Software Engineering 2 project Abate Singe

Requirement Analysis and Specification Document

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1 Introduction

1.1 Purpose

Students&Companies (S&C) is a platform designed to facilitate the matching of university students seeking internships with companies offering such opportunities.
The platform aligns students and companies based on the students' resumes, completed projects, and the terms provided by the companies. Additionally, S&C advertises internships offered by companies, allowing students to manually search for positions that align with their interests.
To further enhance the user experience, the platform employs a recommendation system, which proactively suggests new internship opportunities tailored to the interests and qualifications of each student, also suggesting to companies new students with matching qualification for the internship.

1.1.1 Goals

[G1] Companies create internship offers

[G2] Companies evaluate the candidates

[G3] Companies select the best candidates

[G4] Students search for available internship opportunities

[G5] Students participate in an internships

1.2 Scope

This section defines the domain of the Students & Companies (S&C) platform, which involves two main user types: **companies** and **students**.

- **Companies**: Can create internship offers and provide details such as mentorship, salaries, benefits and choose the best candidate.
- **Students**: Can create profiles, add personal information and fill out the CVs, share their details with companies, and applies to the internship.

The **platform** supports users in performing these actions and enables:

- Viewing and searching for internship opportunities.
- Applying for internships to enter the selection phase.
- When a new internship is posted, S&C uses a recommendation system to notify students whose profiles or CVs match the offer.
- S&C facilitates the evaluation process by managing interviews, helping in the creations of questionnaires and assisting in finalizing the selection.
- S&C monitors the progress of internships and handles user complaints to ensure a smooth experience.
- The platform collects feedback and suggestions from users to enhance its functionality.

1.2.1 World Phenomena

[WP1] Students seek for a job.

[WP2] Companies offers internship opportunities based on term and project to the Student.

[WP3] Companies search for a student for the internship.

1.2.2 Shared Phenomena

World Controlled

[SP1] Students sign up on the platform.

[SP2] Students log in on the platform.

[SP3] Students fill in personal information.

[SP4] Students fill out their own CVs on the platform.

[SP5] Students search for internship opportunities.

[SP6] Students search for companies listed.

[SP7] Students view details of companies.

[SP8] Students view details of internships.

[SP9] Students apply for internships through the platform.

[SP10] Students fill out questionnaire to proceed in the evaluation.

[SP11] Students write information about the ongoing internship on the platform.

[SP12] Students can make complains about the internship that are doing.

[SP13] Student can give feedback and suggestion to the platform.

[SP14] Companies sign up on the platform.

[SP15] Companies log in on the platform.

[SP16] Companies provide their information in the platform.

[SP17] Companies create internship opportunity on the platform.

[SP18] Companies add information and terms of the internship on the platform.

[SP19] Companies view details of student profile.

[SP20] Companies can accept to evaluate a student that has accepted the internship.

[SP21] Companies interview students to identify the best candidates.

[SP22] Companies review questionnaire responses to evaluate candidates.

[SP23] Companies can choose the most suitable candidate from the list of students that were being evaluated.

[SP24] Companies can make complains about the students enrolled for the internship.

Machine Controlled

[SP25] The platform generates a list of available internships.

[SP26] The platform sends notifications to companies about students that have applied to one of their internship.

[SP27] The platform sends notifications to students about suitable internships.

[SP28] The platform sends notifications to companies about fitting available student.

[SP29] The platform assists companies in the creation of questionnaires.

[SP30] The platform helps companies organize online meetings for interviews.

[SP31] The platform helps companies to finalize the selection.

[SP32] The platform send notification to students the result of the evaluation.

[SP33] When a company selects a student for an internship, the platform removes the internship from the list of available opportunities.

[SP34] The platform collects user feedback.

[SP35] The platform collects user complaints.

[SP36] The platform collect statistical analysis from student and companies profiles.

1.3 Definitions, Acronyms, Abbreviations

1.3.1 Definitions

User: It is used as a generalization to represent both company and student accounts.

1.3.2 Acronyms

- **S&C** - Students & Companies
- **API** - Application Programming Interface
- **UML** - Unified Modeling Language

1.3.3 Abbreviations

- **[Gn]** - the n-th goal
- **[WPn]** - the n-th world phenomenon
- **[SPn]** - the n-th shared phenomenon
- **[Dn]** - the n-th domain assumption
- **[Rn]** - the n-th requirement
- **[UCn]** - the n-th use case

1.4 Reference Documents

- Specification of the RASD assignment of the Software Engineering II course, held by professors Matteo Camilli, Elisabetta Di Nitto, and Matteo Rossi at Politecnico di Milano, A.Y. 2024/2025.
- Slides of the course on WeBeep

1.5 Document Structure

1. **Introduction** - Overview of the objectives and purposes aimed to be achieved through this project.
2. **System Description** - General description of the system focusing on its core aspects and domain-level interactions.
3. **Requirements Specification** - Detailed definition of the functional requirements and domain assumptions necessary to achieve the objectives.
4. **Formal Modeling** - Formal description of key world phenomena using Alloy.
5. **Effort Analysis** - Breakdown of the time invested in preparing this document (categorized by person and section).
6. **References** - List of all materials, tools, or sources utilized during the creation of this document.

2 Overall Description

2.1 Product perspective

2.1.1 Scenarios

1. **Student registers on the platform and fills out their profile information:**
   Student A wants to find internship opportunities, so they decide to register on the S&C platform. After completing the registration and logging in, Student A fill out a form that includes details about their skills, past work experience, certificates, degree, and the type of internships they are seeking.

   S&C generates a standardized CV based on the data provided by the student, ensuring consistency across profiles and making it easier for companies to compare candidates. The CV is then displayed on Student A's profile. If needed, Student A can update their information and regenerate a new CV in the future.

   Once Student A completes the form, the information is saved and made visible on their profile, allowing companies to access their details. Additionally, the platform utilizes this information to improve the student's experience, such as sending notifications about newly available internships that match their profile.

2. **Company registers on the platform:**
   Company Y wants to offer internships to students and find suitable candidates for their program. To use the platform, they must first register. After registration, the company is required to provide a general description, the location of their main infrastructure, some photos, and reasons why students should consider their internship offers.

   These details will be displayed on the company's profile, so it is essential for Company Y to provide a compelling description to attract students and spark their interest in applying.

3. **Company creates an internship opportunity:**
   Company T, decides to open new internship positions, in order to achieve this Company T utilizes the S&C platform, on which it is already registered.
   In the internship creation module, Company T is required to provide details about the projects the students will undertake and the terms offered by the company. These terms may include compensation, mentorship opportunities, and other benefits.
   In this phase the Company T has to select if they want to evaluate the students by questionnaire or by meeting.
   Once the module is finalized and reviewed, Company T is prompted to create a questionnaire, partially guided by suggestions from the S&C platform. This questionnaire will be used in the selection process for students who advance to the next stage.

4. **Selection of the Internship:**
   Student B had been searching for internship opportunities and discovered the S&C platform, which provides several services, including a "Recommendation" feature.
   Based on the information that Student B provided during registration, the platform notifies her whenever a new internship that matches her interests becomes available. Also the companies are notified if the internships offered match Student B skills.
   Student B logs into the platform and checks for any notifications about internships matching her profile. Unfortunately, no notifications are available.
   So Student B then selects the "Find an Internship!" option from the menu to search for an opportunity that suits her needs. After reviewing several offers, she finds an internship opportunity with Company Q, which is looking for new trainees.

5. **Selection of Candidates:**
   Company X has posted an internship on S&C because they are looking for a student to fill the position. Student C finds the opportunity interesting and decides to apply for the role.
   Company X reviews Student C's profile and CV to see if they meet the company's requirements. If Student C isn't suitable, the process ends here, and the system waits for other applicants. If Student C is suitable, they are added to the candidate list to wait for the evaluation process to start. Additionally, the recommendation system can suggest potential candidates to Company X. If the company wants to evaluate a suggested candidate, they can send an invitation to the student. If Student C accepts the invitation, they are also added to the candidate list.
   Company X has two options to move from the application phase to the evaluation phase: they can either wait until a deadline set during the job posting or decide to begin the evaluation process when they feel there are enough candidates. The company X invites all students on the candidate list to either complete a structured questionnaire or attend a meeting. If Student X fails to submit the form before the deadline, they will be removed from the list of candidates under consideration.

6. **Evaluation of Candidates:**
   The evaluation process involves either reviewing the student's responses to the questionnaire created during the internship posting or arranging a meeting with Student C.
   S&C does not host meetings, so Company X must send an invitation link to an online meeting platform or set up an in-person meeting. Only one of these methods can be chosen to keep the process efficient.
   Once all the necessary data is collected from the candidates, Company X makes a final decision and selects the best student for the internship.
   If Student C is selected, they will receive a positive notification. Otherwise, they will be informed of the rejection.
   If Company X decides that none of the candidates are a good fit for the position, the platform will delete the internship advertisement.

7. **Student and company during internship:**
   During the internship, Student D and Company W are requested to provide updates about the progress of the internship, allowing S&C to effectively monitor its overall trend.
   In certain situations, Student D might encounter issues with Company W during the internship. To address this, Student D can utilize the same dedicated space as before to report the issue, facilitating a resolution between the two parties. Before submitting the message to the platform, Student D must specify the type of message to distinguish the nature of the communication.

8. **Students are requested to provide feedback on the finished internship:**
   When an internship ends, Student E is asked to complete a feedback form to share their experience about the internship they completed. Student E is requested to answer some question multiple choice question and also give advice to other student if is good or bad to apply for an internship to company Z. All feedback are displayed on the company's profile. This helps Student F in selecting the best internships they wish to enroll in.

2.1.2 Class diagram

The diagram below in Figure 1, illustrates the connections between various elements without delving into the specifics of each. Its purpose is to provide a general overview of the system and its interactions with the external environment.

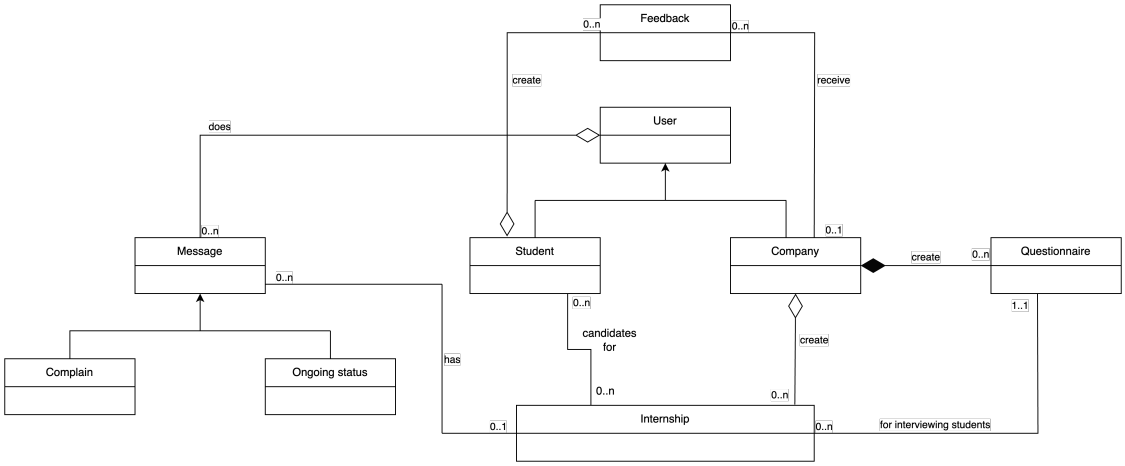

Figure 1: Class Diagram

2.1.3 State diagrams

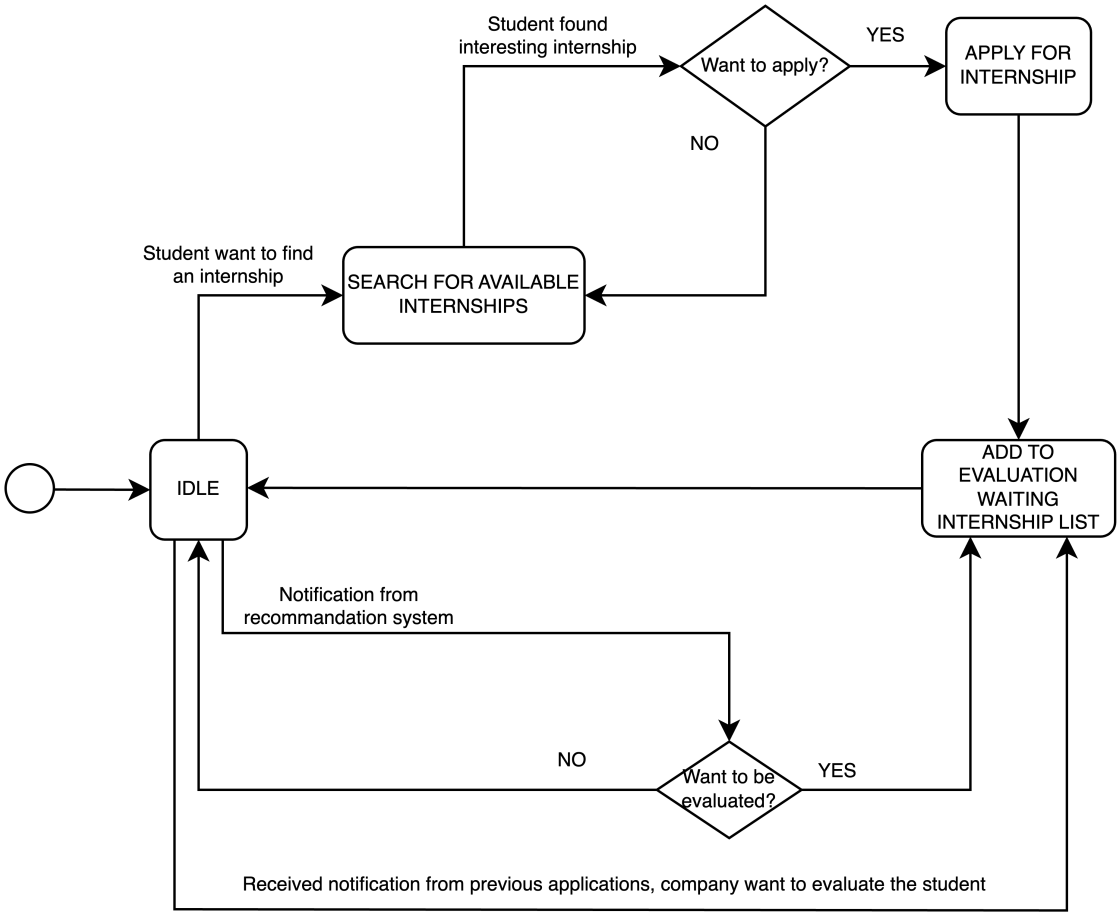

Figure 2: Student search for an internship

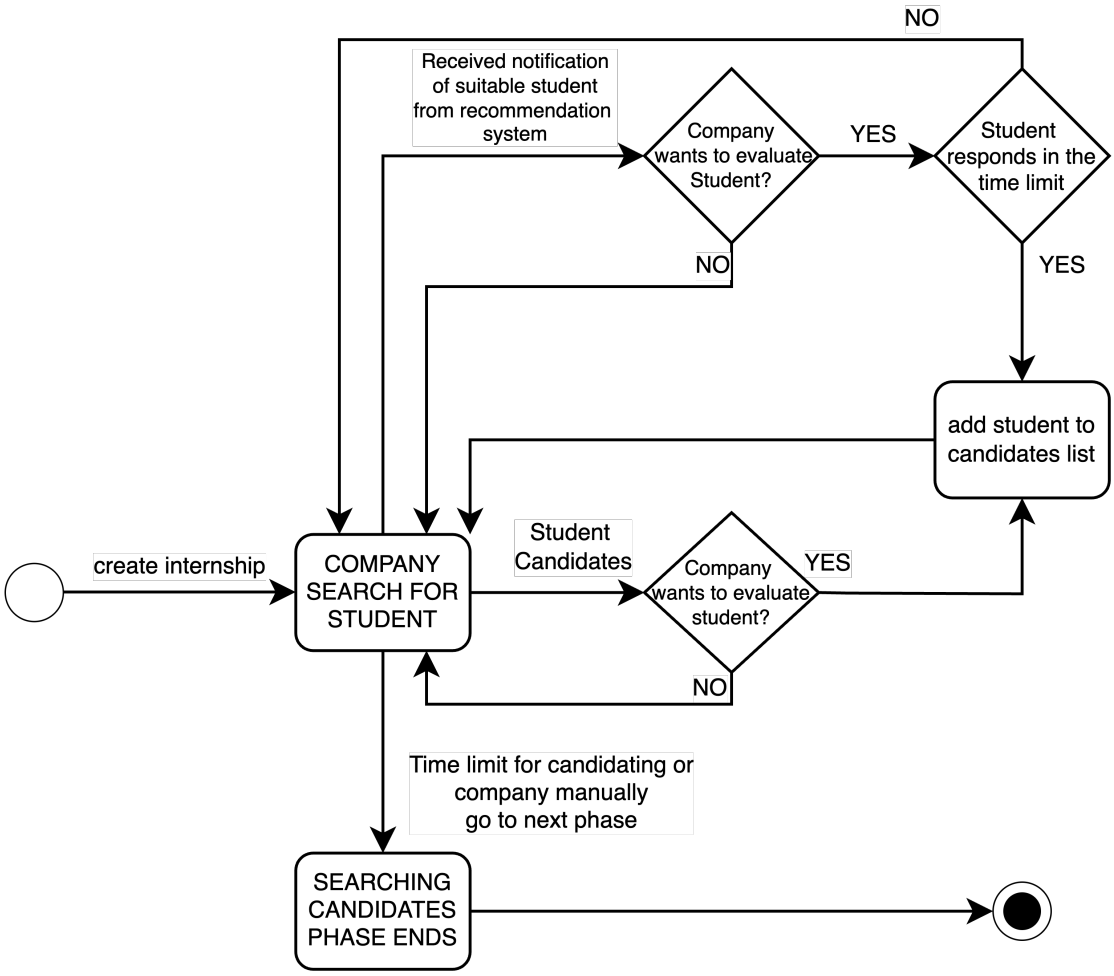

Figure 3: Company search candidates

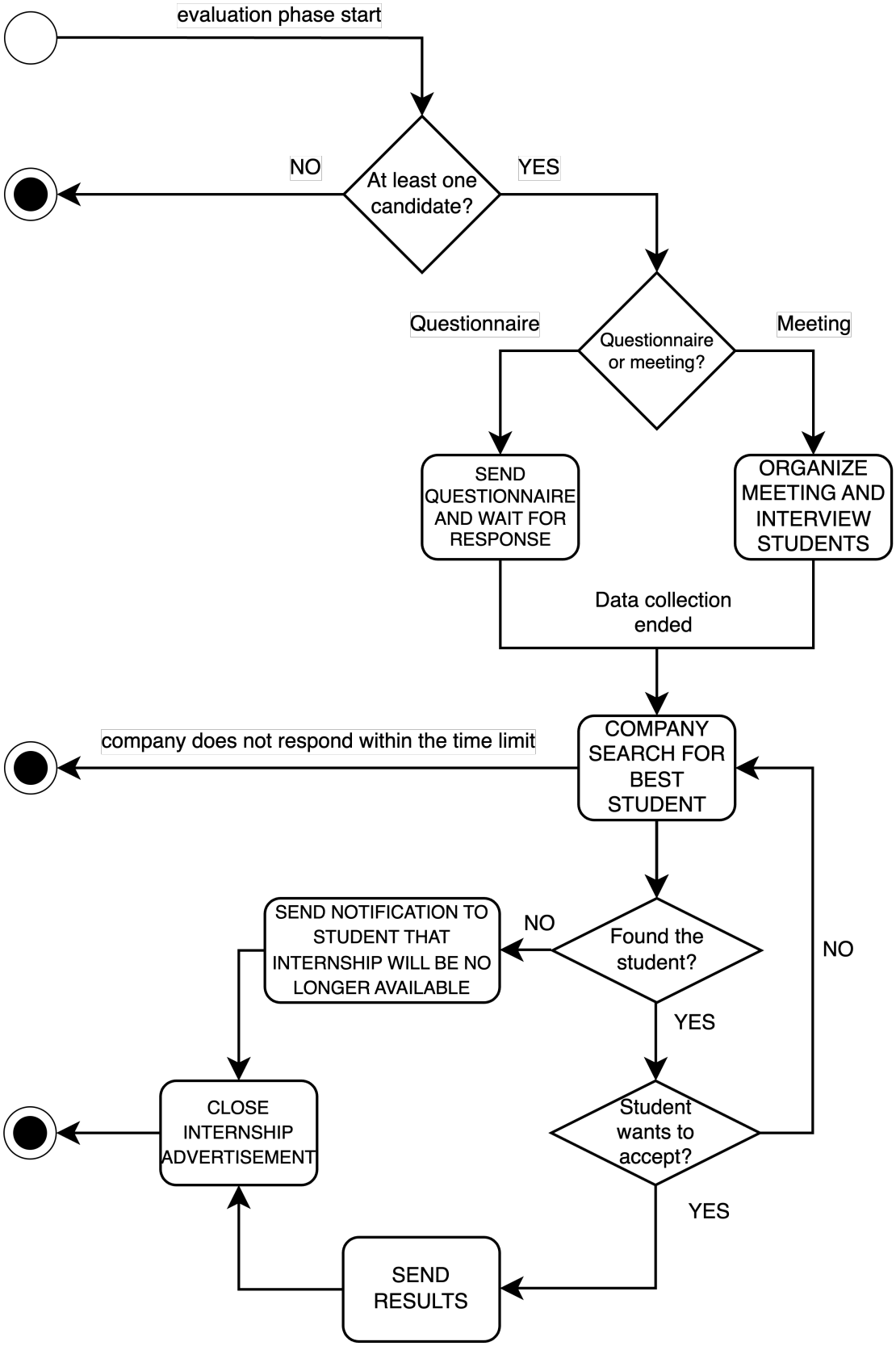

Figure 4: Process evaluation of candidates

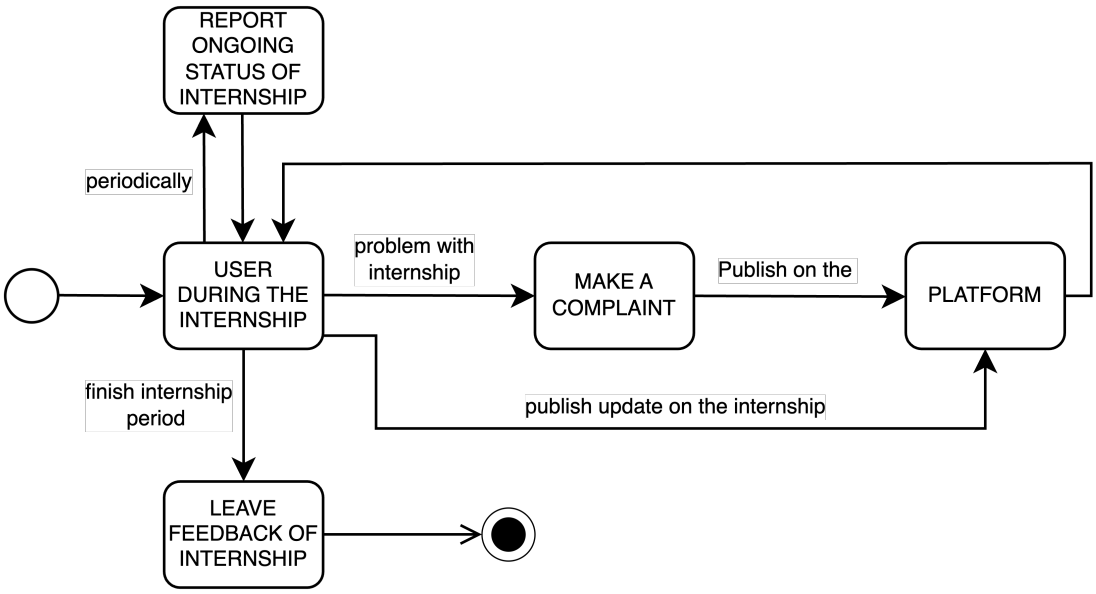

Figure 5: Process of user during internship

2.2 Product functions

2.2.1 Sign up and Login

The registration process allows users to create an account on the platform. After the registration, a verification email is sent to the user to confirm their identity. Once the user verifies their email, they gain access to the application.
The registration process is designed differently depending on whether the user is a company or a student. The login process securely identifies the user using the credentials provided during registration.

2.2.2 Internship Creation

A company can create an internship advertisement and add it to the list of available internships, allowing students to view them on the platform. The advertisement must include an overall description, the terms of the internship, and the skills required to complete the internship.
Before finalizing the internship advertisement, the platform asks the company to create a questionnaire. S&C provides default questionnaires that can be used, or the company can design its own form and save it for future use.

2.2.3 Recommendation System

When a new internship is created, the recommendation system extracts the skills specified in the advertisement and searches the student database. The recommendation system then sends a notification (via email), containing the advertisement, to all students whose profiles match the required skills for the internship. This feature helps companies quickly identify students who are better suited for the open position.

2.2.4 Matching company and student

When a student decides to apply for an internship, the company receives a notification (via email) indicating the application. On the platform, the company can view the student's profile, including their personal information and CV. The company can choose to evaluate the candidate, which triggers a notification sent to the student with details about the next steps. Alternatively, the student receives a notification

stating that they do not meet the company requirements.
If the candidate receives next-step instructions, they may be asked to complete a form on the platform or be provided with details such as time, location, or link to an online meeting.
Both the student and the company are required to complete their respective steps within 24 hours. The student must submit the form or attend the meeting within this time frame, failing which their application will be automatically rejected. The company then has 48 hours after receiving the student's response or completing the interview to decide whether to accept the student.
The decision is communicated to the student via email. If the company selects the candidate, the procedure concludes. Otherwise, the process restarts, waiting for a new applicant.

2.2.5 Monitoring internship

During the internship, it is mandatory to provide status updates on the ongoing internship. S&C provides a dedicated space where both students and companies can send messages detailing the progress of the internship.
Two types of messages can be sent: updates and complaints. The update messages provide general information about the current status of the internship. Complaint messages, on the other hand, are used to report issues or problems encountered during the internship.
All complaints are displayed in the same section and can be sent by the student or the company. This space also allows both parties to review and address complaints in an attempt to resolve them effectively.

2.3 User characteristics

When referring to the term User, it is used as a generalization to represent both company and student accounts.

2.3.1 Non-registered users

Non-registered users are User who are not logged in as either a Student or a Company.
Their actions are limited to registering to the platform.
Any non-registered user can sign up to become either a Student or a Company.

2.3.2 Student

The university student is a user who can register and log in to the platform. They are able to browse available positions, with the option to filter them based on various parameters. The student can apply to one or more positions, file a complaint with their university regarding an ongoing internship, and provide feedback about the company once the internship has concluded.

2.3.3 Company

The company is a user who can register and log in to the platform. They have the ability to create new open internship and manage candidates who have applied for a position by completing their corresponding interview forms. The employee can decide whether to accept or reject a candidate, confirm the selection of a candidate for a position, and close an ongoing internship. Additionally, the employee can file a complaint or updtate status about the student currently completing an internship and provide feedback about the student once the internship has concluded.

2.4 Assumptions, dependencies and constraints

2.4.1 Domain Assumptions

[D1] The system ensures reliable communication between server and client, guaranteeing that users and server receive all information sent by each other.

[D2] The students fill out truthful data in their CV.

[D3] The students are available on the date defined by the company for the meeting.

[D4] The companies inserts truthful data about their Internship Opportunity.

[D5] The companies interview Students by meeting through external communication channels.

3 Specific Requirements

3.1 External Interface

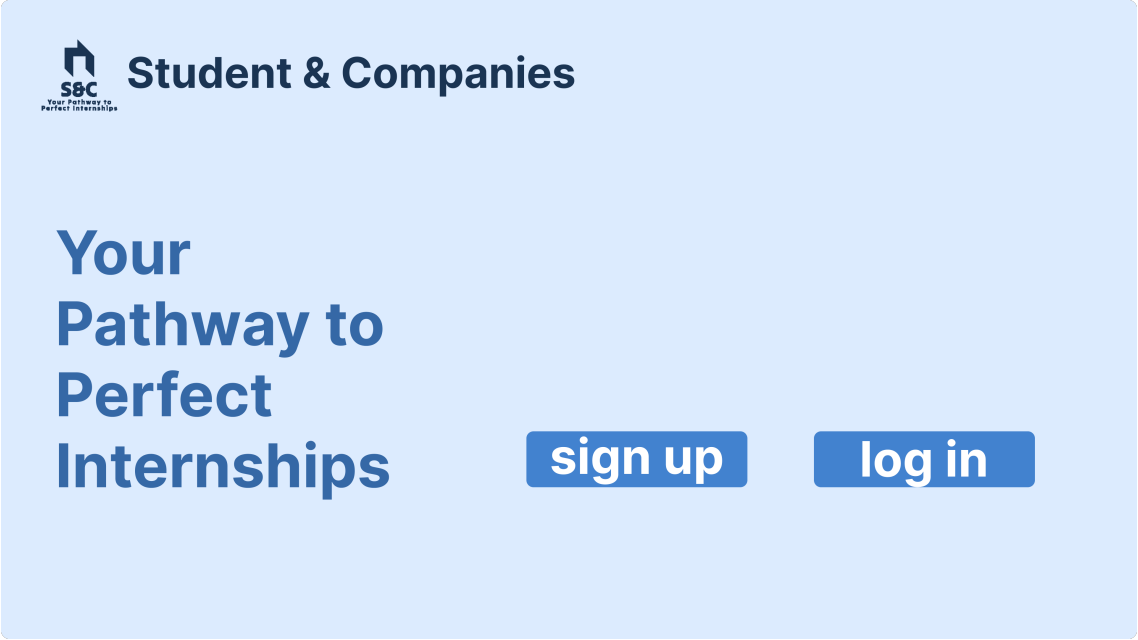

Figure 6: Home page

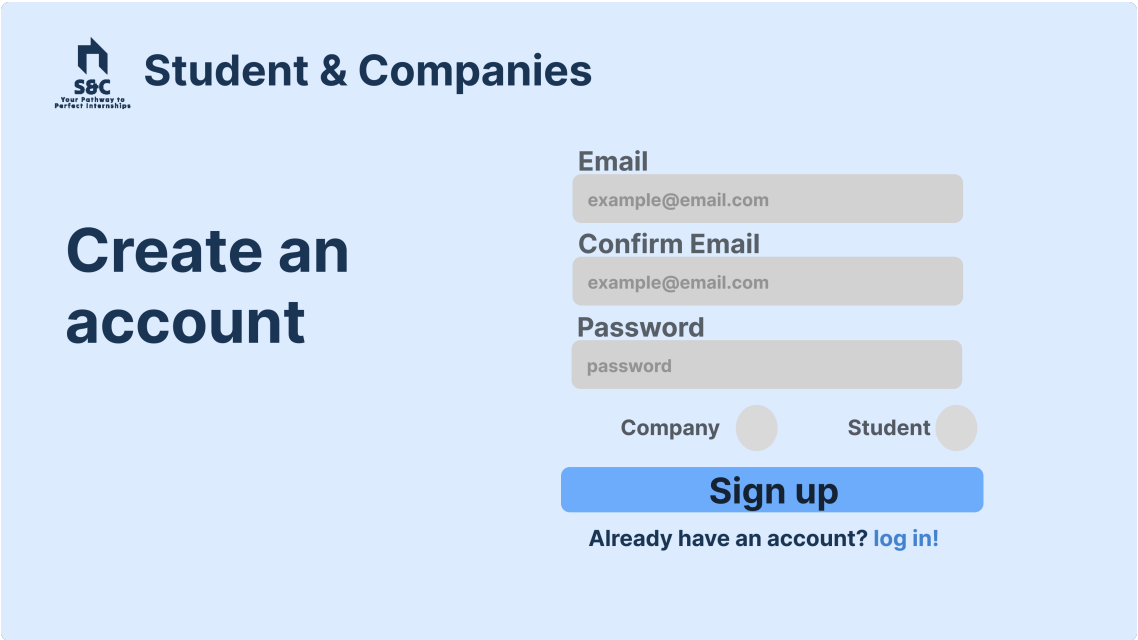

Figure 7: Sign Up

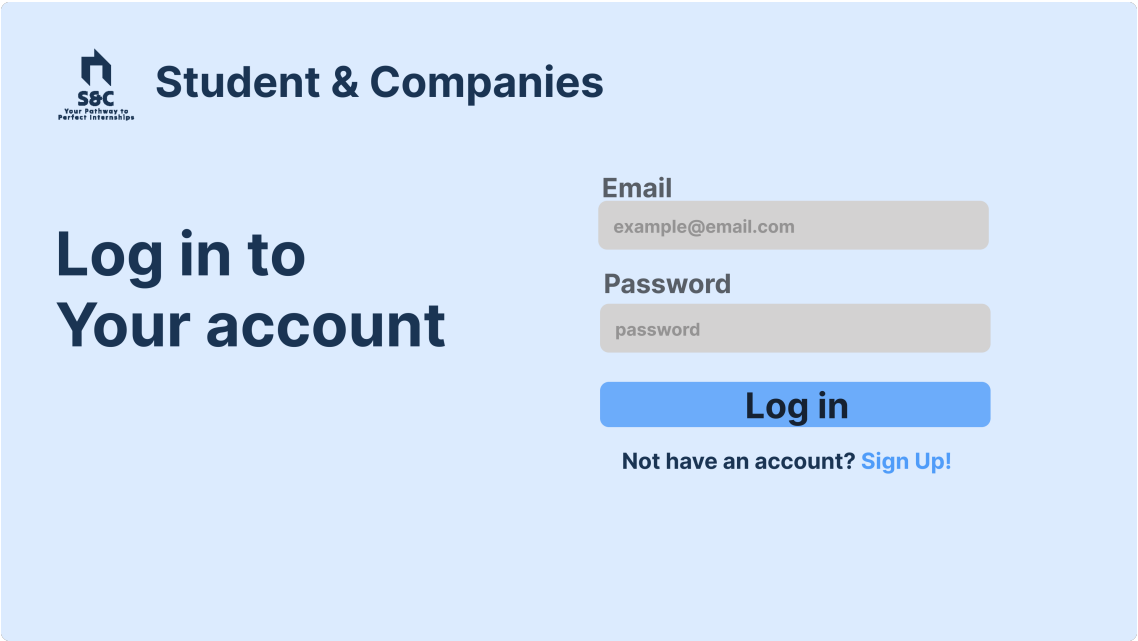

Figure 8: Log In

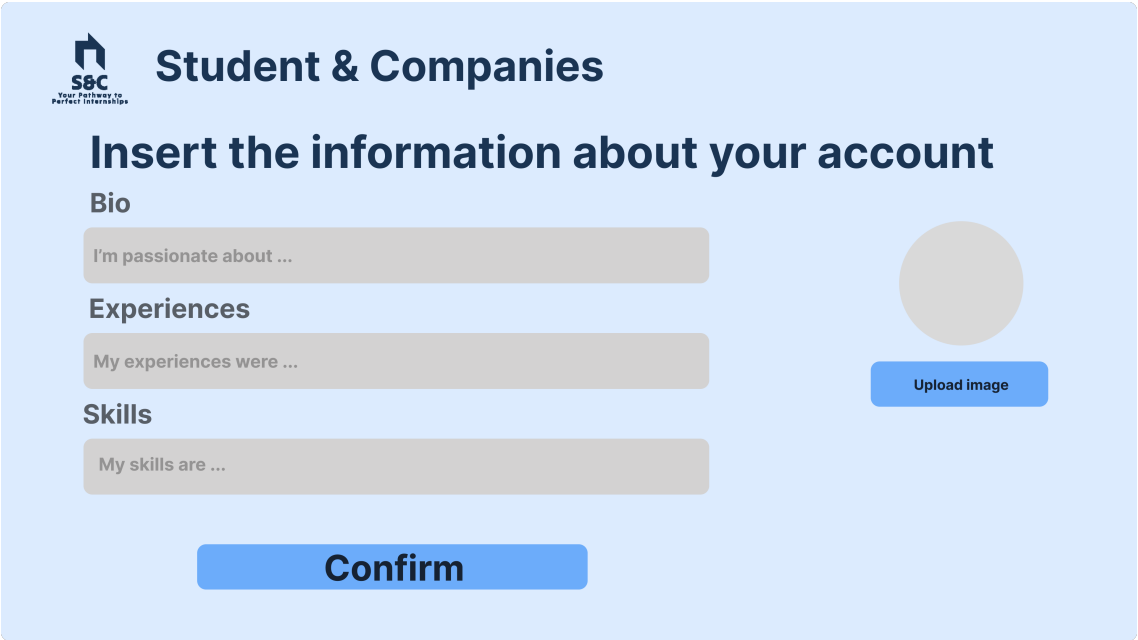

Figure 9: Modify your profile

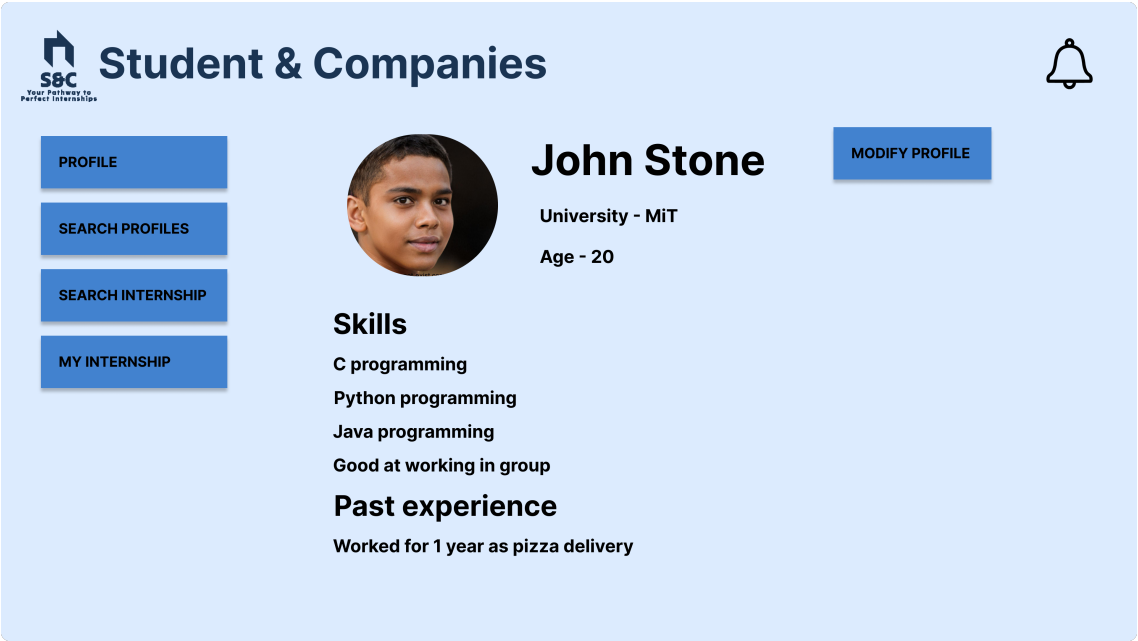

Figure 10: Home page

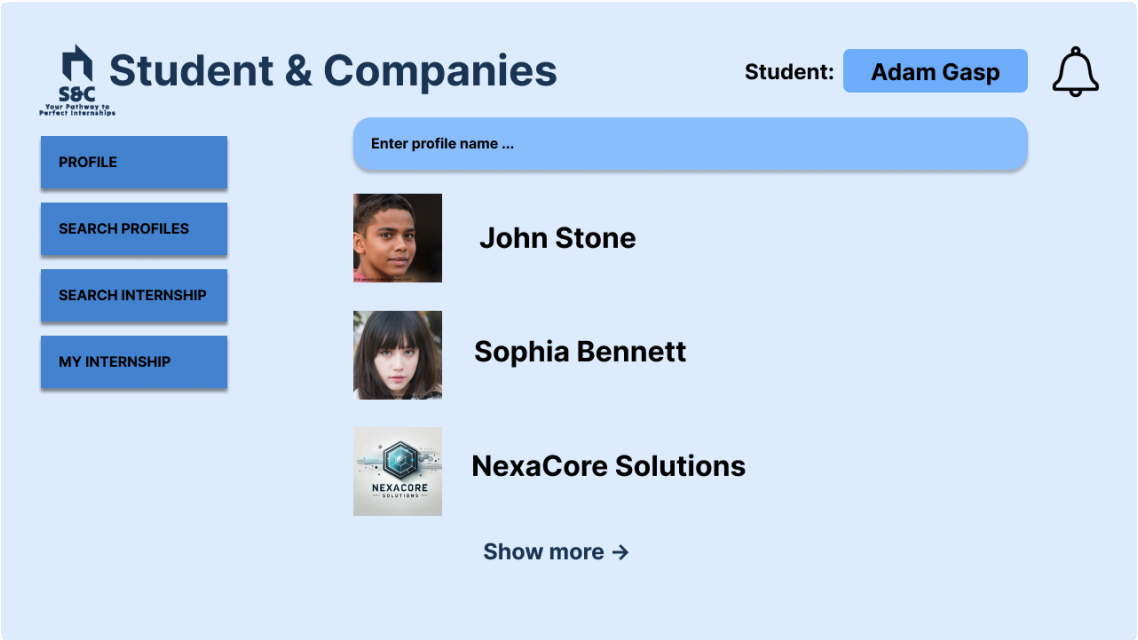

Figure 11: Search profiles

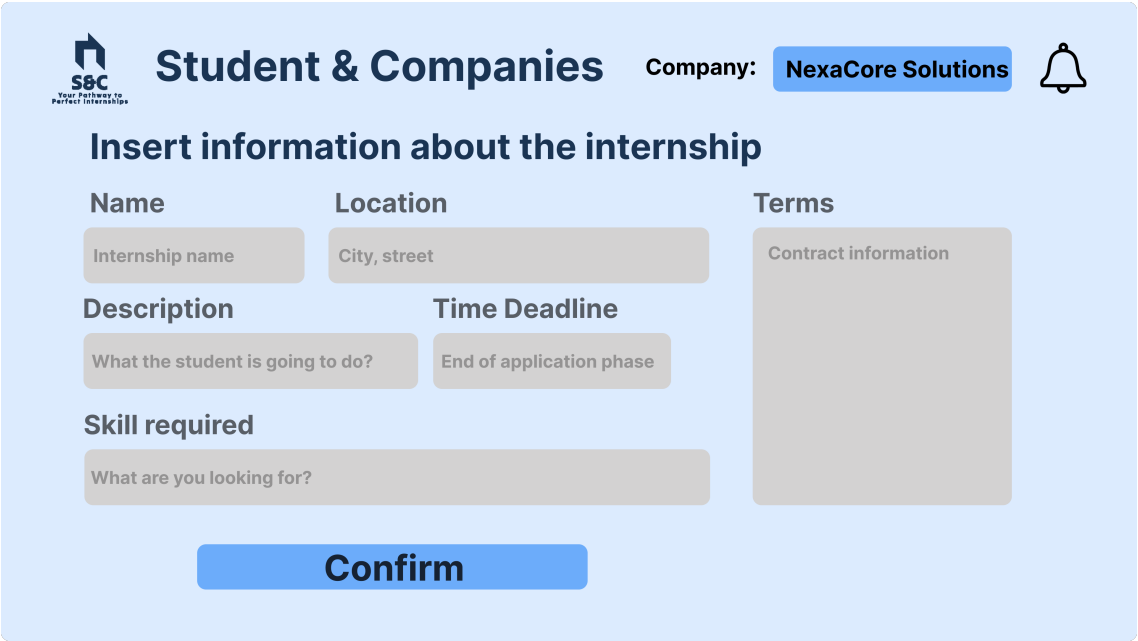

Figure 12: Create internship

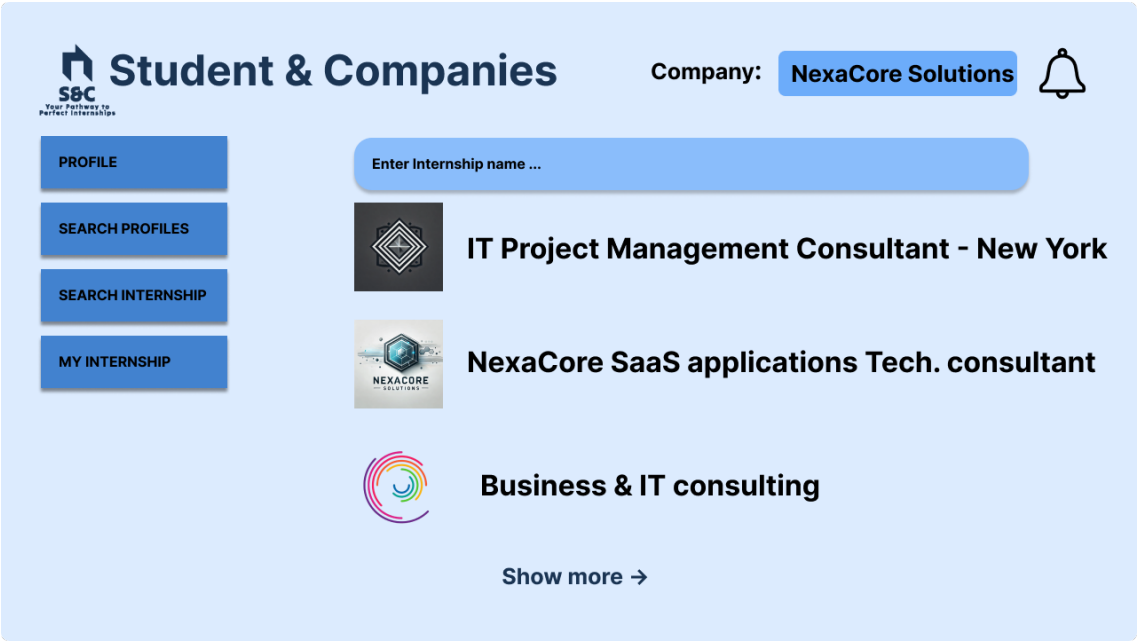

Figure 13: Search internships

3.2 Functional requirements

[R1] The system allows user to sign-up.

[R2] The system allows user to log-in.

[R3] The system send to users an email with a link to confirm their account registration.

[R4] The system allows users to modify their accounts at any moment.

[R5] The system allows users to browse other users profile.

[R6] The system allows users to browse the Internship opportunity available list.

[R7] The system constrain users in an internship to periodically report ongoing status of the internship.

[R8] The system enables users to receive system-generated notifications.

[R9] The system allows users in an internship to make a complaint.

[R10] The system allows students to fill out the information of their CV.

[R11] The system allows students to apply for an open Internship.

[R12] The system allows students to remove application in internship before the evaluation phase.

[R13] The system allows students to work in only one internship at a time.

[R14] The system prevent the students to candidate twice for a internship opportunity.

[R15] The system notifies the student when a new job opportunity of interest becomes available.

[R16] The system allows students to choose whether to be evaluated by the company that notified them.

[R17] The system allows students to fill out questionnaire during evaluation process.

[R18] The system requires students to complete a feedback form provided by the platform at the end of the internship.

[R19] The system allows companies to create an Internship at any moment.

[R20] The system allows companies to define terms and projects in the Internship description.

[R21] The system allows the companies to hire one student for each internship opportunity.

[R22] The system provides to companies a default questionnaire for the evaluation of the Students.

[R23] The system allows companies to modify the default questionnaire given by the system to evaluate the student.

[R24] The system allows companies to evaluate the candidate through a structured questionnaires.

[R25] The system allows companies to evaluate the candidate through a organized meeting.

[R26] The system helps companies to organize a meeting with the Students to evaluate.

[R27] The system prevents the companies from making any modifications, once a job advertisement is published.

[R28] The system allows companies to set a deadline for the start of the selection of the candidates.

[R29] The system allows companies to decide to start manually the selection process.

[R30] The system allows companies to select students who are not currently participating in another internship.

[R31] The system notifies companies when a Student updates their CV with details related to the company's job description.

[R32] The system allows companies to notify students in line with their internship opportunities.

[R33] The system allows companies to decide to evaluate or not a student that made the application for their internship opportunity.

3.2.1 Use cases, Sequence Diagrams, Activity Diagrams

The system classifies users into different categories, each with its own set of available operations.

- **Non-registered user**: Users who are not logged in have limited access to platform operations. They can register as either a student or a company by signing up.

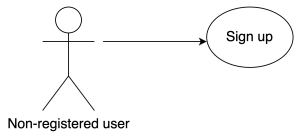

Figure 14: UML - Non-registered user

- **User** It is used to refer to both the student and the company, actions that can be performed by either.

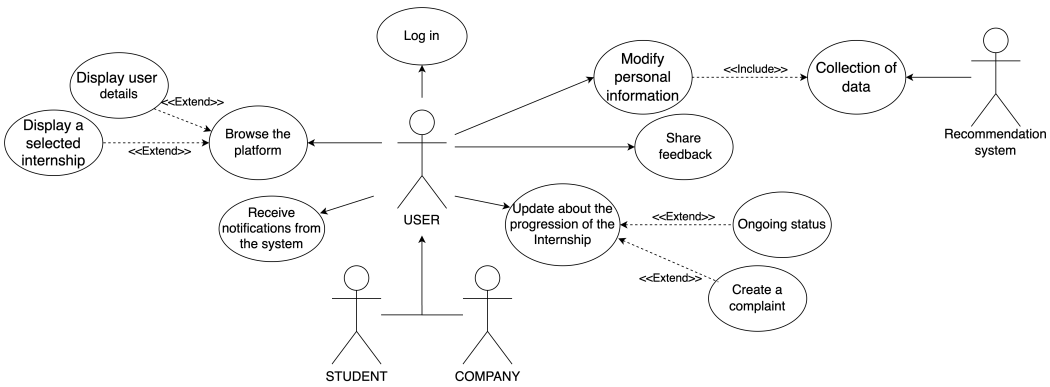

Figure 15: UML - User

- **Student** This type of user uses the platform to search for and do internships. It is assumed to be logged in.

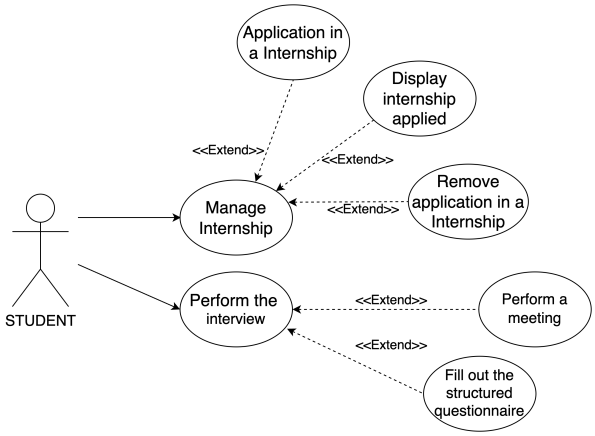

Figure 16: UML - Student

- **Company** This type of user uses the platform to create internships and selects students. It is assumed to be logged in.

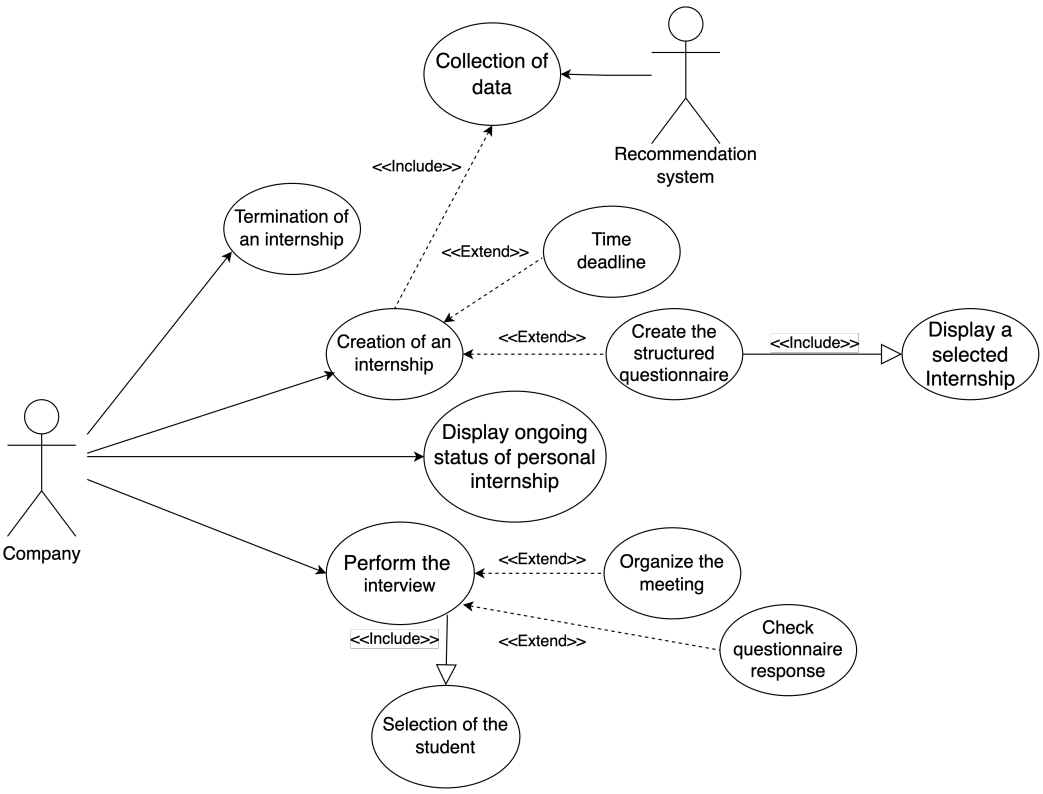

Figure 17: UML - Company

[UC1] Sign up

Name	Sign up
Actor	Non-registered User
Entry Condition	The actor is connected to the platform and wants to create an account
Event Flow	1. The actor browse to the the sign-up page. 2. The platform shows a list of fields that the actor needs to enter. 3. The actor clicks on “Confirm” button. 4. The platform checks if actor already exist. 5. The platform stores the credentials. 6. The platform send to the actor a confirmation email. 7. The actor clicks on confirmation link.
Exit Condition	The actor become user and can access to the functionalities provided by the type of the possessed account
Exceptions	1. The entered email is already associated with an existing account • The platform displays an error message notifying the user that an account is already registered with that email address. 2. The actor attempts to submit the form without completing all required fields • The platform displays an error message indicating that the provided information is incomplete. 3. The actor inserts an incorrect email • The platform shows the same page with an error message inviting the user to modify the email since it is incorrect.

Table 1: Sign Up

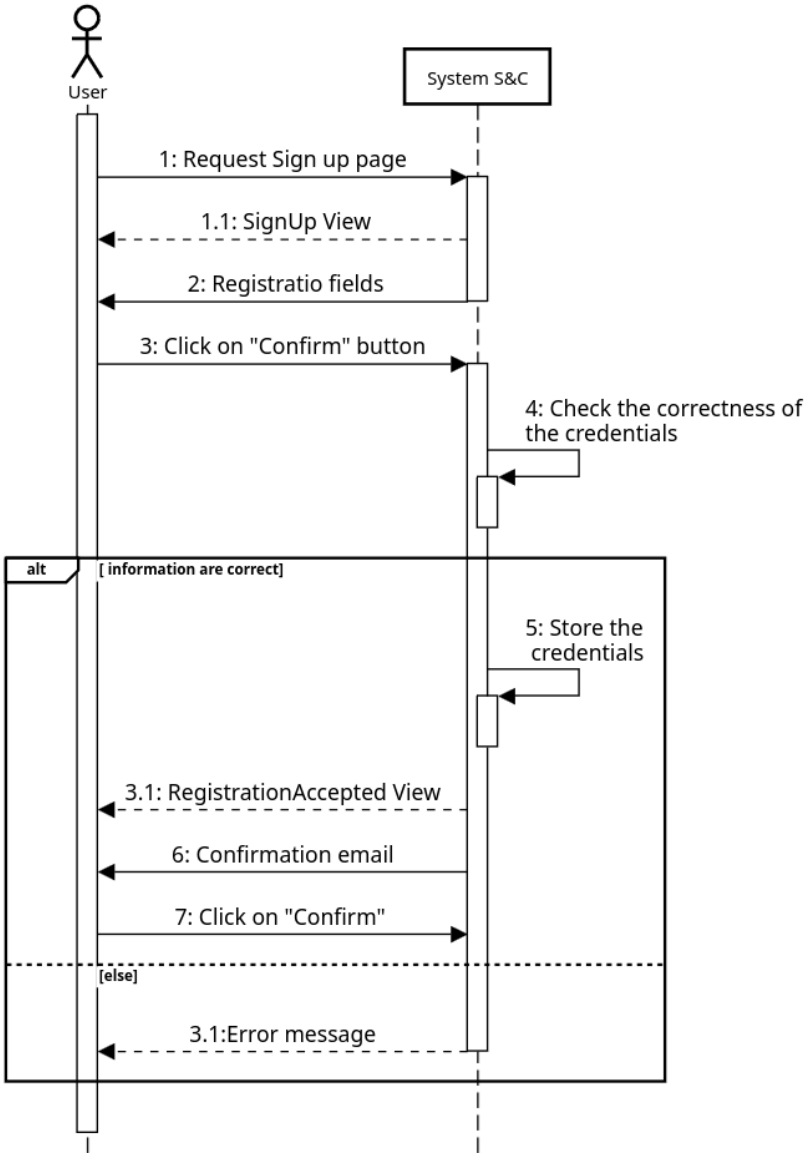

Figure 18: Sign Up

[UC2] Log in

Name	Log in
Actor	User
Entry Condition	The actor wants to log in
Event Flow	1. The actor browses to the log-in page. 2. The platform shows a list of fields that the actor needs to enter. 3. The actor clicks on “confirm” button. 4. The platform checks the credentials.
Exit Condition	The login process is successfully completed, and the platform displays the actor’s profile dashboard.
Exceptions	Credentials are not correct • The platform displays an error message indicating that the credentials are not correct.

Table 2: Log in

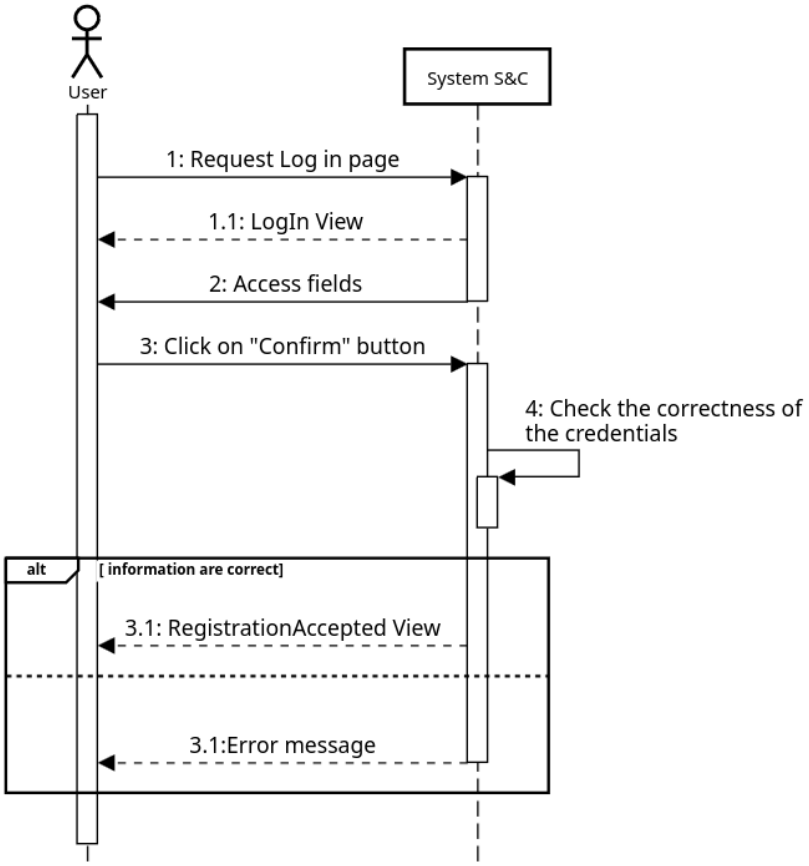

Figure 19: Log in

[UC3] Manage personal information

Name	Manage personal information
Actor	User, Recommendation system
Entry Condition	The actor wants to update their personal information
Event Flow	1. The actor navigates to the "Home" page. 2. The actor clicks the button "Modify profile". 3. The actor modifies editable fields. 4. The actor confirms the modifies by clicking the "Confirm" button. 5. The platform checks the updated information. 6. The platform records all the changes. 7. The platform send the user's profile to the recommendation system. 8. The recommendation system makes analysis on the information. 9. The platform notifies the company if the student updates their CV to align with the proposed internship.
Exit Condition	The actor has been modified their profile
Exceptions	The actor clicks the "Confirm" button with empty fields. • The platform displays an error message indicating that the provided information is incomplete.

Table 3: Manage personal information

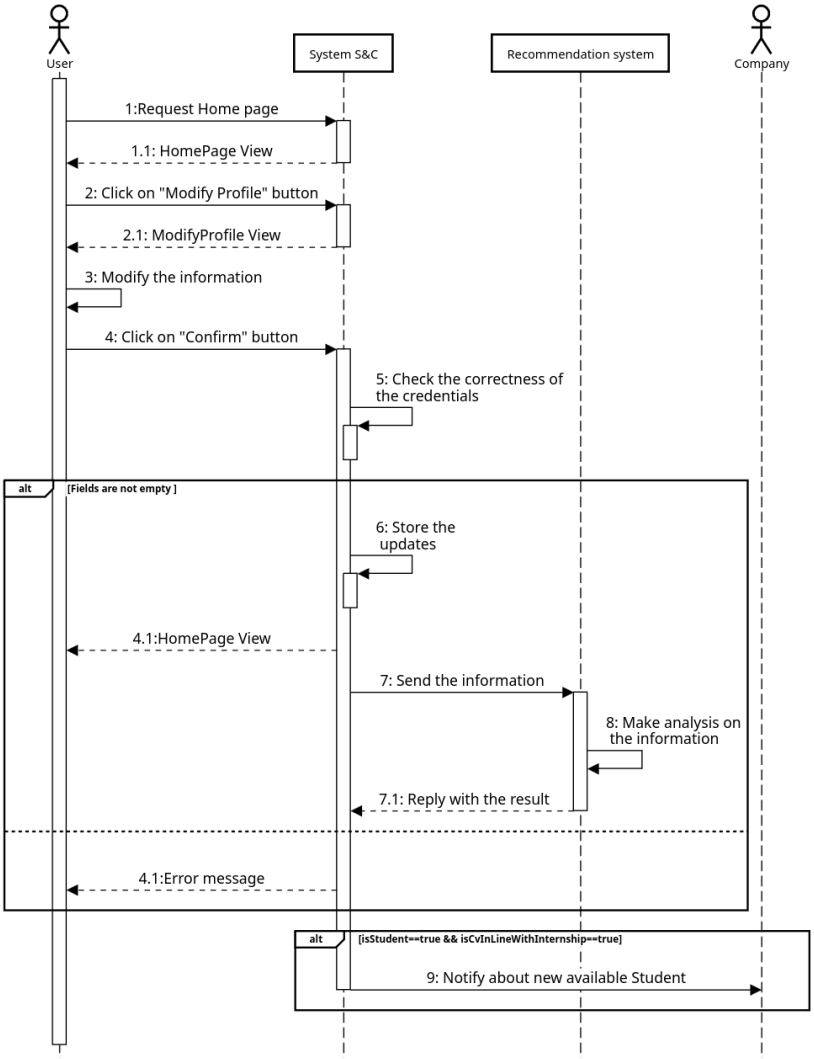

Figure 20: Manage personal information

[UC4.0] Explore the platform - Display user details

Name	Explore the platform - Display user details
Actor	User
Entry Condition	The actor wants to view the information of a specific user's profile
Event Flow	1. The actor navigates to the "Profile search" section. 2. The actor enters the name or keywords they want to search for in the designated field and performs the search by: • Querying the desired profile • Searching using keywords 3. The platform verifies the existence of a profile matching the entered request.
Exit Condition	The platform displays the corresponding profile.
Exceptions	The actor attempts to search for the desired user's profile, but it is either unavailable or does not exist • The platform displays an error message notifying the actor that the user can not be found.

Table 4: Explore the platform - Display user details

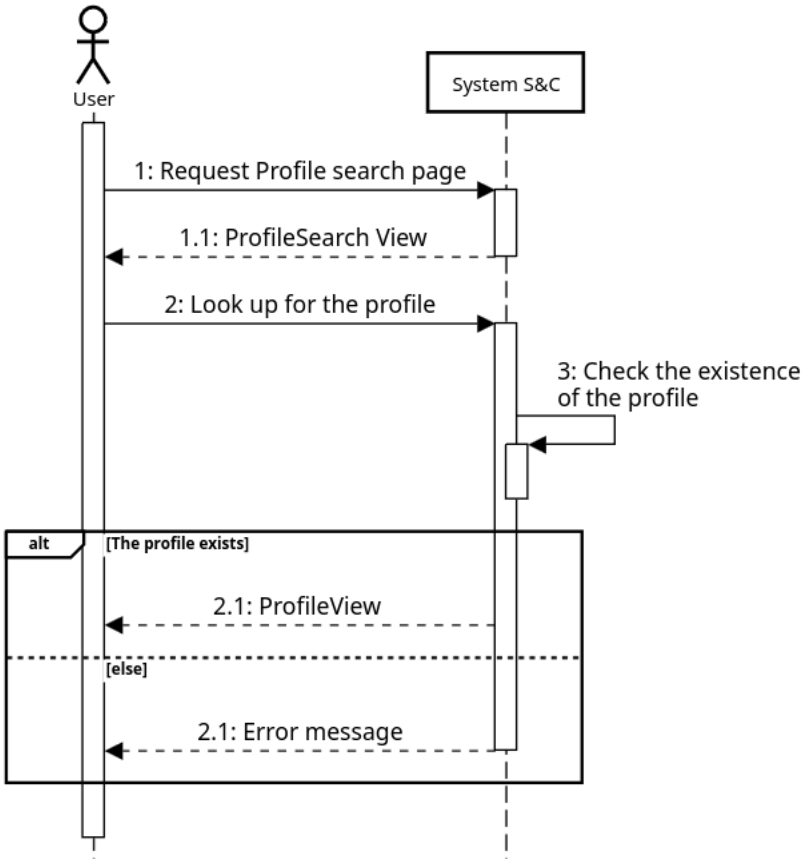

Figure 21: Explore the platform - Display user details

[UC4.1] Explore the platform - Display a selected internship

Name	Explore the platform - Display a selected Internship
Actor	User
Entry Condition	The actor wants to look up for a given internship
Event Flow	1. The actor navigates to the "Internship" section. 2. The actor can perform the search by: • Querying the desired internship in the research field • Browsing through the menu to find the appropriate one 3. The platform checks if an internship matching the entered name exists. 4. The platform displays the corresponding internship information.
Exit Condition	The actor has been shown the desired internship
Exceptions	The actor attempts to search for the desired internship, but it is either unavailable or does not exist • The platform displays an error message notifying the internship can not be found.

Table 5: Explore the platform - Display a selected Internship

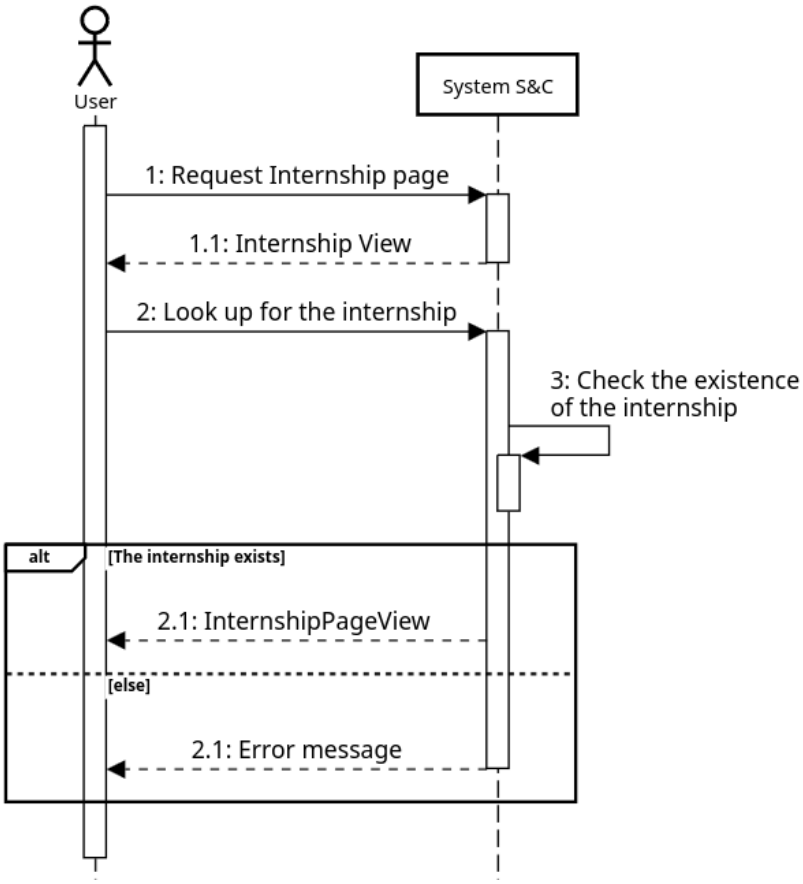

Figure 22: Explore the platform - Display a selected internship

[UC5] Update and complaint about ongoing internship

Name	Update and complaint about ongoing internship
Actor	User
Entry Condition	The actor is currently participating in an internship and needs to send either an update or a complaint message.
Event Flow	1. The actor clicks on "My Internships". 2. The actor selects the message icon. 3. The actor chooses the message type: • update status • make a complaint 4. The actor click the "Send" button. 5. The platform checks the correctness of the message. 6. The platform saves the information.
Exit Condition	The actor sent correctly the message and the platform record it
Exceptions	1. The actor attempts to send a message but it's empty. • The platform displays an error message notifying that the message is empty. 2. The actor attempts to send a message without selecting the type. • The platform displays an error message notifying that the message needs a type.

Table 6: Update and complaint about ongoing internship

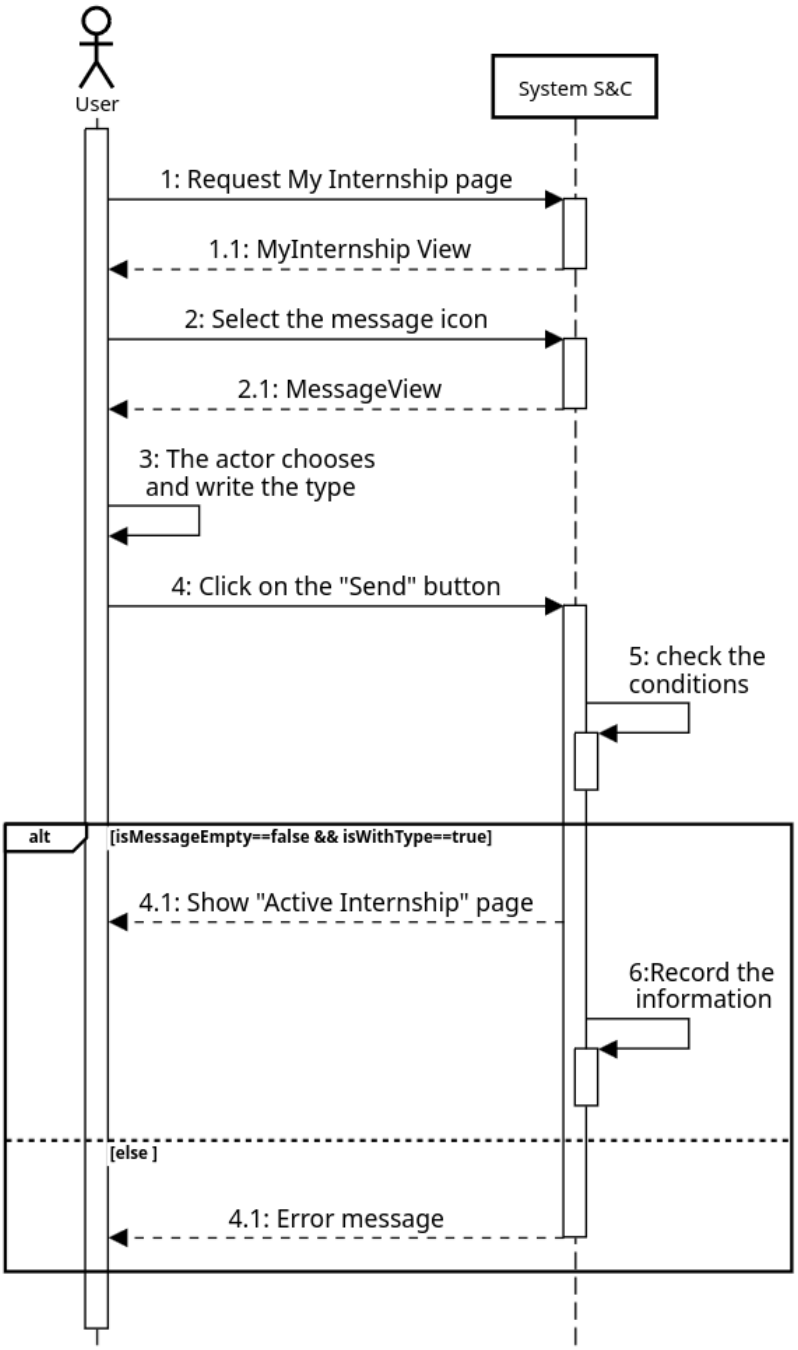

Figure 23: Update and complaint about ongoing internship

[UC6] Feedback about the internship

Name	Feedback about the internship
Actor	User
Entry Condition	The actor is currently participating in an internship and the time deadline of the internship expires (according to the terms)
Event Flow	1. The platform notifies the actors interested in the internship. 2. The actors goes to the fields for writing the evaluation by: • Clicking on the notification. • Browse to "My Internships", select the desired internship and then click on the button "Leave Feedback". 3. The actor clicks on "Send" button. 4. The platform checks the form sent. 5. The platform records the feedback form. 6. The platform removes the actor from the list of participants in the internships
Exit Condition	The actor has sent the message.
Exceptions	The actor attempts to send a message but it's empty. • The platform displays an error message notifying that the message is empty.

Table 7: Feedback about the internship

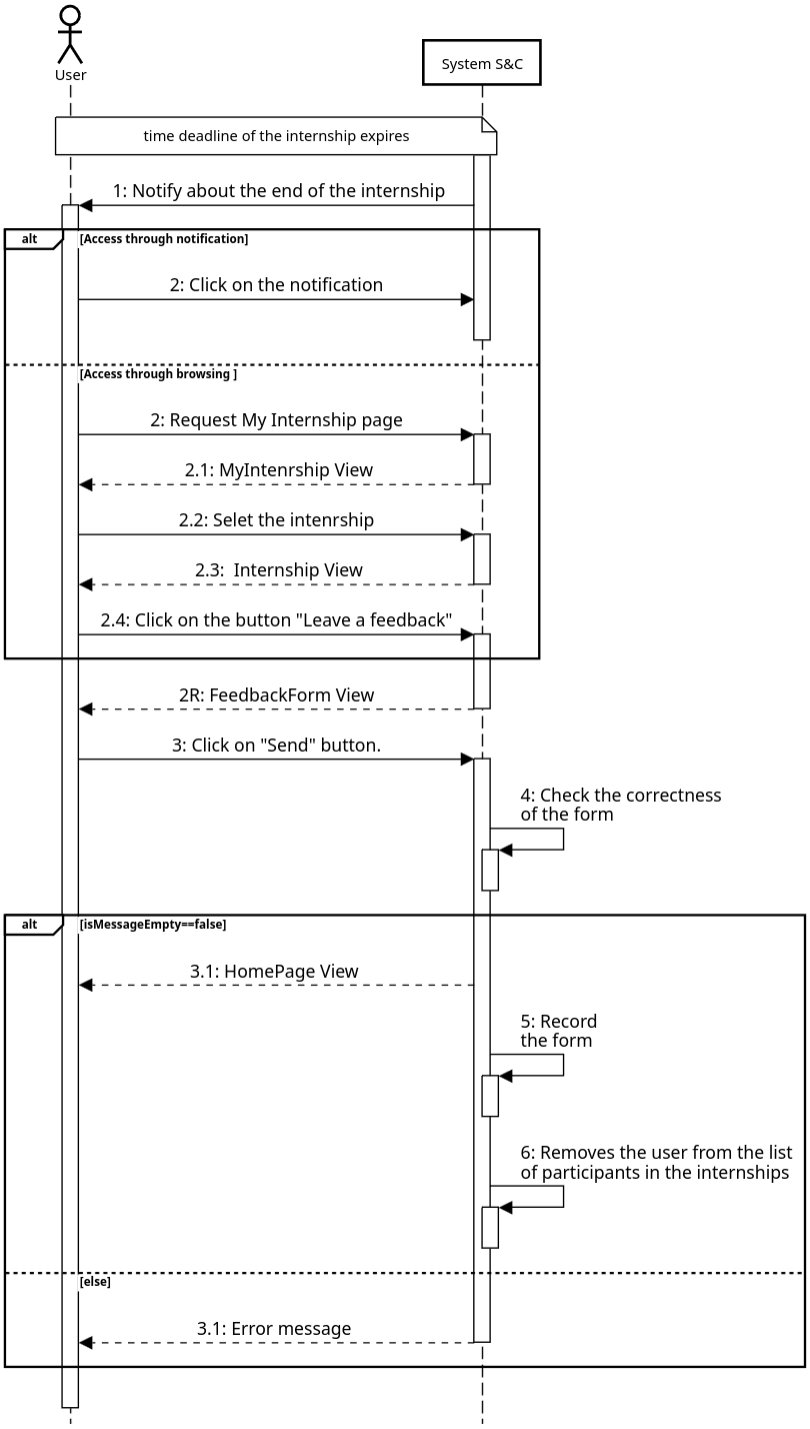

Figure 24: Feedback about the internship

[UC7.0] Manage internship - Apply to an Internship

Name	Manage internship - Apply to an Internship
Actor	Student
Entry Condition	The actor wants to join internships opportunity
Event Flow	1. The actor brows to "Internship" section. 2. The actor searches for an internship that matches their interests by: • Querying name of the desired internship • Querying keywords • Browsing through the menu to find the appropriate one 3. The platform elaborates the query. 4. The actor clicks on the button "Apply!". 5. The platform adds the application to the list of applicants. 6. The platform notifies the company about a new student that applied for the internship.
Exit Condition	The actor has applied for the selected internship.
Exceptions	1. The actor attempts to search for the desired Internship, but it is either unavailable or does not exist. • The platform displays an error message notifying the internship can not be found. 2. The actor was already registered to the internship. • The platform displays an error message indicating that user is already applied.

Table 8: Manage internship - Apply to an Internship

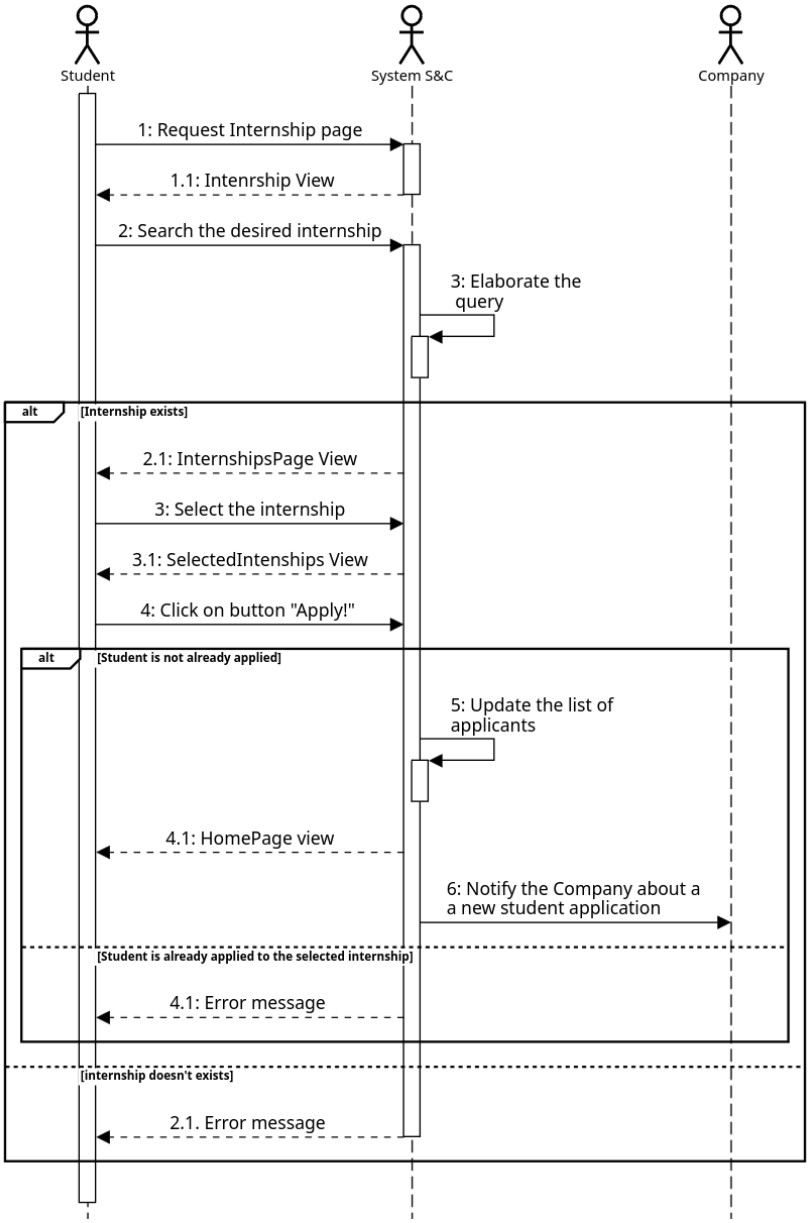

Figure 25: Manage internship - Apply to an Internship

[UC7.1] Manage internship - Withdraw application from internship.

Name	Manage internship - Withdraw application from internship.
Actor	Student
Entry Condition	The actor wants to cancel the application for a internship, before evaluation phase
Event Flow	1. The actor navigates to "Applied internship" page. 2. The actor selects the internship they no longer wish to apply for. 3. The actor clicks on "Withdraw application" button. 4. The platform elaborates the request. 5. The platform removes the actor from the list of Student that applied. 6. The platform notifies the company about an actor that withdraw from a internship.
Exit Condition	The actor is no more applied for the internship.
Exceptions	The actor is not applied to the internship. • The platform displays an error message informing the actor that they are not applied for the internship.

Table 9: Manage internship - Withdraw application from internship

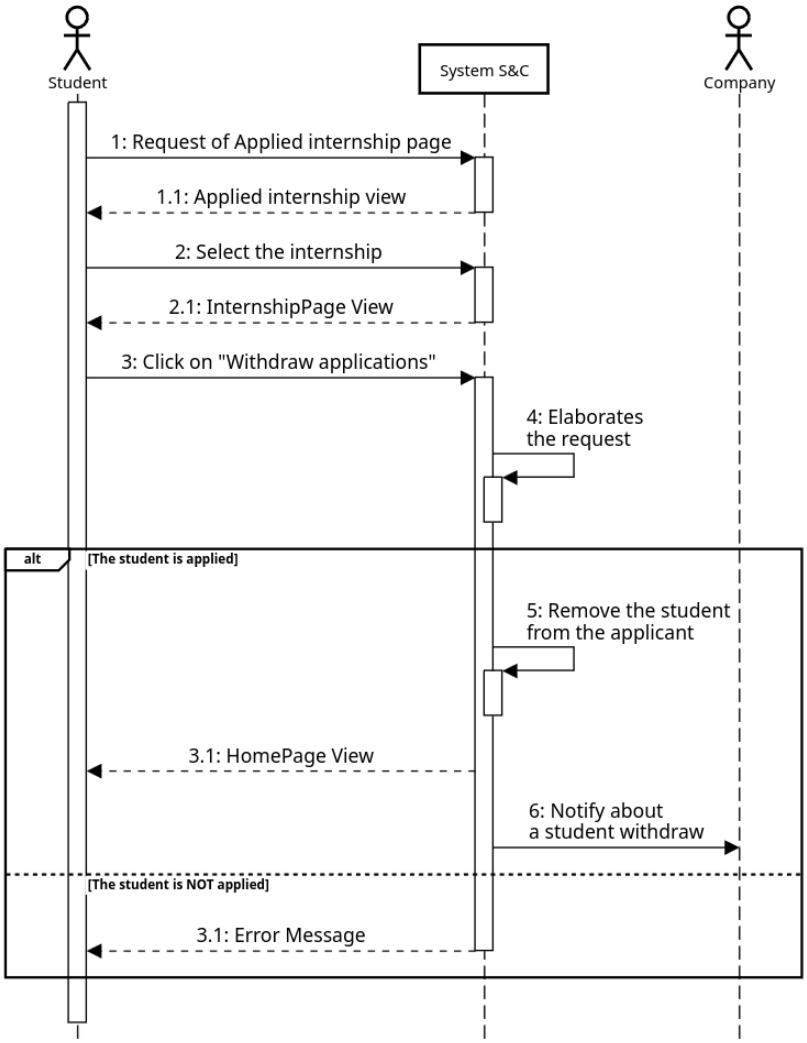

Figure 26: Manage internship - Withdraw application from internship

[UC8.0] Recommendation system - The internship has been created

Name	Recommendation system - The internship has been created
Actor	Student, Company, Recommendation system
Entry Condition	• The company has been created a new internship • The student is not already engaged in the internship. • The internship is in the open phase
Event Flow	1. The platform sent all the information about internship and students to the Recommendation system 2. The recommendation system compute if there is pair between the new internship and the available students 3. The recommendation system notify the students in line with the internship 4. The recommendation system notify the company with all the students in line with the newly created internship. 5. The company to view the recommended students can: • clicks on the notification • browse to "My Internships", selected the desired internship and click on "Recommended students" 6. The company select all the students that want to notify 7. The company click "Confirm" button 8. The platform checks the selection sent 9. The platform notifies the Student/s interested 10. The student can whether select to accept or not 11. The student confirm his chose 12. The platform checks if the time deadline is respected 13. The platform updates the list of applicants 14. The platform notifies the company about a new student that applied for the internship.
Exit Condition	The student choose to apply or not

Exceptions	The student accepts the invite from the Company in the evaluation phase • The platform displays an error message informing the student that the time deadline has expired. The company clicks on the "Confirm" button but the list of students selected is empty • The platform displays an error message informing the student that the list of students is empty.

Table 10: Recommendation system - The internship has been created

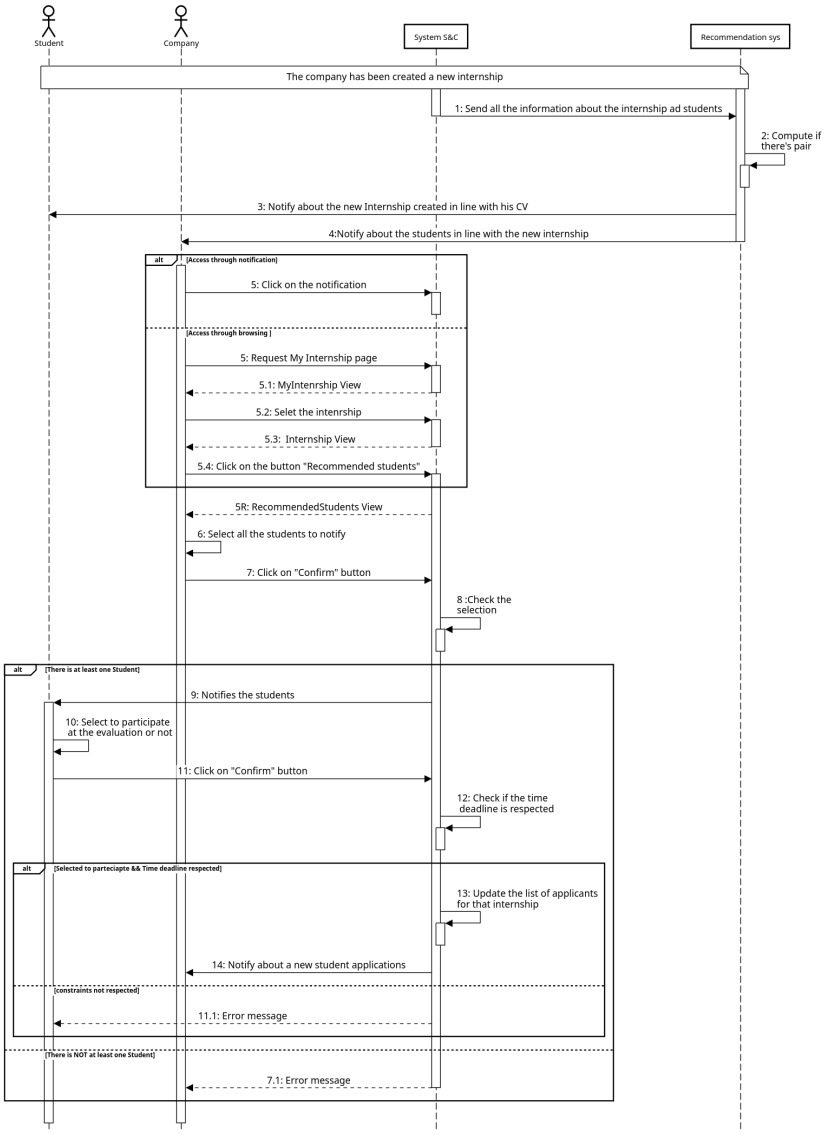

Figure 27: Recommendation system - The internship has been created

[UC8.1] Recommendation system - The student updates their CV

Name	Recommendation system - The student updates their CV.
Actor	Student, Company, Recommendation system
Entry Condition	• The company created a new internship • The student is not engaged in another internship • The internship is in the Open phase • The student updates their CV(Upon the update of the new CV from the student)

Event Flow	1. The platform sent all the information about internships and student to the Recommendation system
	2. The recommendation system compute if there is pair between the updated CV of the student and the available internships
	3. The recommendation system notifies the company or companies if the computation results are positive.
	4. The company to view the recommended students can:
	  • clicks on the notification
	  • browse to "My Internships", selected the desired internship and click on "Recommended students"
	5. The company select all the students that want to notify
	6. The company click "Confirm" button
	7. The platform checks the selection sent
	8. The platform notifies the Student/s interested
	9. The student can whether select to accept or not
	10. The student confirm his chose
	11. The platform checks if the time deadline is respected
	12. The platform updates the list of applicants
	13. The platform notifies the company about a new student that applied for the internship.

Exit Condition	The student correctly update

Exceptions	The students notified select the chose that they prefers, and the Company is notified. • The platform displays an error message informing the student that the time deadline has expired. The company clicks on the "Confirm" button but the list of students selected is empty • The platform displays an error message informing the student that the list of students is empty.

Table 11: Recommendation system - The student updates their CV

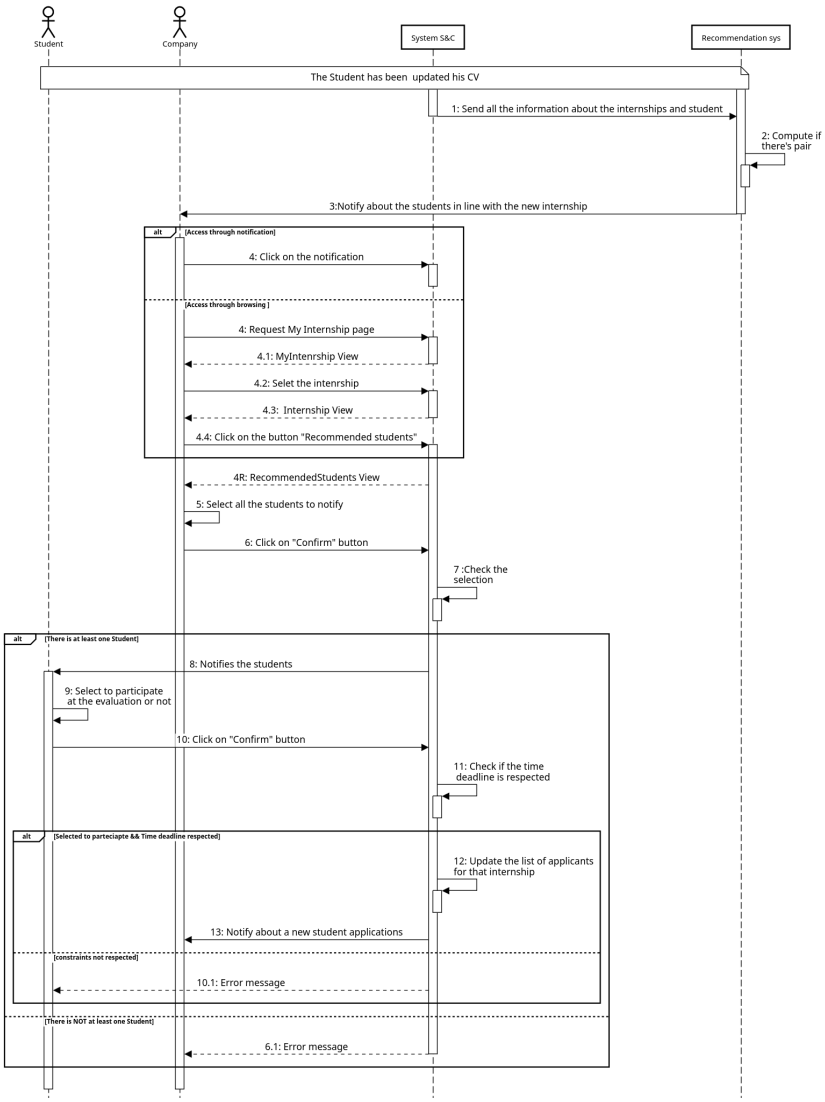

Figure 28: Recommendation system - The student updates their CV

[UC9.0] Evaluation phase - Fill out form

Name	Evaluation phase - Fill out form
Actor	Student (may be more than one), Company
Entry Condition	The Company has selected the student/s to evaluate. The evaluation is done with a structured questionnaire form
Event Flow	1. The platform send notifications to the student with the way that they will be evaluated. 2. The student browses to the page of the internship: • clicking on the notification. • select the "My Internships" button, and then click on the "Perform the evaluation" button. 3. The student select the button "Response to questionnaire". 4. The student click on "Send questionnaire" button. 5. The platform checks the constraints 6. The platform record the form. 7. The platform notifies the company about the actor that filled out a questionnaire.
Exit Condition	The student send compiled form to the platform, which record it and send it to the company.
Exceptions	One or more questions are not completed • The platform displays an error message indicating that the provided information is incomplete.

Table 12: Evaluation phase - Fill out form

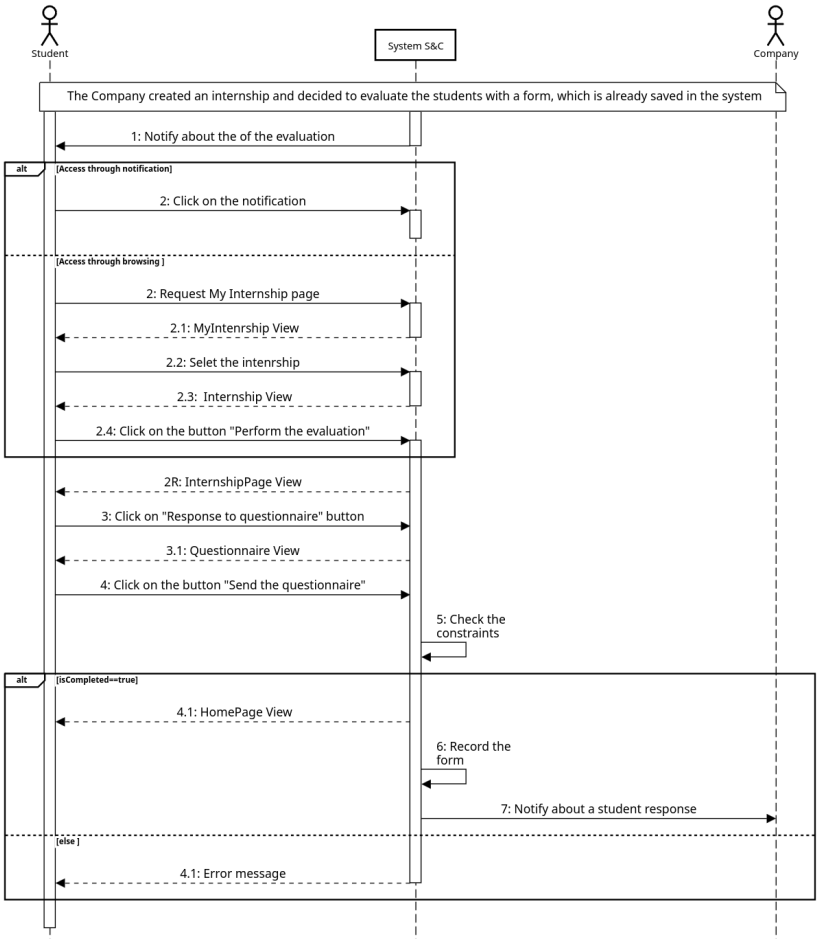

Figure 29: Evaluation phase - Fill out form

[UC9.1] Evaluation phase - Meeting with company

Name	Evaluation phase - Meeting with company
Actor	Student (may be more than one), Company
Entry Condition	The Company has selected the actor/s to evaluate. The evaluation is done with a meeting.
Event Flow	1. The platform send notifications to the student with the way that they will be evaluated. 2. The student browses to the page of the internship: • clicking on the notification. • select the "My Internships" button, and then click on the "Perform the evaluation" button. 3. The student select the button "Check up the date of the meeting". 4. The student click on "I'll be there!". 5. The platform record the chose. 6. The platform notifies the company about the student that accepted the invite.
Exit Condition	The student approves the meeting date, the system record it and the company is notified.
Exceptions	The student try to approve date of the meeting but the time deadline has expired. • The platform displays an error message indicating that the time deadline has expired.

Table 13: Evaluation phase - Meeting with company

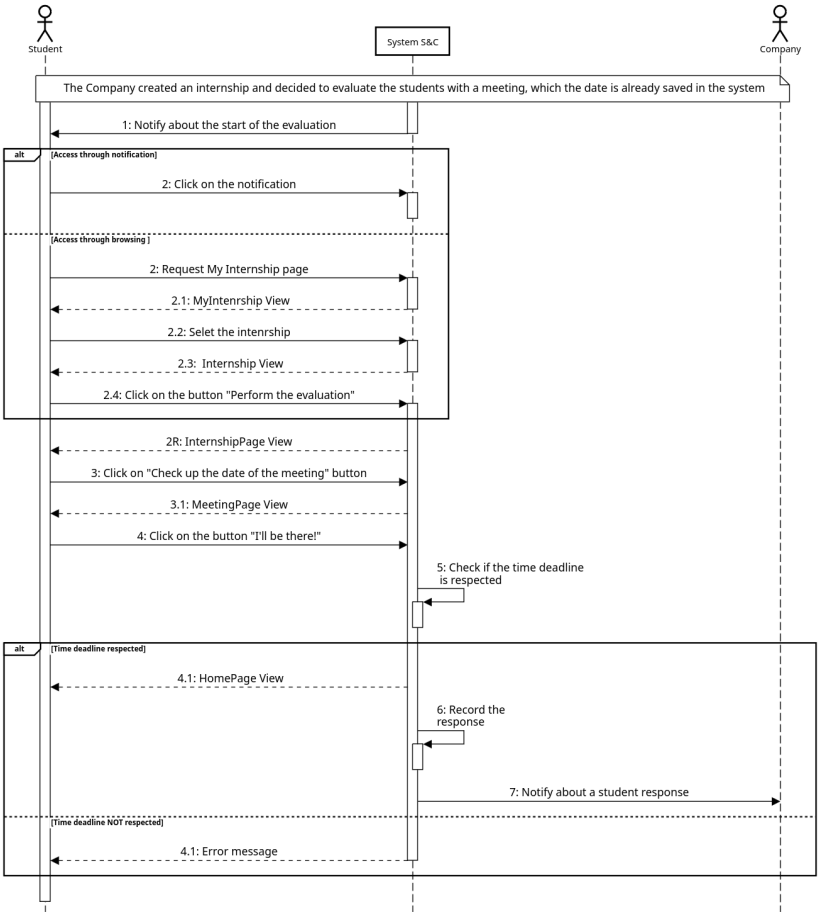

Figure 30: Evaluation phase - Meeting with company

[UC10] Termination of the evaluation phase

Name	Termination of the evaluation phase
Actor	Company, Student
Entry Condition	The company decided that the evaluation phase is ended or the time deadline has expired
Event Flow	1. The company navigates to "My Internships" page 2. The company selects the desired internship 3. The company clicks on "Select Student" button 4. The company decided whether if there's one candidate to hire or not 5. The company clicks on "Confirm" button 6. The platform records the responses 7. The platform sends a notification to the actors either selected or not. 8. If the selected student, in the case that is selected, does not respond within the specified time window, they are considered to have declined, and a different student is chosen 9. The student reply to the request 10. The platform computes the request of the Student 11. The platform records the request of the Student 12. The platform notifies the company about the reply of the student 13. The platform hides the internship from the list of "Available internship".
Exit Condition	The company found out the suitable student and the student accepted the offer, or the company decided to close the position without selecting a candidate.
Exceptions	The student selected by the company accepted the request but he was already hired by another company • The platform displays an error message indicating that the student is already hired by another company

Table 14: Termination of the evaluation phase

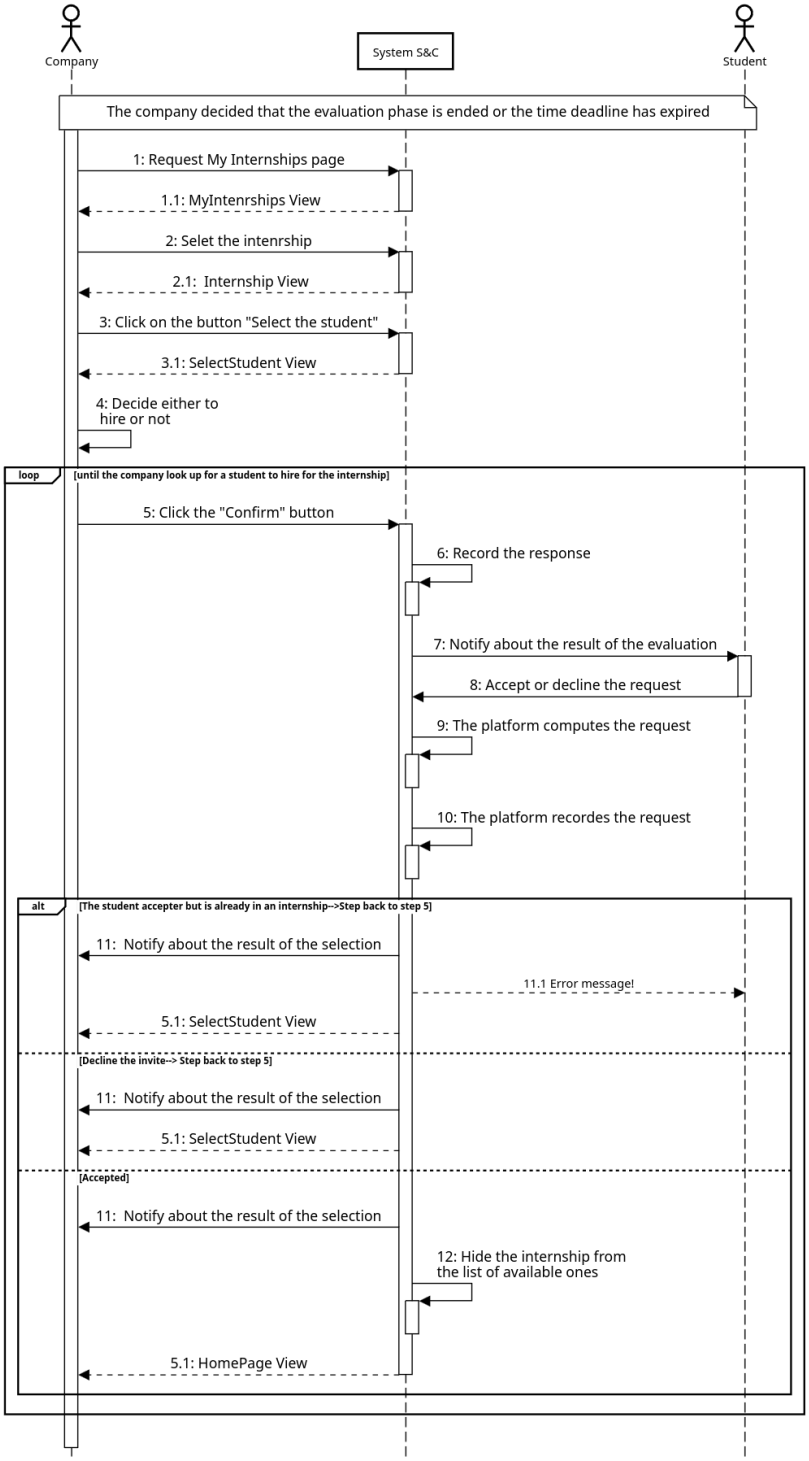

Figure 31: Termination of the evaluation phase

3.2.2 Requirements mapping

This section outlines the correlations between the defined requirements and domain assumptions for each goal.

[G1] Companies create internship offers	
Requirements	**Domain Assumptions**
[R1] The system allows users to sign-up.	[D1]The system ensures reliable communication between server and client, guaranteeing that users and server receive all information sent by each other.
[R2] The system allows users to log-in.	[D4] The company insert truthful data about their Internship Opportunity.
[R3] The system send to users an email with a link to confirm their account registration.	
[R4] The system allows users to modify their accounts at any moment.	
[R5] The system allows users to browse other users profile.	
[R6] The system allows users to browse the Internship opportunity available list.	
[R19] The system allows companies to create an Internship at any moment.	
[R20] The system allows companies to define terms and projects in the Internship description.	
[R21] The system allows the companies to hire one intern for each internship opportunity.	
[R22] The system provides to companies a default questionnaire for the evaluation of the Students.	
[R23] The system allows companies to modify the default questionnaire given by the system to evaluate the student.	
[R27] The system prevents the companies from making any modifications, once a job advertisement is published.	
[R28] The system allows companies to set a deadline for the start of the selection of the candidates.	

Table 15: Requirements and Domain Assumptions for Tournament Creation - G1

[G2] Companies evaluate the candidates	
Requirements	**Domain Assumptions**
[R1] The system allows users to sign-up.	[D1] The system ensures reliable communication between server and client, guaranteeing that users and server receive all information sent by each other.
[R2] The system allows users to log-in.	[D3] The students are available on the date defined by the company for the meeting.
[R3] The system send to users an email with a link to confirm their account registration.	[D4] The company insert truthful data about their Internship Opportunity.
[R24] The system allows companies to evaluate the candidate through a structured questionnaires.	[D5] The companies interview Students by meeting through external communication channels.
[R25] The system allows companies to evaluate the candidate through a organized meeting.	
[R26] The system helps companies to organize a meeting with the Students to evaluate.	
[R29] The system allows companies to decide to start manually the selection process.	
[R30] The system allows companies to select students who are not currently participating in another internship.	
[R32] The system allows companies to decide to evaluate or not a student that made the application for their internship opportunity.	

Table 16: Requirements and Domain Assumptions for Tournament Creation - G2

[G3] Companies select the best candidates	
Requirements	**Domain Assumptions**
[R1] The system allows users to sign up.	[D1] The system ensures reliable communication between server and client, guaranteeing that users and server receive all information sent by each other.
[R2] The system allows users to log-in.	[D2] The students are available on the date defined by the company for the meeting.
[R3] The system send to users an email with a link to confirm their account registration.	[D4] The companies interview Students by meeting through external communication channels.
[R7] The system constrain users in an internship to periodically report ongoing status of the internship.	
[R8] The system enables users to receive system-generated notifications.	
[R9] The system allows users in an internship to make a complaint.	
[R22] The system allows companies to make a selection between all the candidate Students.	
[R31] The system allows companies to select students who are not currently participating in another internship.	
[R32] The system notifies companies when a Student updates their CV with details related to the Company's job description.	
[R33] The system allows companies to notify students in line with their internship opportunities.	

Table 17: Requirements and Domain Assumptions for Tournament Creation - G3

[G4] Students search for available internship opportunities	
Requirements	**Domain Assumptions**
[R1] The system allows users to sign up.	[D1] The system ensures reliable communication between server and client, guaranteeing that users and server receive all information sent by each other.
[R2] The system allows users to log-in.	[D2] The student fill out truthful data in their CV.
[R3] The system send to users an email with a link to confirm their account registration.	
[R4] The system allows users to modify their accounts at any moment.	
[R6] The system allows users to browse other users profile.	
[R7] The system allows users to browse the Internship opportunity available list.	
[R10] The system allows students to fill out the information of their CV.	
[R11] The system allows students to apply for an Internship at any moment.	
[R12] The system allows students to remove application in internship before the evaluation phase.	
[R13] The system allows students to participate in only one internship at a time.	
[R14] The system prevent the students to candidate twice for a internship opportunity.	
[R15] The system notifies the student when a new job opportunity of interest becomes available.	
[R16] The system allows students to choose whether to be evaluated by the company that notified them.	
[R17] The system allows students to fill out questionnaire during evaluation process.	

Table 18: Requirements and Domain Assumptions for Tournament Creation - G4

[G5] Students participate in an internships	
Requirements	**Domain Assumptions**
[R2] The system allows users to log-in.	[D1] The system ensures reliable communication between server and client, guaranteeing that users and server receive all information sent by each other.
[R4] The system allows users to modify their accounts at any moment.	
[R5] The system allows users to browse other users profile.	
[R6] The system allows users to browse the Internship opportunity available list.	
[R18] The system requires students to complete a feedback form provided by the platform at the end of the internship.	

Table 19: Requirements and Domain Assumptions for Tournament Creation - G5

3.3 Design constraints

3.3.1 Reliability

The system will incorporate robust error-handling mechanisms to manage unexpected events and prevent critical failures. Regular automated testing and continuous monitoring will be implemented to proactively detect and resolve potential issues. Additionally, regular backup procedures will be in place to protect against data loss, ensuring a reliable platform.

3.3.2 Availability

The system is not designed to provide emergency services; therefore, an availability of approximately 99% is considered acceptable. This corresponds to a maximum downtime of 3.65 days per year.

3.3.3 Security

Comprehensive measures will be implemented to protect user data and defend against potential threats. These measures include the use of secure authentication and authorization mechanisms, encryption of sensitive information, and routine security audits to identify and mitigate vulnerabilities. Furthermore, the system will adhere to industry best practices and compliance standards to provide a secure environment for users.

3.3.4 Maintainability

The system will feature scalable and reusable modules designed for easy maintenance and swift replacement in case of failure. Ordinary maintenance, for bug fixes and improvements, will be scheduled during night time, when the user traffic is minimal. Key aspects of maintainability and modularity will be taken in account in the design document.

3.3.5 Portability

As previously stated, the system must be compatible with all widely used web browsers. Additionally, the design and functionality should be responsive, ensuring that the platform performs well across different screen sizes. Whether accessed via a mobile device or a desktop computer, the user experience should remain consistent and fully functional, without any loss of usability or performance.

4 Formal Analysis Using Alloy

In this Alloy model, we focus on the process of selecting a student for an internship. The model simulates the evolution of the internship status, providing a clear understanding of the transitions during the selection process. Specifically, we simulate a scenario in which at least two students apply to an internship and then one student is ultimately selected. The internship status progresses from ‘Open‘ to ‘Evaluation‘ to ‘Closed‘. Constraints ensure that once the status moves forward, it cannot revert to a previous state.

4.1 Signatures

```
// Signature declarations for primitive attributes
sig Email, Password, CV, Int_name {}

// Enumeration to represent the possible status of an internship
enum InternshipStatus {Open, Evaluation, Closed}

// Abstract signature for a generic User
abstract sig User {
    email: one Email,
    password: one Password
}

// Student inherits from User and adds a CV attribute
sig Student extends User {
    cv: one CV
}

// Company inherits from User and has a set of internships
sig Company extends User {
    ls_internship: set Internship
}

// Internship signature with attributes and constraints
sig Internship {
    name: one Int_name,            // Each internship has a unique name
    var ls_candidates: set Student,  // Students who have applied to the internship
    var selected_Student: lone Student, // A single selected student or none
    var status: one InternshipStatus    // Status of the internship
}{
    // Constraints on the status transitions:

    // If the status is Evaluation, it cannot transition back to Open
    always status = Evaluation implies (not status' = Open)
    // If the status is Closed, it cannot transition back to Open or Evaluation
    always status = Closed implies (not status' = Open + Evaluation)
}
```


```
// Signature declarations for primitive attributes
sig Email, Password, CV, Int_name {}

// Enumeration to represent the possible status of an internship
enum InternshipStatus {Open, Evaluation, Closed}

// Abstract signature for a generic User
abstract sig User {
    email: one Email,
    password: one Password
}

// Student inherits from User and adds a CV attribute
sig Student extends User {
    cv: one CV
}

// Company inherits from User and has a set of internships
sig Company extends User {
    ls_internship: set Internship
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```

```
// Internship signature with attributes and constraints
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    name: one Int_name,            // Each internship has a unique name
    var ls_candidates: set Student,  // Students who have applied to the internship
    var selected_Student: lone Student, // A single selected student or none
    var status: one InternshipStatus    // Status of the internship
}{
    // Constraints on the status transitions:

    // If the status is Evaluation, it cannot transition back to Open
    always status = Evaluation implies (not status' = Open)
    // If the status is Closed, it cannot transition back to Open or Evaluation
    always status = Closed implies (not status' = Open + Evaluation)
}
```

4.2 Facts

```
// Constraint for unique emails across all users
fact uniqueMailPerUser {
    always all u1, u2: User | (u1 ≠ u2) implies (u1.email ≠ u2.email)
}

// Constraint for unique CVs across all students
fact studentsDontShareCV {
    always all s1, s2: Student | (s1 ≠ s2) implies (s1.cv ≠ s2.cv)
}

// Each internship can belong to exactly one company
fact internshipBelongToOneCompany{
    always all c1, c2: Company |
        all i: c1.ls_internship | c1 ≠ c2 implies i not in c2.ls_internship
}

// Each internship name must be unique
fact uniqueNamePerInternship {
    always all i1, i2: Internship | (i1 ≠ i2) implies (i1.name ≠ i2.name)
}

// Initial state and status constraints
fact start {
    // All internships start with the status Open
    all i: Internship | i.status = Open
    // If an internship is Open, it should have no candidates or selected student
    always all i: Internship | i.status = Open implies
            (no i.ls_candidates and no i.selected_Student)
    // If an internship is in Evaluation, it must have candidates but no selected student
    always all i: Internship | i.status = Evaluation implies
        (some i.ls_candidates and no i.selected_Student and
            i.ls_candidates' = i.ls_candidates)
    // If an internship is Closed, it must have candidates and a selected student
    always all i: Internship | i.status = Closed implies
        (some i.ls_candidates and one i.selected_Student and
         i.ls_candidates' = i.ls_candidates and i.selected_Student' = i.selected_Student)
}

// Rule for a student applying to an internship
fact studentApplyToInternship {
    // When a student applies to an Open internship, it transitions to Evaluation
    all i: Internship | some s: Student |
        ((i.status = Open) implies after
            (i.ls_candidates' = i.ls_candidates + s and
             #i.ls_candidates' ≥ 2 and
             i.status' = Evaluation))
}
```

```
// Rule for a company selecting a student
fact companySelectStudent {
    // When a company selects a student for an internship in Evaluation,
        it transitions to Closed
    after all i: Internship | one s: Student |
        ((i.status = Evaluation) implies
         after after (i.selected_Student = s and i.status' = Closed))
}
```

4.3 Run

```
// Execution command to generate instances
run {} for 5 but exactly 3 Student, exactly 1 Company, exactly 1 Internship
```

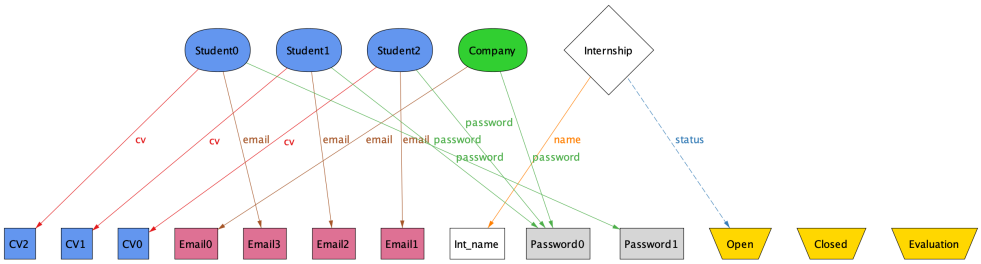

Figure 32: Open State - internship just created

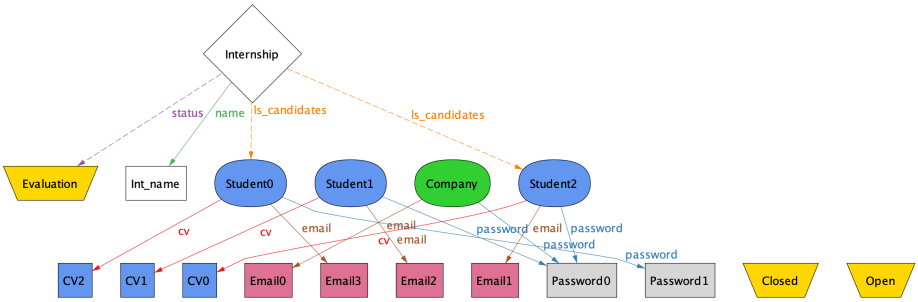

Figure 33: Evaluation State - found some candidates

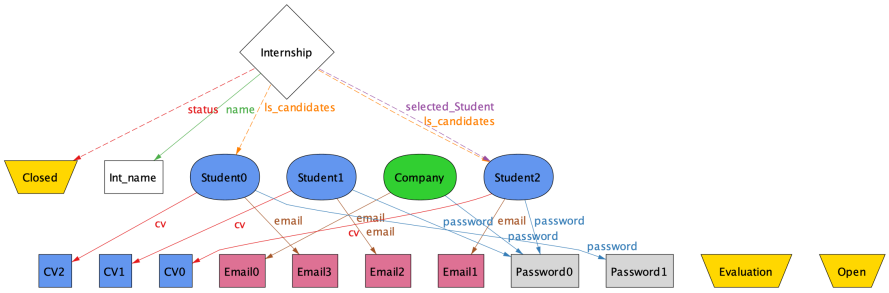

Figure 34: Closed State - company has found a student

5 Effort Spent

Section	Gabriele Lorenzo Singe	Kevin Pio Abate
1	4	3
2	12	12
3	10	45
4	25	1
tot	51	61

Table 20: Time spent on each section by contributors.

References

- IEEE standard for RASD documents: https://ieeexplore.ieee.org/document/8559686
- State machine, use case and class diagrams made with: https://app.diagrams.net/
- Sequence diagrams made with: https://sequencediagram.org/
- User Interface mockups made with: https://www.figma.com/