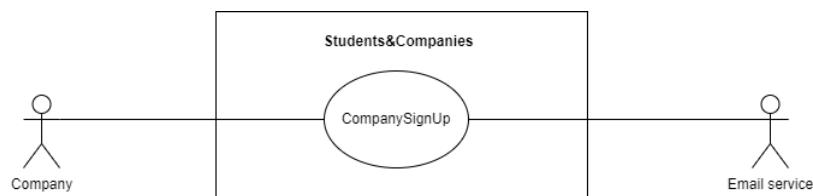


Figure 49: CompanySignUp

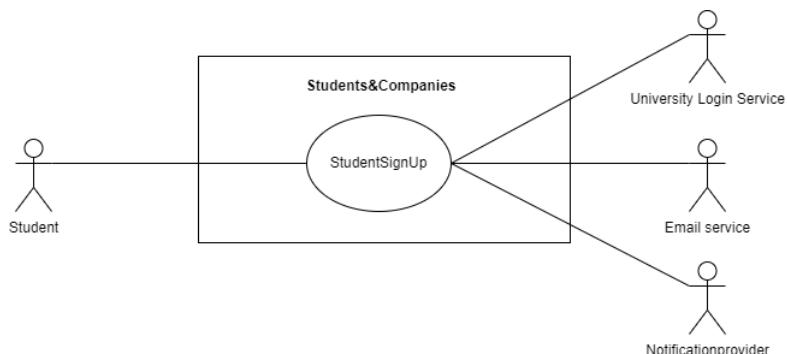


Figure 50: StudentSignUp

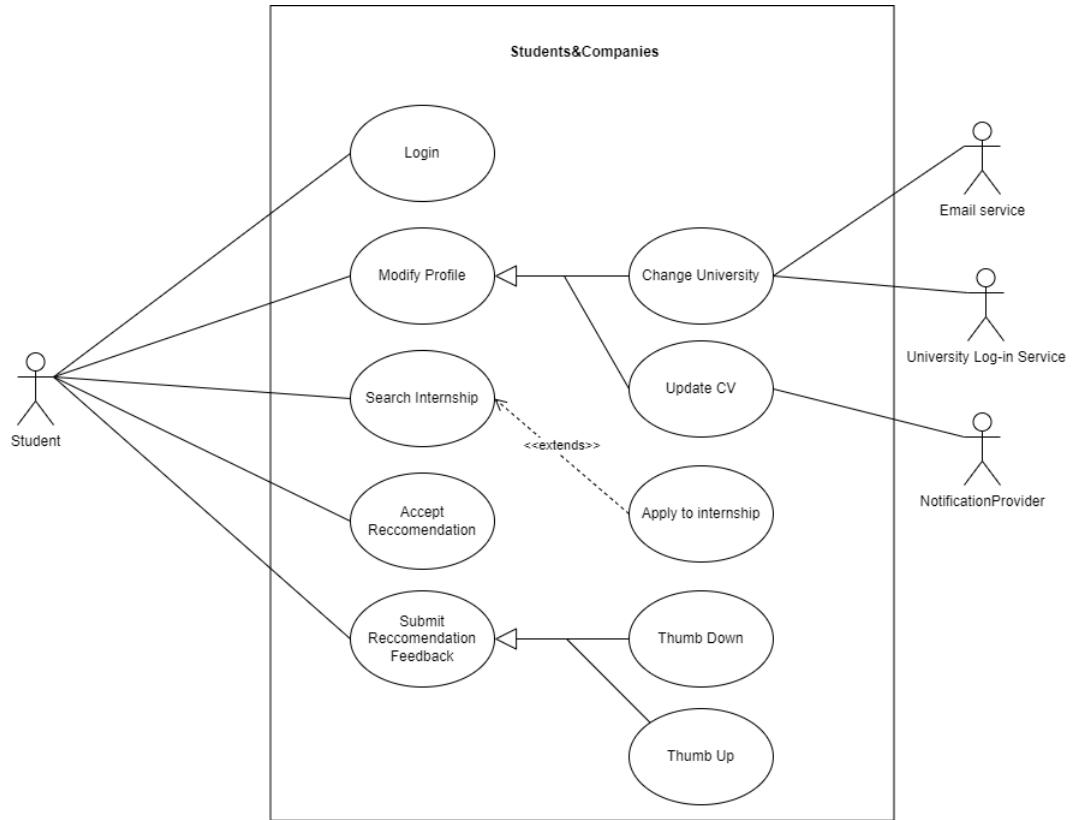


Figure 51: Student

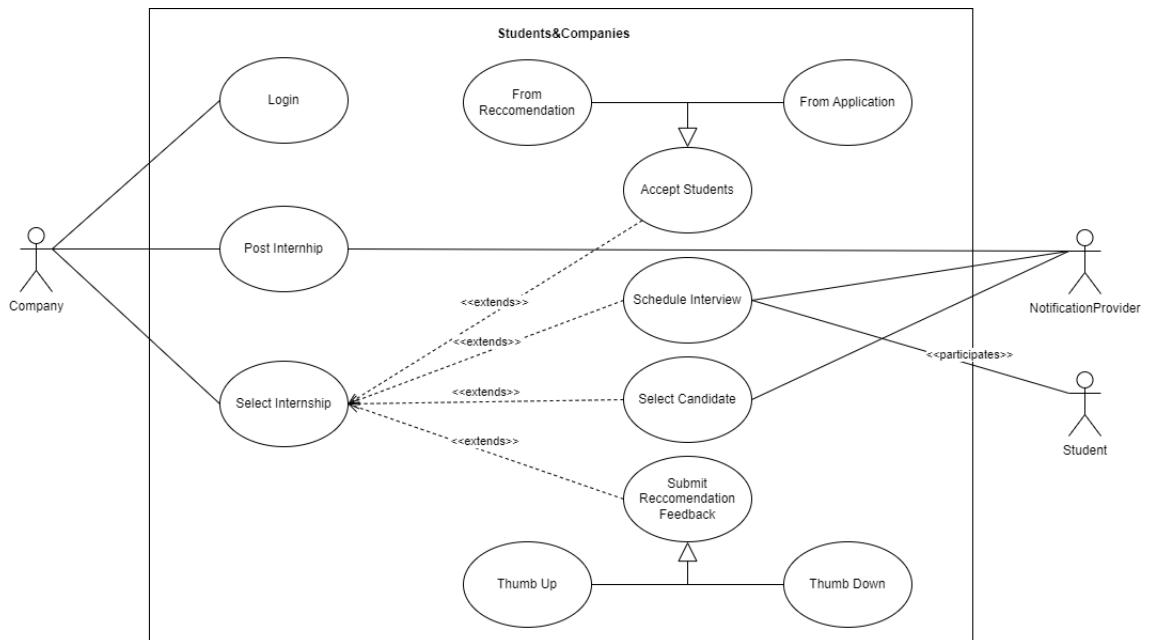


Figure 52: Company

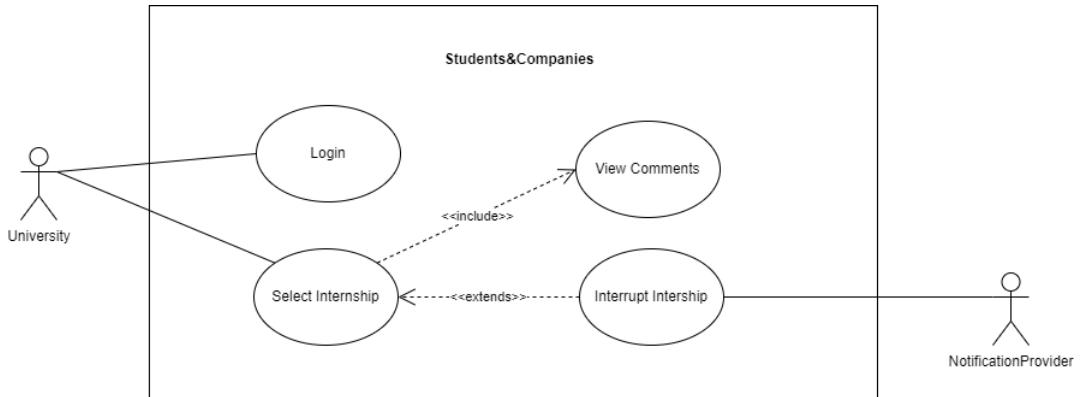


Figure 53: University

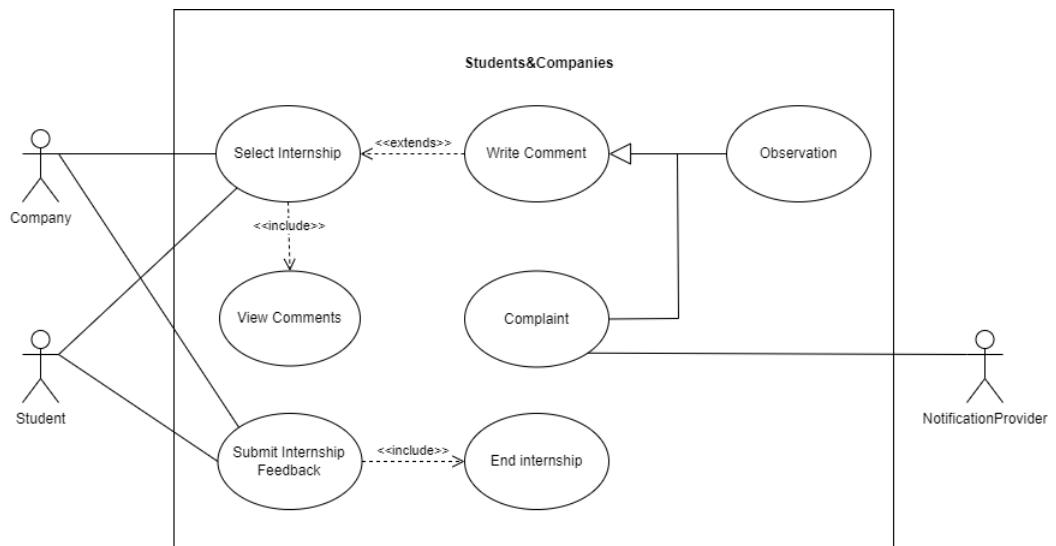
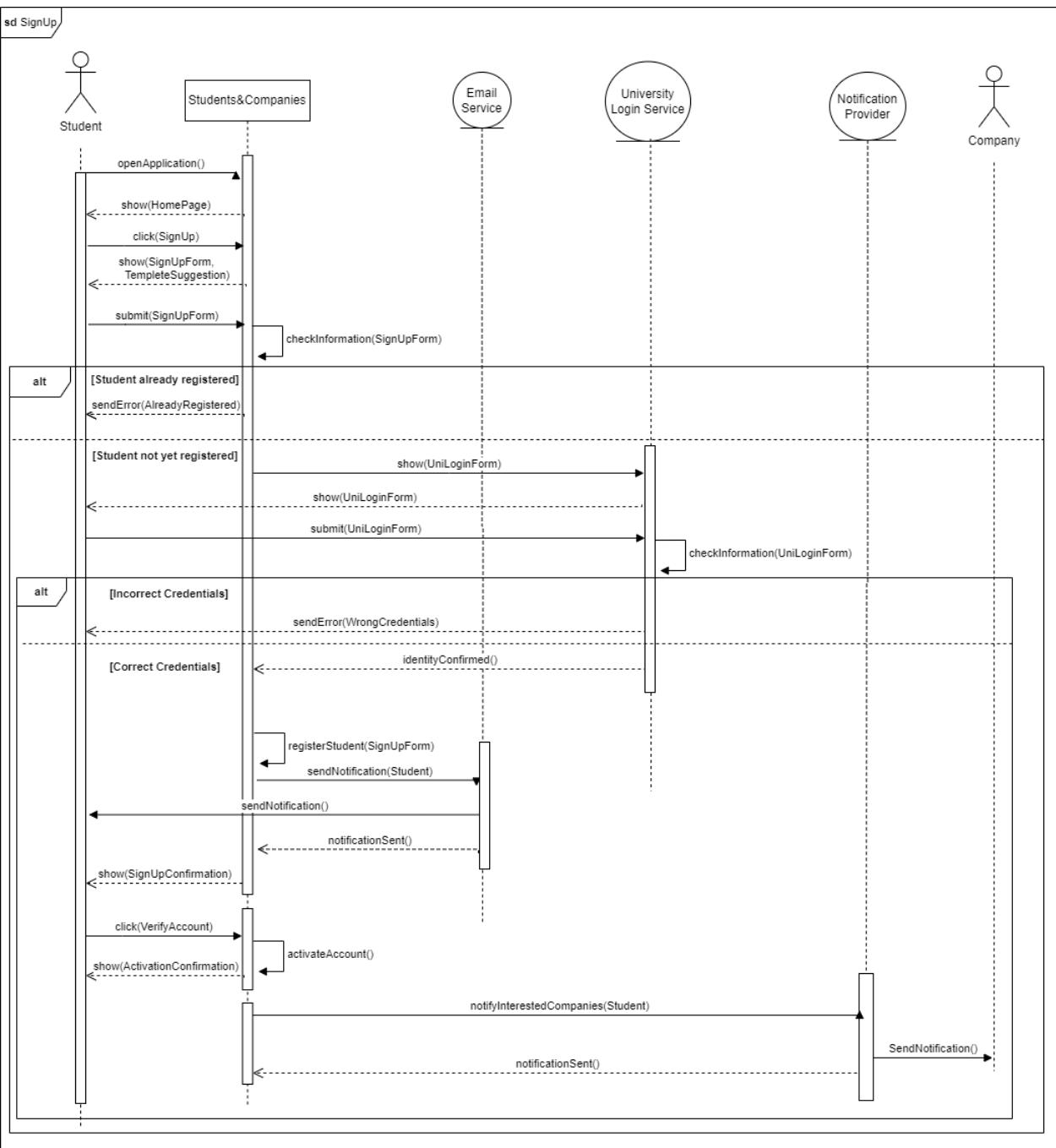


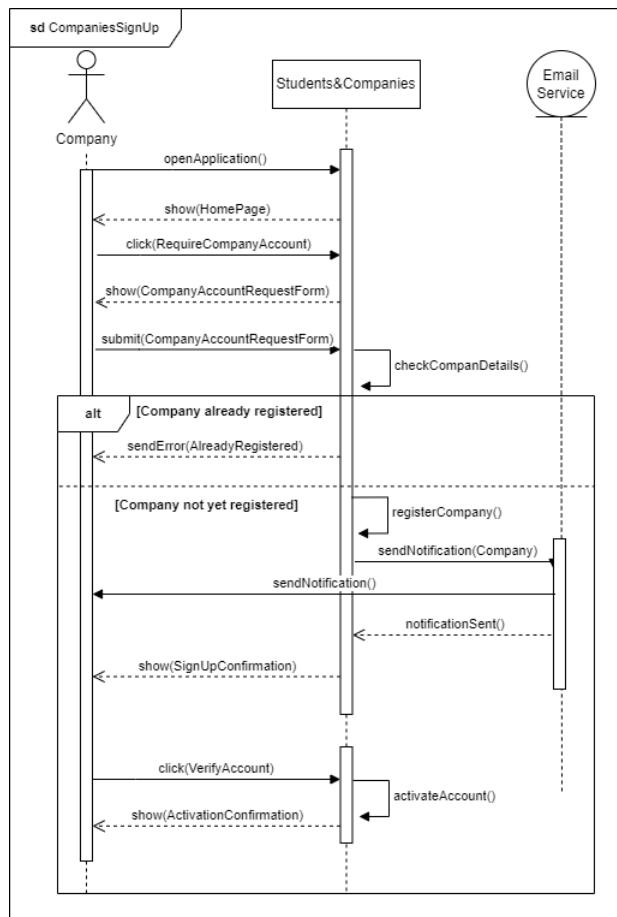
Figure 54: Internship

3.2.2 Use cases

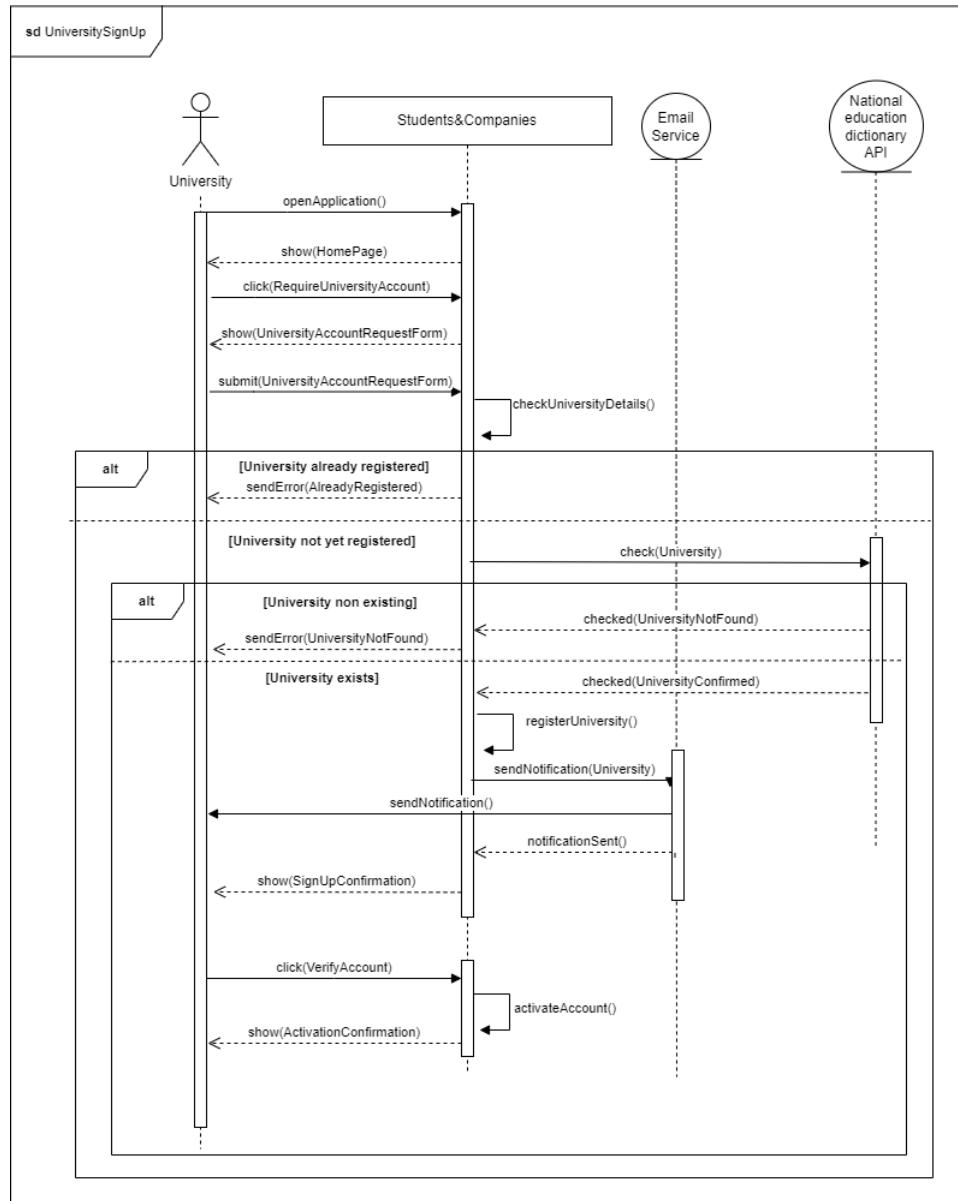
StudentsSignUp	
Participating Actors	Student, Company, EmailService, Students&Companies, UniversityLoginService, NotificationProvider
Entry Condition	True
Flow of Events	<ul style="list-style-type: none"> • 1. The Student opens the “Sign up” page • 2. Students&Companies shows the page to sign up with the suggested CV template. • 3. The Student fills the required information and clicks “Sign Up” button • 4. Students&Companies checks the information provided by the Student • 5. Students&Companies shows the university login page through the UniversityLoginService • 6. The Student fills the required information and clicks “Login” button • 7. UniversityLoginService checks the information provided by the Student • 8. UniversityLoginService confirms the student identity to Students&Companies • 9. Students&Companies registers the Student • 10. Students&Companies sends confirmation of signup and inform the Student to verify the account • 11. Students&Companies sends a notification to verify the account through the EmailService • 12. The Student verifies the account • 13. Students&Companies activates the Student’s account • 14. Students&Companies might recommend the student to some internships based on the (new) CV. • 15. Students&Companies sends to the home page.
Exit Condition	The Student successfully signed up and activated his account
Exceptions	<ul style="list-style-type: none"> • The Student was already registered • The Student inserts the wrong login credentials



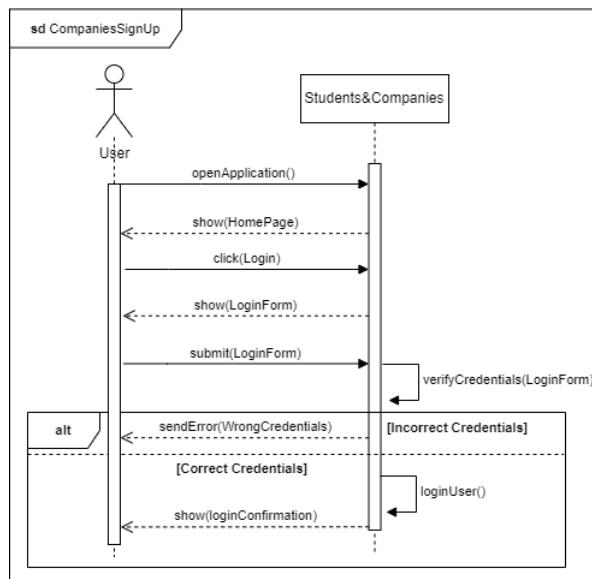
CompanySignUp	
Participating Actors	Company, EmailService, Students&Companies
Entry Condition	True
Flow of Events	<ul style="list-style-type: none"> • 1. The Company opens the “Sign up” page • 2. Students&Companies shows the page to sign up • 3. The Company fills the required informations and clicks “Require a Company Account” button • 4. Students&Companies shows the form to require an Company account • 5. Students&Companies registers the Company • 6. Students&Companies sends confirmation of signup and inform the Company to verify the account • 7. Students&Companies sends a notification to verify the account through the EmailService • 8. The Company verifies the account • 9. Students&Companies activates the Company’s account • 10. Students&Companies sends to the home page
Exit Condition	The Company successfully signed up and obtained an Company account
Exceptions	The Company was already registered



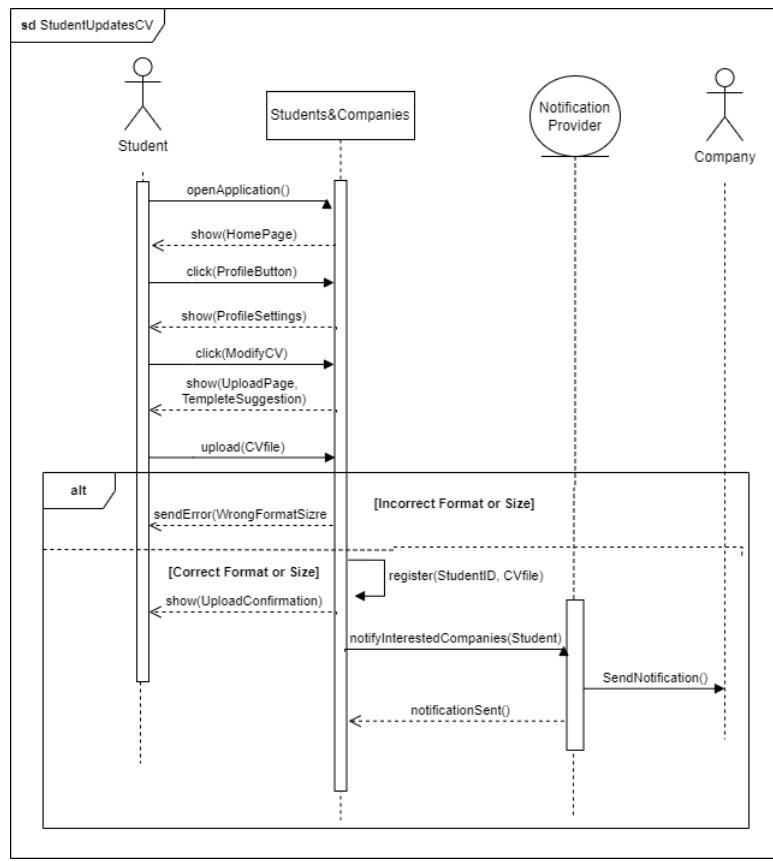
UniversitySignUp	
Participating Actors	University, EmailService, National education dictionary API (NED-API), Students&Companies
Entry Condition	True
Flow of Events	<ul style="list-style-type: none"> • 1. The University opens the “Sign up” page • 2. Students&Companies shows the page to sign up • 3. The Company fills the required information and clicks “Require a University Account” button • 4. Students&Companies shows the form to require an University account • 5. Students&Companies check the University existence through he NED-API • 6. Students&Companies registers the University • 7. Students&Companies sends confirmation of sign up and inform the University to verify the account • 8. Students&Companies sends a notification to verify the account through the EmailService • 9. The University verifies the account • 10. Students&Companies activates the University’s account • 11. Students&Companies sends to the home page
Exit Condition	The University successfully signed up and obtained a University account
Exceptions	<ul style="list-style-type: none"> • The University was already registered • The University does not exist



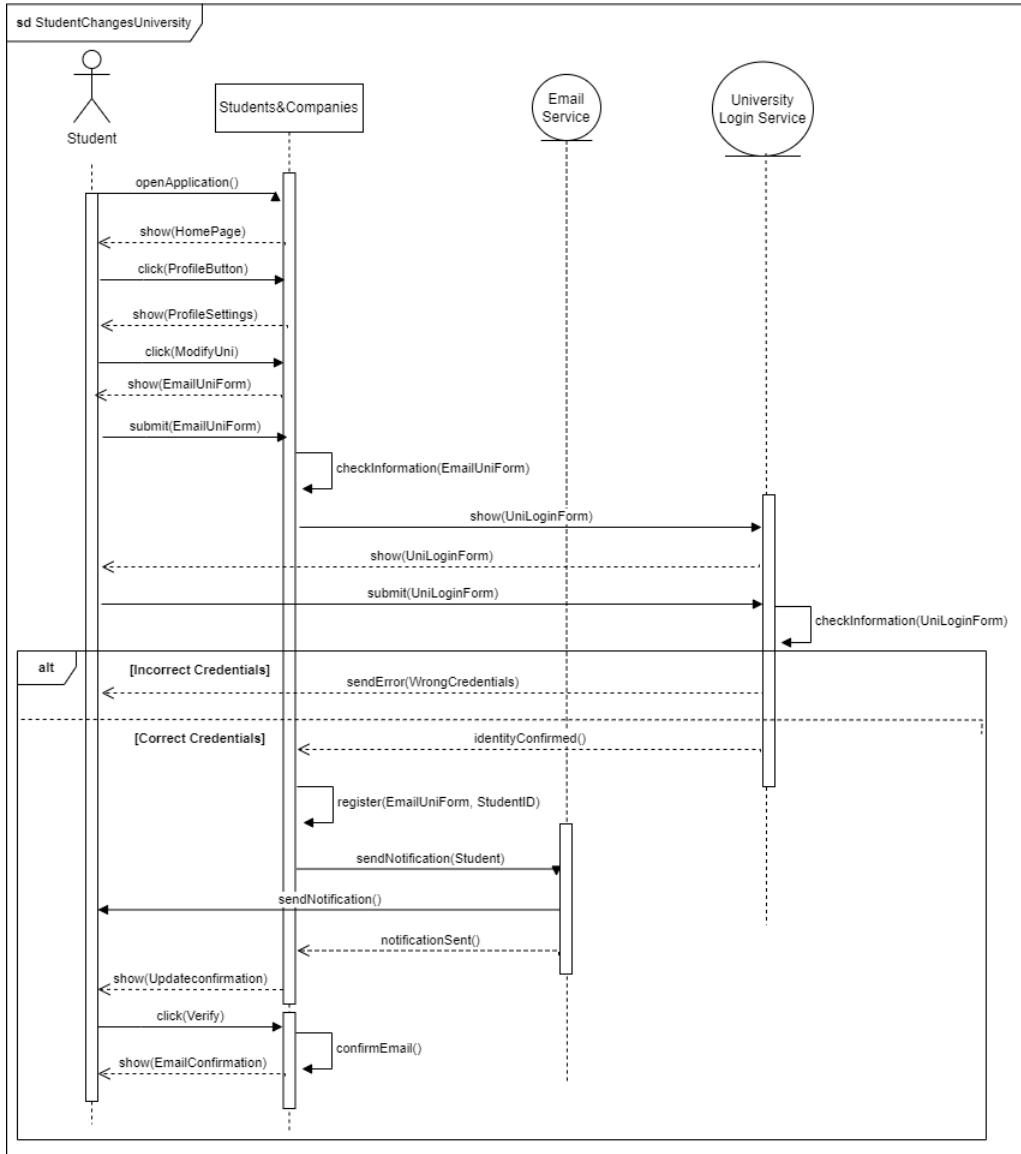
UserLogsIn	
Participating Actors	User, Students&Companies
Entry Condition	User has an account
Flow of Events	<ul style="list-style-type: none"> 1. The User opens Students&Companies 2. The User clicks the “Log in” button 3. Students&Companies shows the form to log in 4. The User fills the required informations and clicks “Log in ” button 5. Students&Companies verifies the credentials of the User 6. Students&Companies logs in the User
Exit Condition	The User successfully logged in
Exceptions	The User filled wrong credentials



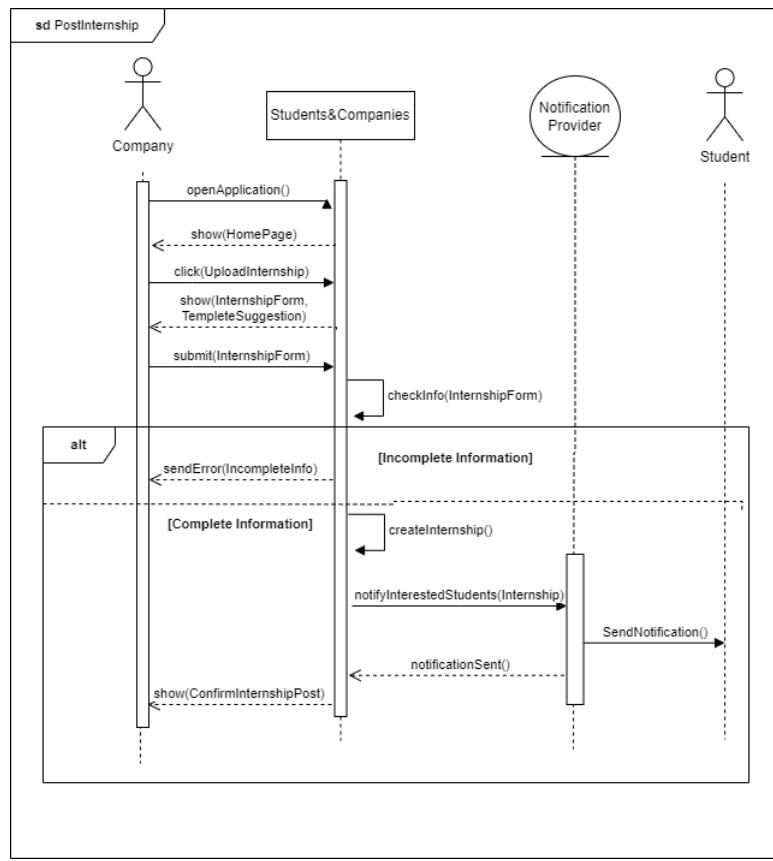
StudentUpdatesCV	
Participating Actors	Student, Students&Companies, Company , NotificationProvider
Entry Condition	The Student is logged in
Flow of Events	<ul style="list-style-type: none"> • 1. The Student navigates to the profile section • 2. Students&Companies displays information about the Student • 3. The Student clicks on the "ModifyCV" button • 4. Students&Companies displays the "Upload Page" with the suggested template. • 3. The Student uploads a CV file in the provided field. • 4. Students&Companies validates the file format and saves the CV file. • 5. Students&Companies might recommend the student to some internships based on the (new) CV.
Exit Condition	The Student's CV is successfully updated
Exceptions	File upload fails due to incorrect format or size



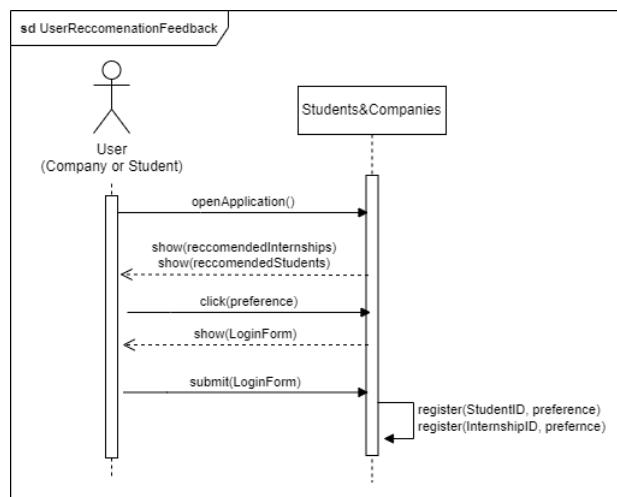
StudentChangesUniversity	
Participating Actors	Student, Students&Companies, UniversityLoginService, EmailService
Entry Condition	The Student is logged in and has an active account
Flow of Events	<ul style="list-style-type: none"> • 1. The Student navigates to the “Profile” section • 2. Students&Companies displays information about the Student • 3. The Student selects the mail field and overwrites the email with the one from the new from the other University • 4. Students&Companies shows the university login page through the UniversityLoginService • 5. The Student fills the required information and clicks “Login” button • 6. UniversityLoginService checks the information provided by the Student • 7. UniversityLoginService confirms the student identity to Students&Companies • 8. Students&Companies saves the new Student’s email • 9. Students&Companies sends confirmation of signup and inform the Student to verify the email • 10. Students&Companies sends a notification to verify the email through the EmailService • 11. The Student verifies the email • 12. Students&Companies validates the university information
Exit Condition	The Student’s university information is successfully updated
Exceptions	The Student inserts the wrong login credentials



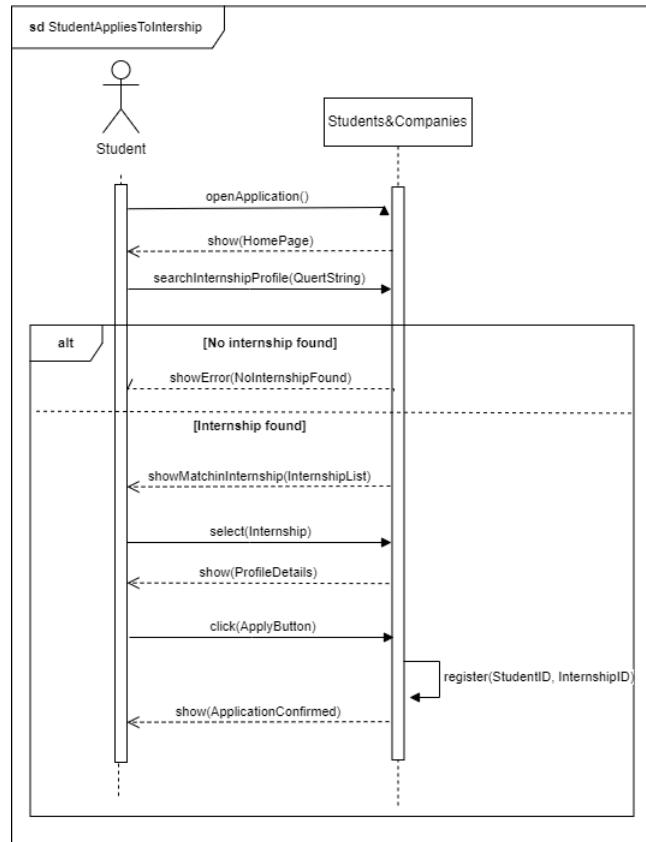
CompanyPostsInternship	
Participating Actors	Company, NotificationService, Student, Students&Companies
Entry Condition	The Company is logged in
Flow of Events	<ul style="list-style-type: none"> • 1. The Company clicks on to the “Post Internship” button • 2. Students&Companies displays the internship creation form with the suggested template. • 3. The Company fills out the form with internship details and submits it • 4. Students&Companies validates the information and publishes the internship • 5. the NotificationService may notify certain students of this new internship through recommendation
Exit Condition	The internship is successfully posted and visible to Students
Exceptions	Incomplete internship details provided



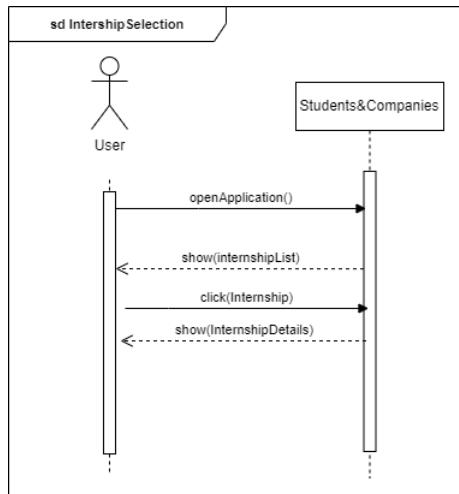
UserReccomendationFeedback	
Participating Actors	User (Student or Company), Students&Companies
Entry Condition	The User is logged into the platform
Flow of Events	<ul style="list-style-type: none"> 1. The Student navigates to the homepage. The Company selects one of its posted Internships. 2. The User selects the "thumb-up" or the "thumb-down" button. 3. Students&Companies registers the preference and updates the recommendation system.
Exit Condition	The User feedback is taken into account for future recommendations.



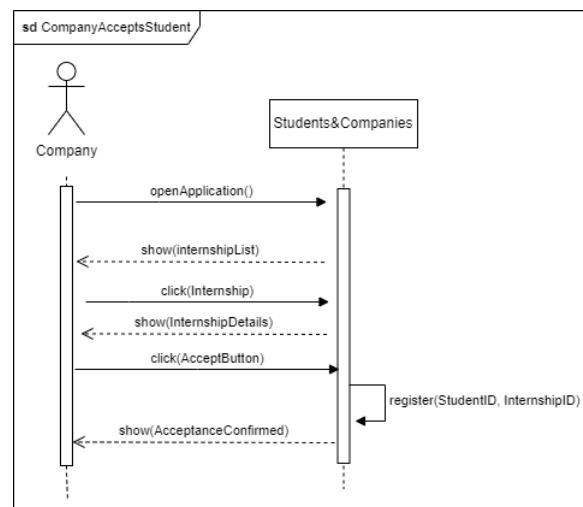
StudentAppliesToInternship	
Participating Actors	Student, Students&Companies
Entry Condition	The Student is logged in
Flow of Events	<ul style="list-style-type: none"> • 1. The Student types in the search bar the internship or the company that he would like to intern at. • 2. Students&Companies retrieves and displays matching available internships. • 3. The Student clicks on an Internship. • 4. Students&Companies shows the Internship's profile details. • 5. The Student clicks on the "Apply" button. • 6. Students&Companies performs the student application and adds the student to the list of applicants of the related company.
Exit Condition	The Student views a list of internships matching their criteria
Exceptions	No internships match the search criteria



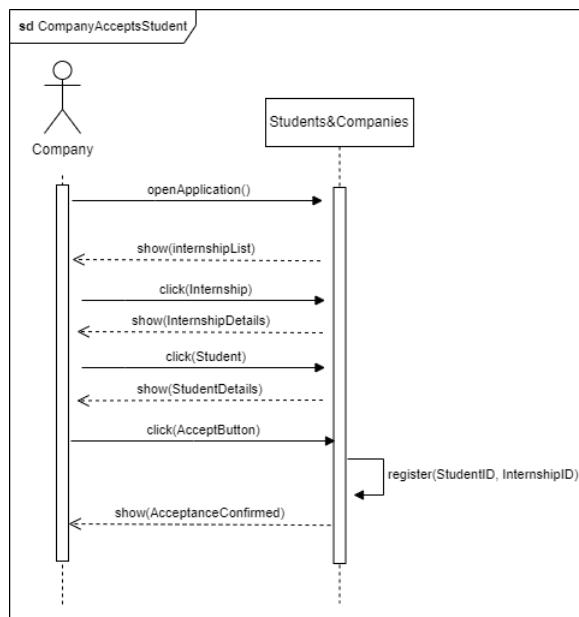
UserSelectsInternship	
Participating Actors	User (Student, Company, or University), Students&Companies
Entry Condition	The User is logged in
Flow of Events	<ul style="list-style-type: none"> • 1. The User access the homepage of the platform • 2. Students&Companies displays: to the companies their posted internships to the students the ones recommended by the system and to universities the ongoing ones in which their students are taking part. • 3. The User clicks on one of the shown internships from the list. • 4. Students&Companies displays all the information about the selected internship.
Exit Condition	The user visualizes the current information about the internship
Exceptions	None



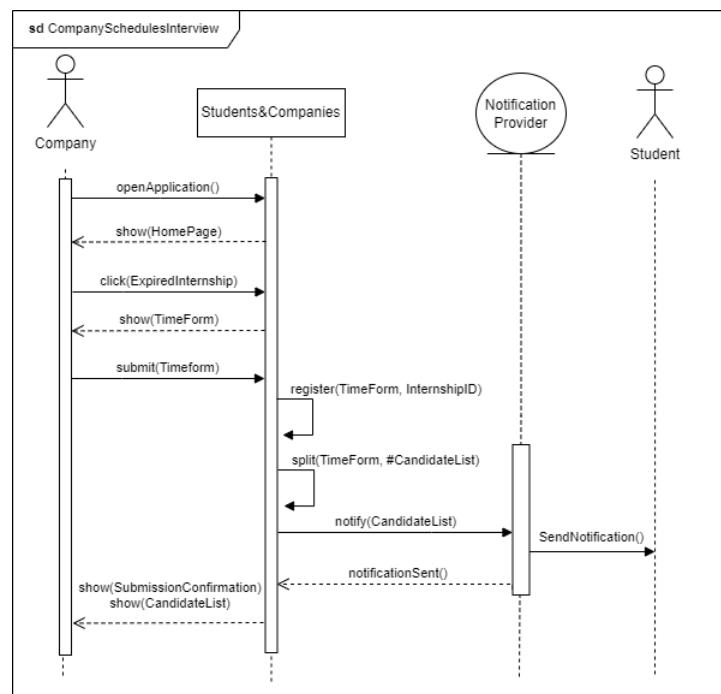
StudentAcceptsCompany	
Participating Actors	Student, Students&Companies
Entry Condition	The Student is Logged in
Flow of Events	<ul style="list-style-type: none"> 1. The Student selects one of the recommended internships. 2. Students&Companies displays all the information regarding the Internship. 5. The Student clicks on the "Accept" button. 6. Students&Companies registers the Student acceptance accordingly.
Exit Condition	The Company successfully accepted the Student for one of its posted internships.
Exceptions	None



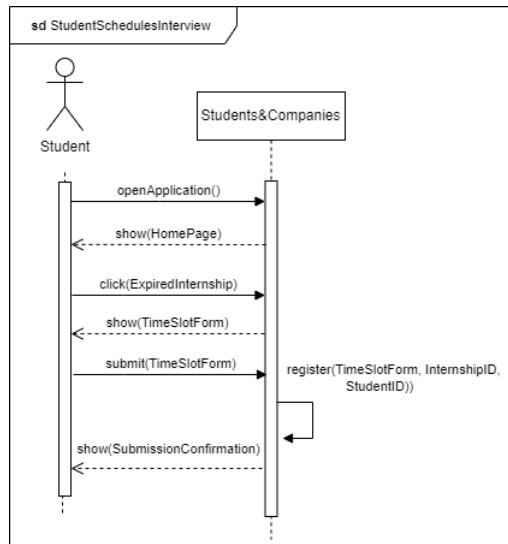
CompanyAcceptsStudent	
Participating Actors	Company, Students&Companies
Entry Condition	The Company is Logged in
Flow of Events	<ul style="list-style-type: none"> • 1. The Company selects one of its posted internship. • 2. Students&Companies displays the list of all the recommended and applicant students for that internship. • 3. The Company selects one of the Student from the list. • 4. Students&Companies displays all the information regarding the Student. • 5. The Company clicks on the "Accept" button. • 6. Students&Companies registers the Company acceptance accordingly.
Exit Condition	The Company successfully accepted the Student for one of its posted internships.
Exceptions	None



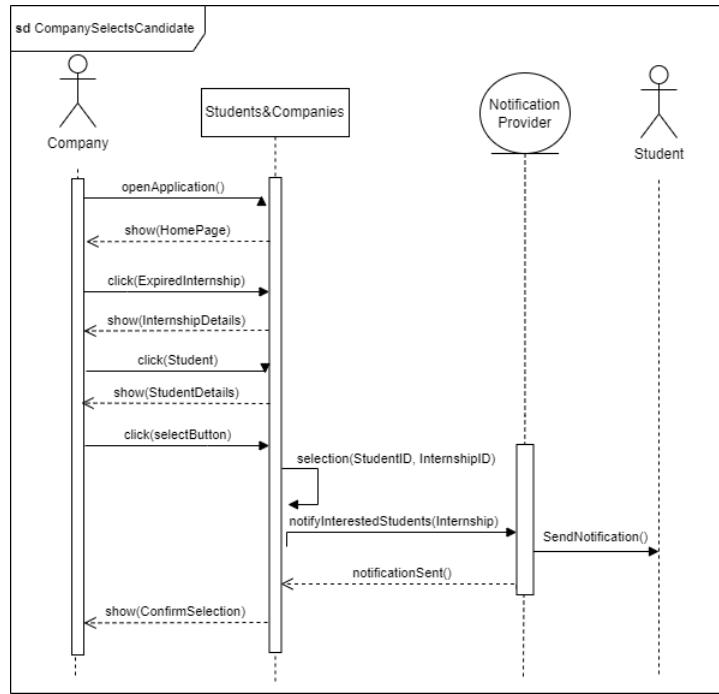
CompanySchedulesInterview	
Participating Actors	Company, Students&Companies, NotificationProvider, Student
Entry Condition	The company is logged in and has at least one internship whose application deadline is expired.
Flow of Events	<ul style="list-style-type: none"> • 1. The Company selects one of its posted internship whose application deadline is expired. • 2. Students&Companies displays a time span form. • 3. The Company fills the form in giving the dates and timings that it will use for interview. • 4. Students&Companies splits the given time span in slots of equal size according to the number of candidates. • 5. the NotificationService notifies all candidates of the interview time-slots availability. • 6. Students&Companies shows to the company the list of candidates and for each the associated time-slot preference if they have already chosen one.
Exit Condition	The company has successfully scheduled the interview periods.
Exceptions	None



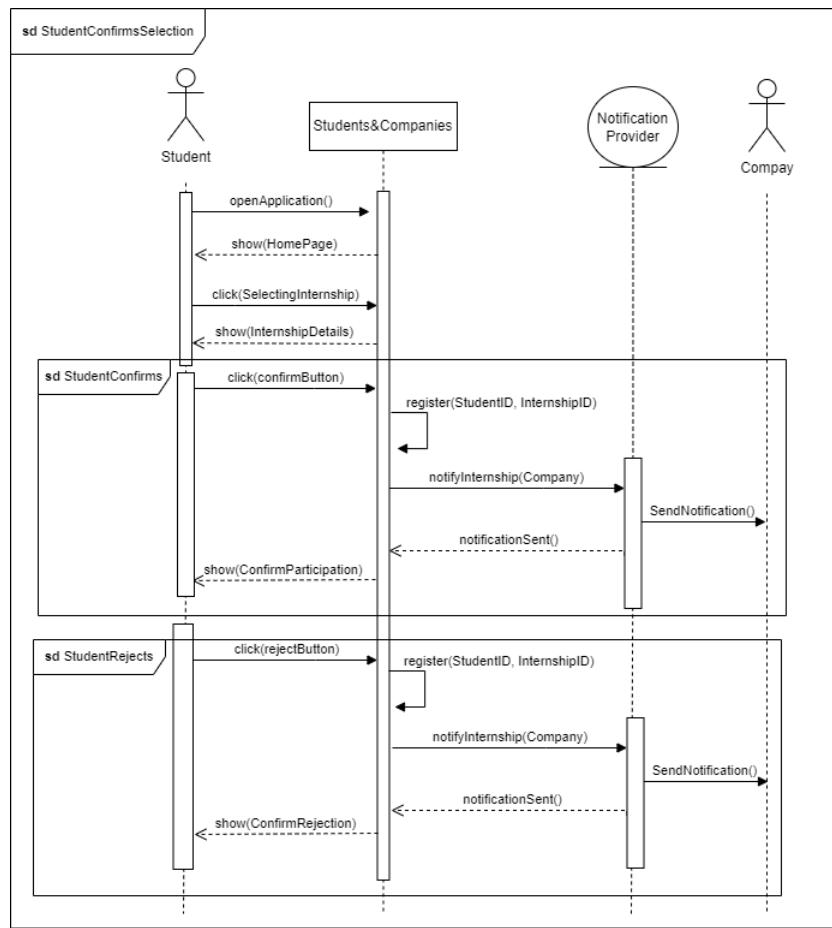
StudentSchedulesInterview	
Participating Actors	Student, Students&Companies
Entry Condition	The Student is logged in, he is a candidate for an internship and has received a notification about the availability of time-slots for that internship.
Flow of Events	<ul style="list-style-type: none"> • 1. The Student selects the internship he has been notified of. • 2. Students&Companies shows a form containing the available time-slots to book for the interview with that internship. • 3. The Student selects a time slot and submits the form. • 4. Students&Companies registers the choice.
Exit Condition	The Student has successfully booked a time slot for the internship interview.
Exceptions	None



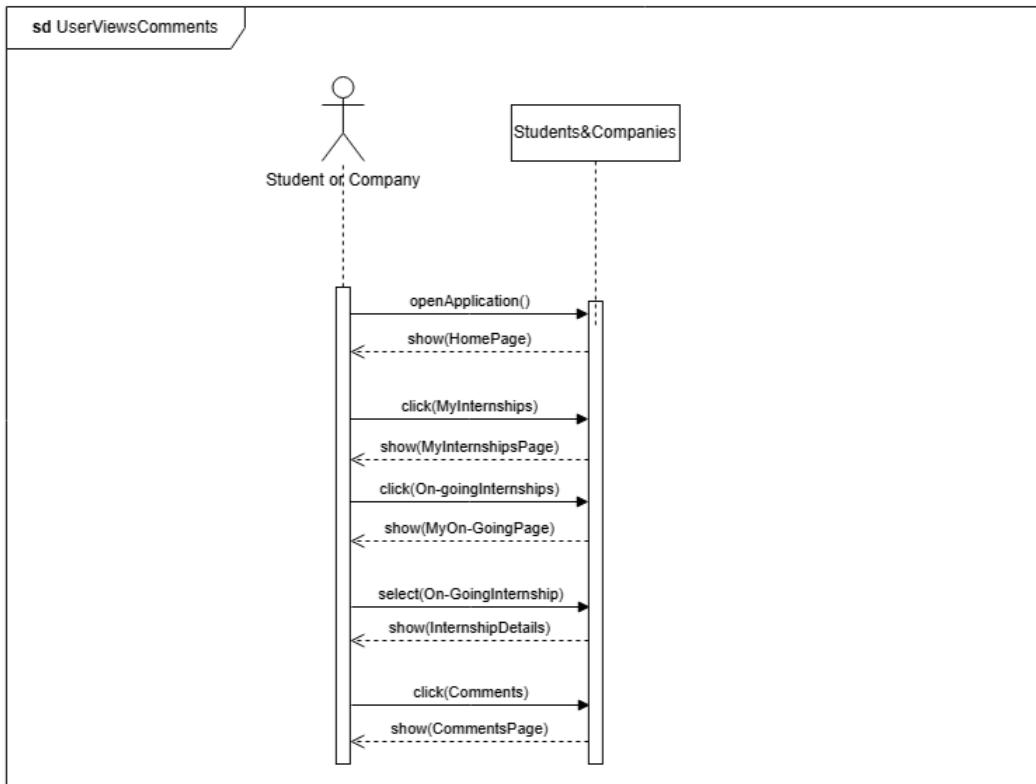
CompanySelectsCandidate	
Participating Actors	Company, Students&Companies, NotificationProvider, Student
Entry Condition	The Company is Logged in
Flow of Events	<ul style="list-style-type: none"> • 1. The Company selects one of its posted internship with expired deadline. • 2. Students&Companies displays the list of all the candidate students for that internship. • 3. The Company selects one of the Student from the list. • 4. Students&Companies displays all the information regarding the Student. • 5. The Company clicks on the "Select" button. • 6. Students&Companies registers the Company selection for that internship and waits for the student confirmation. • 7. The NotificationService notifies the selected Student of his selection. • 8. Students&Companies changes the button changes the .
Exit Condition	The Company successfully selected the Student for one of its posted internships.
Exceptions	None



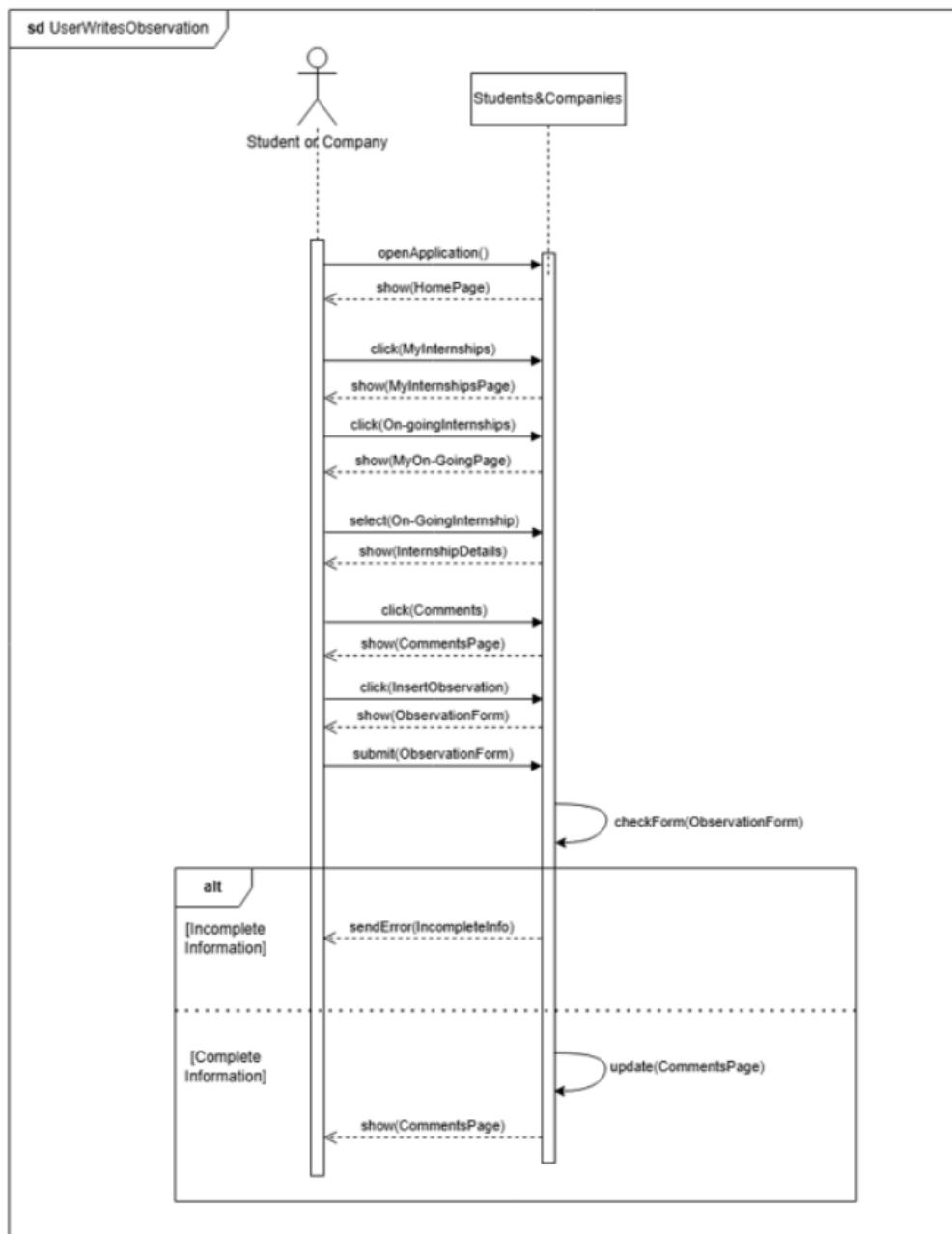
StudentconfirmsSelection	
Participating Actors	Company, Students&Companies, NottificationProvider, Student
Entry Condition	The Student is Logged in
Flow of Events	<ul style="list-style-type: none"> • 1. The Student clicks on the Internship that selected him. • 2. Students&Companies displays the selection confirmation form. • 3. The Student clicks on the "Confirm" or the "Reject" button accordingly to his will. • 4. Students&Companies registers the Student choice for that internship. • 5. The NotificationService notifies the providing Company about the selction choice.
Exit Condition	The Student successfully chooses if to confirm or reject his participation to the Intenrship. The providing company gets informed accordingly.
Exceptions	None



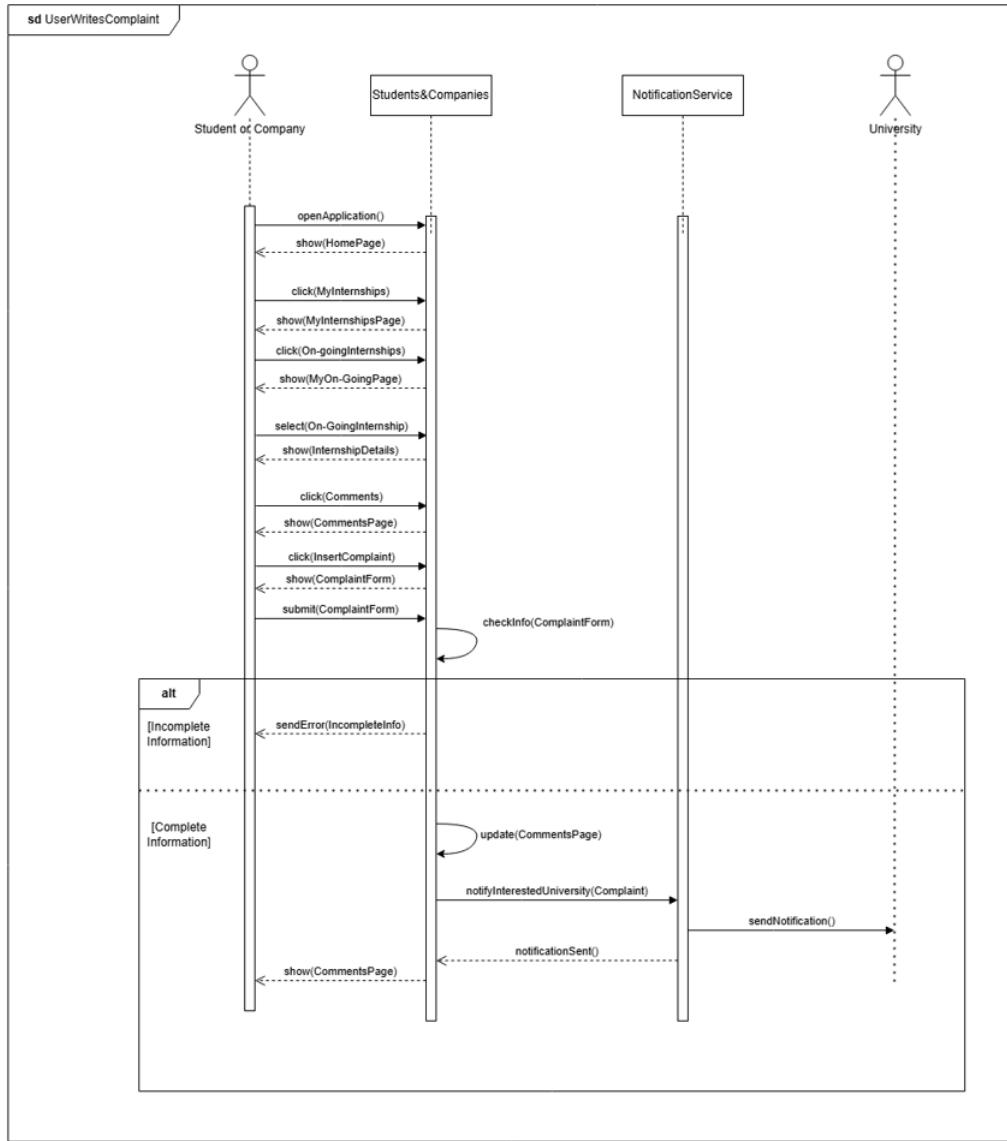
UserViewsComments	
Participating Actors	User (Student, Company, or University), Students&Companies
Entry Condition	The User is logged into the platform
Flow of Events	<ul style="list-style-type: none"> 1. The User navigates to the internship page he has been selected for. 1. The User navigets to the "View Comments" section 2. Students&Companies retrieves the comments associated with the relevant internship 3. Students&Companies displays the comments to the User
Exit Condition	The User views all comments for the selected internship
Exceptions	No comments are available for the internship



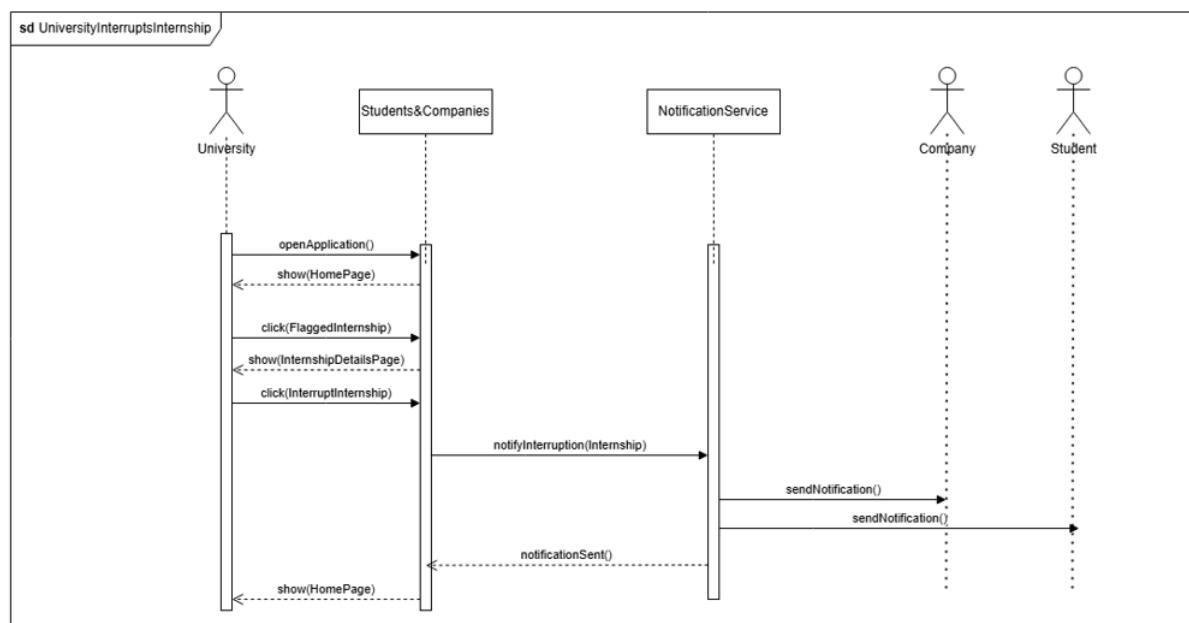
UserWritesObservation	
Participating Actors	User (Student or Company), NotificationService, Students&Companies
Entry Condition	The User is logged into the platform
Flow of Events	<ul style="list-style-type: none"> • 1. The User navigates to the “Write Comment” section • 2. Students&Companies displays the comment input form • 3. The User chooses to write an observation • 3. The User writes the observation and submits it • 4. Students&Companies validates the input and saves the complaint • 5. Students&Companies notifies the relevant User (Student or Company) of the new comment
Exit Condition	The comment is successfully saved and notified to the other party
Exceptions	The comment is invalid (e.g., empty or contains restricted content)



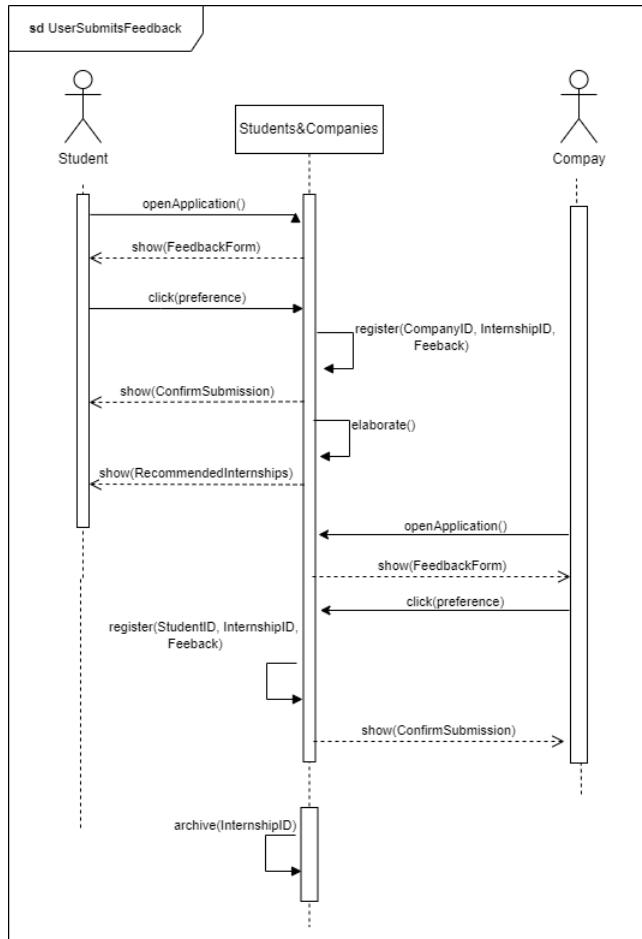
UserWritesComment	
Participating Actors	User (Student or Company), NotificationService, University, Students&Companies
Entry Condition	The User is logged into the platform
Flow of Events	<ul style="list-style-type: none"> • 1. The User navigates to the “Write Comment” section • 2. Students&Companies displays the comment input form • 3. The User chooses to write a complaint • 3. The User writes the complaint and submits it • 4. Students&Companies validates the input and saves the complaint • 5. Students&Companies notifies the relevant User (Student or Company) of the new comment; the university of the student doing the internship is also notified of the new complaint.
Exit Condition	The comment is successfully saved and notified to the other party
Exceptions	The comment is invalid (e.g., empty or contains restricted content)



UniversityInterruptsInternship	
Participating Actors	University, NotificationService, Students&Companies
Entry Condition	The University has logged in and is in home page
Flow of Events	<ul style="list-style-type: none"> 1. The University selects a flagged internship 2. the University clicks the button to interrupt the internship 3. Students&Companies interrupts the internship and notifies the Student and the Company
Exit Condition	The internship is interrupted and both parties are notified
Exceptions	The University cannot interrupt an internship already completed



UserSubmitsFeedback	
Participating Actors	User (Company or Student), Students&Companies
Entry Condition	The user is logged in and one of the internship he participated in has just finished.
Flow of Events	<ul style="list-style-type: none"> • 1. The User opens the internship page • 2. Students&Companies displays a feedback form containing five possibilities. • 3. The User chooses one of the five possibilities and submits the feedback. • 4. Students&Companies closes and archives the internship after both the company and the student have submitted the feedback.
Exit Condition	The internship was archived successfully
Exceptions	None



3.2.3 Mapping

G1: Allows registered companies to post and advertise the available internships that they offer.	
R1	The system must allow a student who wants to register to sign up.
R2	The system must allow a company who wants to register to sign up.
R4	The system must allow registered users to sign in using their credentials.
R7	The system must allow registered students to enter information from their CV to complete their profiles.
R8	The system must allow registered companies to post internship advertisements.
R9	The system must allow companies to review students' CVs and select candidates who meet their internship requirements.
R10	The system must allow students to review internship advertisements and select them if they wish to apply.
R12	The system must notify students when there are updates regarding the internships they applied for or accepted.
R16	The system must recommend a student and a company profile to each other and allow them to review whether the company has an active internship position and if the profiles could attract each other's interest.
R21	The system must notify students when there are updates regarding the results of the internships they have applied for.
R24	The system must allow companies to view and manage applications for the internships they have posted.
R25	The system must allow students to view all details about the internships they have applied for, such as completion status, and deadlines.
D1	The User must have a working Internet connection.
D3	The User registering is either a student, a university or a company.

G2: Allows registered students to proactively and autonomously search and apply internships.	
R1	The system must allow a student who wants to register to sign up.
R4	The system must allow registered users to sign in using their credentials.
R7	The system must allow registered students to enter information from their CV to complete their profiles.
R11	The system must allow students to manually search for internship opportunities and apply for them.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

G3: Helps registered students and registered companies by suggesting them appealing templates for their CVs and internship projects drafts.	
R1	The system must allow a student who wants to register to sign up.
R2	The system must allow a company who wants to register to sign up.
R4	The system must allow registered users to sign in using their credentials.
R6	The system must be able to send notifications to all users.
R7	The system must allow registered students to enter information from their CV to complete their profiles.
R8	The system must allow registered companies to post internship advertisements.
R18	The system must allow companies to evaluate students during the internship process and provide feedback on their CVs.
R20	The system must provide a suggested template to users for improving their CV or project description.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

G4: Allows a registered student to be recommended a list of advertised internships that might be of interest to him/her with respect to: his/her uploaded CV, the internships projects, and users' feedbacks.	
R1	The system must allow a student who wants to register to sign up.
R2	The system must allow a company who wants to register to sign up.
R3	The system must allow a university who wants to register to sign up.
R4	The system must allow registered users to sign in using their credentials.
R6	The system must be able to send notifications to all users.
R7	The system must allow registered students to enter information from their CV to complete their profiles.
R8	The system must allow registered companies to post internship advertisements.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

G5: Allows a registered company to be recommended a list of registered students who might be of interest for one of its advertised internships with respect to: their uploaded CVs, the internship project and users' feedbacks.	
R1	The system must allow a student who wants to register to sign up.
R2	The system must allow a company who wants to register to sign up.
R3	The system must allow a university who wants to register to sign up.
R4	The system must allow registered users to sign in using their credentials.
R7	The system must allow registered students to enter information from their CV to complete their profiles.
R8	The system must allow registered companies to post internship advertisements.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

G6: Allows a registered company to view the list of all the students who applied to one of its advertised internships.	
R1	The system must allow a student who wants to register to sign up.
R2	The system must allow a company who wants to register to sign up.
R4	The system must allow registered users to sign in using their credentials.
R7	The system must allow registered students to enter information from their CV to complete their profiles.
R8	The system must allow registered companies to post internship advertisements.
R24	The system must allow companies to view and manage applications for the internships they have posted.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

<p>G7: Allows a registered student to access the list of internships that he/she has applied for and the ones that he/she has accepted, along with deadlines and other important details.</p>	
R4	The system must allow registered users to sign in using their credentials.
R7	The system must allow registered students to enter information from their CV to complete their profiles.
R10	The system must allow students to review internship advertisements and select them if they wish to apply.
R13	The system must notify a student and a company that accept each other.
R17	The system must allow companies to offer internship proposals to selected students after the interview process is completed.
R22	The system must allow selected students to accept or decline internship proposal sent by companies.
R25	The system must allow students to view all details about the internships they have applied for, such as completion status, and deadlines.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

G8: Allows a registered company to access the list of students that applied to its internships and the status of each student's application (rejected, selected, etc.).	
R4	The system must allow registered users to sign in using their credentials.
R8	The system must allow registered companies to post internship advertisements.
R9	The system must allow companies to review students' CVs and select candidates who meet their internship requirements.
R16	The system must recommend a student and a company profile to each other and allow them to review whether the company has an active internship position and if the profiles could attract each other's interest.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

G9: Allows a registered university to view the comments about an ongoing internship, written either by its interning students or by the host company.	
R3	The system must allow a university who wants to register to sign up.
R4	The system must allow registered users to sign in using their credentials.
R7	The system must allow registered students to enter information from their CV to complete their profiles.
R27	The system must allow universities to follow internship processes, handle complaints raised by students, and interrupt an internship if necessary.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D5	The university profiles are registered using the university email from the ones of the specialized staff (like career centers, internship coordinators, etc.) for the task.
D6	The student registers using his university mail.

G10: Allows a registered company to track and update the application status of students applying to its internships.	
R4	The system must allow registered users to sign in using their credentials.
R8	The system must allow registered companies to post internship advertisements.
R9	The system must allow companies to review students' CVs and select candidates who meet their internship requirements.
R15	The system must allow companies to provide feedback to students regarding their application status.
R27	The system must allow universities to follow internship processes, handle complaints raised by students, and interrupt an internship if necessary.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

G11: Allows registered students and companies to communicate with each other regarding internship applications and statuses.	
R4	The system must allow registered users to sign in using their credentials.
R8	The system must allow registered companies to post internship advertisements.
R10	The system must allow students to review internship advertisements and select them if they wish to apply.
R12	The system must notify students when there are updates regarding the internships they applied for or accepted.
R14	The system must allow students to contact companies regarding the internships they applied for.
R18	The system must allow companies and students to give feedback at the end of the internship in which they took part.
R19	The system must allow the student and company who got recommended to each other to give feedback about the recommendation.
D1	The User must have a working Internet connection.
D2	Students are enrolled in a registered university as students of any kind.
D3	The User registering is either a student, a university or a company.
D4	A university needs to be registered for its students to link their accounts and start applying for internships.
D6	The student registers using his university mail.

3.3 Performance Requirements

Due to the non-critical nature of the system, strict performance requirements are not needed. Nonetheless, for the best user experience these are the set requirements:

- The system should let Companies create an Internship within 2 seconds.
- The system should let Students upload their CV within 2 seconds.
- The system should let Students accept an Internship recommendation within 2 seconds.
- The system should let Companies accept a Student recommendation within 2 seconds.

- The system should reload the Users recommendations within 5 seconds after a user feedback submission.
- The system should let Companies fix the interview time slots accordingly within 2 seconds.
- The system should let Students select their preferred interview time slot within 2 seconds.
- The system should let Companies select their preferred internship candidate within 2 seconds.
- The system should let Companies and Students post comments within 2 seconds.
- The system should let Universities interrupt internships within 5 seconds.

3.4 Design Constraints

3.4.1 Standards compliance

Specifications described in this document must be respected by the system. The source code of the application must be commented on and documented adequately. The system should respect the guidelines described by the GDPR.

3.4.2 Hardware limitations

The system requires any device and a stable internet connection.

3.5 Software System Attributes

3.5.1 Reliability and Availability

The system should guarantee an availability equal to 99.5 or more%. In other words, the system will be inaccessible for less than two days every year. To achieve this goal, a high redundancy for the critical components will be ensured. Furthermore, in order to guarantee better reliability performances, all the scheduled maintenance actions on the system should be done during the night.

3.5.2 Security

The connection between the application and the server must be safe. To keep a good level of security, the system should use the Transport Layer Security protocol. For this purpose, it is needed an SSL/TSL certificate.

3.5.3 Maintainability

The source code must be commented on as well as possible and the correlated documentation must be kept updated during the whole life cycle of the system. Modularity and low coupling between components must be a focus during the designing and developing phases.

4 Formal Analysis Using Alloy

4.1 Objectives of the Analysis

This section presents the formal modeling activity conducted using Alloy notation. The primary objective of this work is to provide a rigorous description of the system's domain and its properties. The main objective of the formal modeling activity is to ensure the correctness, consistency, and efficiency of the platform. By formally modeling key aspects of the system using Alloy, we aim to verify that the system behaves as intended under various conditions and check complex relationships and constraints between entities.

The main aspects that can be proven are:

- Mutual Recommendation and Acceptance
- Concurrency Constraints
- Internship State Transitions
- Correctness of Feedback Submission
- Correctness of Comment Submission

4.2 Description of the Model

The model captures the following key features:

- Users and Roles: The model distinguishes between three types of users: Student, University, and Company. These users interact with internships in different ways, with students applying to internships, accepting recommendations, and leaving feedback. While, universities manage student data and can interrupt internships.
- Internships: Internships are the central object in the system, with states that reflect their progression from Application to Ended. Each internship has a status, an applicationDeadline, a startingDate, an endingDate, comments and feedbacks.
- Relationships and Constraints. Several constraints govern the interactions between users and internships.

4.3 Relevance

Modeling the platform in this way is important for two main reasons. Consistency and scalability.

Consistency is ensured by verifying constraints on internship transitions and user interactions. This guarantees that the platform behaves predictably, reducing the risk of system malfunctions and avoids conflicting actions.

On the other hand, facilitating scalability is equally important. The model ensures that the

system remains robust even in scenarios with multiple internships and users interactions. In this way, we can avoid performance bottlenecks and ensure that the platform can scale efficiently without introducing errors.

4.4 Alloy Code

4.4.1 Definition of actors, components and auxiliar entities

```

1 // Abstract signature representing a generic user in the system
2 abstract sig User {}

3
4 // A student is a type of user with relationships to internships
5 sig Student extends User {
6     reccomended: some Internship,           // Internships recommended to the student
7     appliesTo: set Internship,             // Internships the student has applied to
8     accepts: set Internship              // Internships the student has accepted
9 } {
10    accepts in reccomended            // Students can only accept recommended
11    internships
11    appliesTo & accepts = none        // Applied and accepted internships must
11    not overlap
12 }
13
14 // A university is a user that manages students
15 sig University extends User {
16     students: some Student           // Students associated with the
16     university
17 }
18
19 // A company is a user that manages internships
20 sig Company extends User {}

21
22 // Represents the current moment in time
23 one sig CurrentDate {
24     time: one Int                  // Current time as an integer value
25 }

26
27 // Represents a specific point in time (e.g., deadlines, start dates)
28 sig Date {
29     time: one Int                  // Time as an integer value
30 }

31
32 // Enumeration of possible internship statuses
33 enum InternshipStatus {Application, Selection, Ongoing, Feedback, Ended,
33   Interrupted}

34
35 // Represents an internship with various attributes and constraints
36 sig Internship {
37     status: one InternshipStatus,    // Current status of the internship
38     managedBy: one Company,         // The company managing the internship
39     reccomended: some Student,      // Students recommended for the
39     internship

```

```

40     accepted: set Student,           // Students whose recommendation was
41         accepted
42     candidates: set Student,       // Students mutually accepted for
43         selection
44     selected: lone Student,       // Selected student (if any)
45     applicationDeadline: one Date, // Application deadline
46     startingDate: one Date,       // Internship start date
47     endingDate: one Date,         // Internship end date
48     comments: set Comment,        // Comments on the internship
49     feedbacks: set Feed,          // Feedback associated with the
50         internship
51     interruptedBy: lone University // University that interrupted the
52         internship (if any)
53 } {
54     applicationDeadline.time < startingDate.time           // Valid time
55     constraints
56     startingDate.time < endingDate.time
57     accepted in recommended                                // Accepted students
58     must be recommended
59     candidates in accepted
60     among accepted students                                // Candidates must be
61     selected in candidates
62     must be among candidates
63     interruptedBy != none implies (selected in interruptedBy.students and
64     some c : comments | c.complaint = True)
65 }
66
67 // Enumeration for boolean values
68 enum Boolean {True, False}
69
70 // Represents a comment made by a user
71 sig Comment {
72     wroteBy: one User,           // User who wrote the comment
73     complaint: one Boolean      // Indicates if the comment is a complaint
74 } {
75     wroteBy & University = none // Universities cannot write comments
76     complaint = True implies wroteBy & Company = none // Complaints cannot
77         come from companies
78 }
79
80 // Abstract signature representing generic feedback in the system
81 abstract sig Feed {
82     submittedBy: one User        // User who submitted the feedback
83 } {
84     submittedBy in User - University // Universities cannot submit feedback
85 }
86
87 // Feedback submitted by students and companies after the internship
88 sig RatingFeedback extends Feed {
89     stars: one Int              // Rating value
90 } {
91     stars >= 0 and stars <= 5   // Ratings must be between 0 and 5

```

```

82 }
83
84 // Enumeration for thumbs-up or thumbs-down feedback
85 enum Thumb {Up, Down}
86
87 // Feedback about recommendations given by students and companies
88 abstract sig ReccomendationFeedback extends Feed { preference: one Thumb }
89
90 sig ReccomendationCompany extends ReccomendationFeedback {
91     relatedTo: one Student
92 }
93     submittedBy in Company
94     relatedTo in Internship.reccomended
95 }
96
97 sig ReccomendationStudent extends ReccomendationFeedback {}
98 {submittedBy in Student}

```

4.4.2 Facts

```

1 fact commentExistance {
2     all c : Comment |
3         one i : Internship | c in i.comments
4 }
5
6 fact commentConstring {
7     all i : Internship |
8         all c : Comment |
9             c in i.comments iff
10            c.wroteBy in (i.selected + i.managedBy) and i.selected != none and
11            i.status != Application and i.status != Selection
12 }
13
14 fact feedbackExistance {
15     all f : Feed |
16         one i : Internship | f in i.feedbacks
17 }
18
19 fact ratingConstraint {
20     all i : Internship |
21         all f : RatingFeedback |
22             f in i.feedbacks iff
23             f.submittedBy in (i.selected + i.managedBy) and (i.status = Feedback or
24                 i.status = Ended)
25 }
26
27 fact recommendationConstraint {
28     all disj f1, f2: ReccomendationCompany | f1.submittedBy = f2.
29         submittedBy implies f1.relatedTo != f2.relatedTo
30 }
31
32 fact companyRecommendationConstraint {

```

```

31     all i: Internship |
32     all f :ReccomendationFeedback |
33     f in i.feedbacks iff f.submittedBy in (i.reccomended + i.managedBy)
34 }
35
36 fact feedbackLimit {
37     all i : Internship |
38     all disj f1, f2 : i.feedbacks & RatingFeedback |
39     f1.submittedBy != f2.submittedBy
40 }
41
42 // Ensures reciprocal recommendation between students and internships
43 fact reciprocalReccomendation {
44     all s: Student |
45     all i: Internship |
46     i in s.reccomended iff s in i.reccomended
47 }
48
49 // Ensures mutual acceptance between students and internships
50 fact mutualAcceptance {
51     all s: Student |
52     all i: Internship |
53     s in i.candidates iff
54     s in i.accepted and (i in s.accepts or i in s.appliesTo)
55 }
56
57 // Defines the application phase for internships
58 fact applicationState {
59     all cd: CurrentDate |
60     all i: Internship |
61     i.status = Application iff (i.applicationDeadline.time > cd.time and no
62         s : Student | i.selected = s)
63 }
64
65 // Defines the selection phase for internships
66 fact selectionState {
67     all cd: CurrentDate |
68     all i: Internship |
69     i.status = Selection iff (i.applicationDeadline.time < cd.time and i.
70         startingDate.time > cd.time and
71             no s: Student | i.selected = s)
72 }
73
74 // Defines the ongoing phase for internships
75 fact ongoingState {
76     all cd: CurrentDate |
77     all i: Internship |
78     i.status = Ongoing iff
79         (i.startingDate.time <= cd.time and i.endingDate.time >= cd.time and
some s: Student | i.selected = s)
}

```

```

80 // A student cannot intern for two different companies at the same time
81 fact ongoingInternships {
82     all disj i1, i2 : Internship |
83     no s : Student |
84     i1.selected = s and i2.selected = s and i1.status = Ongoing and i2.
85         status = Ongoing
86 }
87
88 // Defines the feedback phase for internships
89 fact feedbackState {
90     all cd: CurrentDate |
91     all i: Internship |
92     i.status = Feedback iff (i.endingDate.time < cd.time and some s: Student
93         | i.selected = s)
94 }
95
96 // Defines the ended state for internships
97 fact endedState {
98     all cd: CurrentDate |
99     all i: Internship |
100    i.status = Ended iff ((i.startingDate.time < cd.time and i.selected =
101        none) or
102            (#(i.feedbacks & RatingFeedback) = 2))
103 }
104
105 // Defines the interrupted state for internships
106 fact interruptedState {
107     all i: Internship |
108     i.status = Interrupted iff i.interruptedBy != none
109 }
110

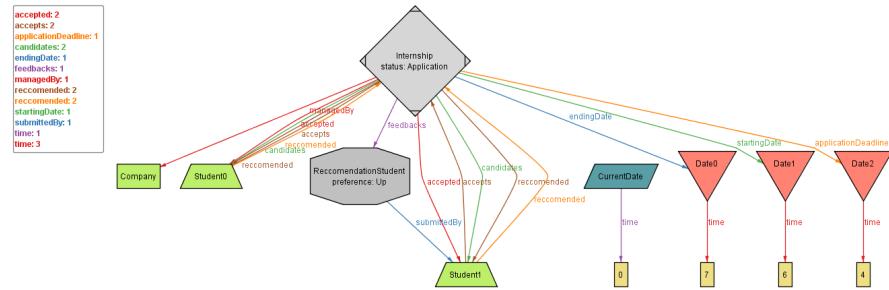
```

4.4.3 Predicates and Assertion

```

1 pred ApplicationState {
2     one i : Internship | all s: Student | i.status = Application and s in (i
3         .reccomended)
4 }
5 run ApplicationState

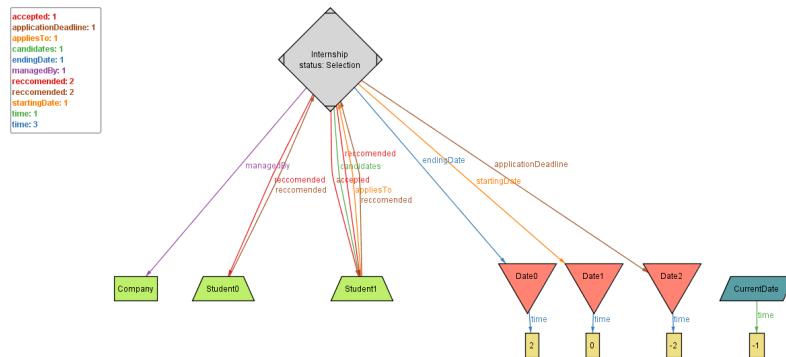
```



```

1 pred SelectionState{
2     one i : Internship | some disj s1, s2:Student | i.status = Selection and
3         s1 in (i.reccomended) and s2 in (i.candidates)
4 }
5 run SelectionState

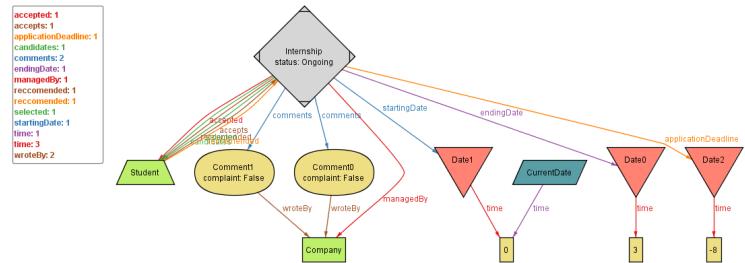
```



```

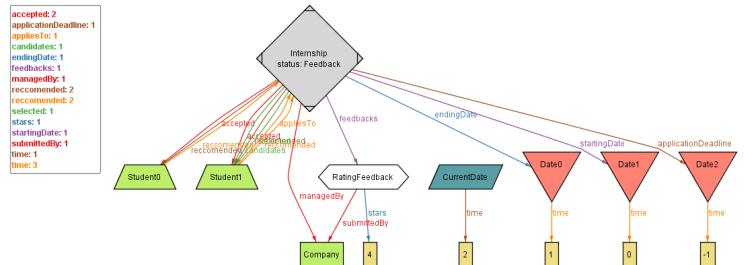
1 pred OngoingState {
2     one i : Internship | i.status = Ongoing
3 }
4 run OngoingState

```



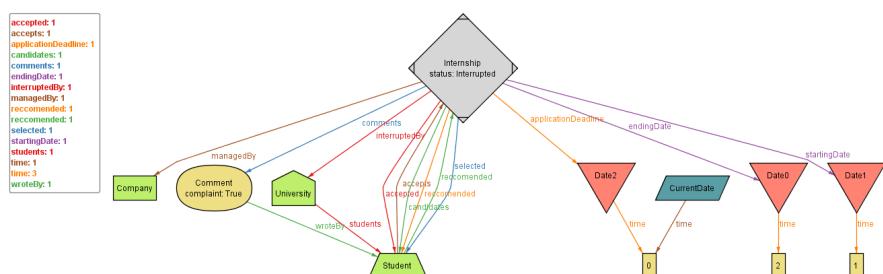
```

1 pred FeedbackState {
2     one i : Internship | i.status = Feedback
3 }
4 run FeedbackState
  
```



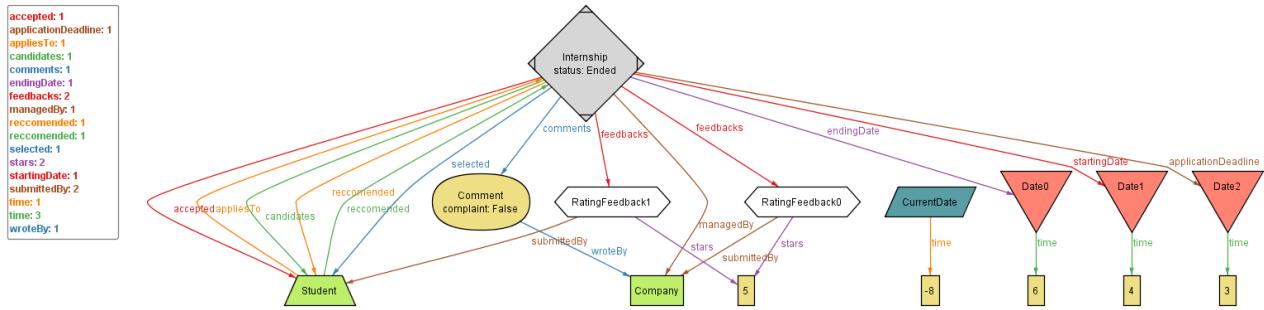
```

1 pred InterruptedState {
2     one i : Internship | i.status = Interrupted
3 }
4 run InterruptedState
  
```



```

1 pred EndedState {
2     one i : Internship | i.status = Ended
3 }
4 run Ended
  
```



```

1 assert NoConcurrentInternships {
2     all disj i1, i2: Internship |
3         no s: Student |
4             i1.selected = s and i2.selected = s and
5                 i1.status = Ongoing and i2.status = Ongoing
6 }
7 check NoConcurrentInternships
  
```

Executing "Check NoConcurrentInternships"

Solver=sat4j Bitwidth=4 MaxSeq=4 SkolemDepth=1 Symmetry=20

5981 vars. 340 primary vars. 16314 clauses. 221ms.

No counterexample found. Assertion may be valid. 28ms.

5 Effort Spent

5.1 Effort Spent per Unit

This section shows the amount of time that each member has spent to produce the document.

UNIT	MEMBERS	HOURS
SetUp	Ratti, Salvatore, Yalcin	3 hours
Scenarios	Salvatore	3 hours
Use Cases, Sequence Diagrams	Ratti, Salvatore	15 hours
Phenomena	Salvatore, Yalcin	5 hours
Goals	Ratti, Salvatore, Yalcin	4 hours
Domain Assumptions	Salvatore	3 hours
Requirements	Yalcin	4 hours
Mapping	Salvatore	5 hours
Class Diagram	Ratti	4 hours
Use Case Diagrams	Ratti	6 hours
State Charts	Ratti	6 hours
UI Mockups	Yalcin	20 hours
Alloy	Ratti	9 hours
Final Review	Ratti, Salvatore, Yalcin	10 hours

6 References

6.1 References and Tools

1. The UI Mockups have been made with: <https://www.figma.com>
2. Pictures have been made with: <https://deepai.org/machine-learning-model/text2img>
3. Logos have been made with: <https://www.canva.com/>
4. Sequence Diagrams have been made with: <http://draw.io>
5. Use Case Diagrams have been made with: <http://draw.io>
6. Class Diagrams have been made with: <http://draw.io>
7. State Charts have been made with: <http://draw.io>