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Requirements Analysis and Specification Document

STUDENTS&COMPANIES

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1 | Introduction

A. Purposes and Goals

A.1. Purpose

Internships provide students with a valuable opportunity to apply their skills in real job environments while enabling companies to connect with fresh talent. However, the process of finding and securing internships can be challenging for both parties.

Students&Companies (S&C) is a platform designed to facilitate this connection throughout the internship process. It allows students to match their preferences with available opportunities, ensuring internships align with their experiences and skills. Companies can specify project requirements to attract suitable candidates.

The platform supports both students and companies in two phases: recommendation and selection. During the recommendation phase, it utilizes keyword searches and statistical analysis to assess internship information. Students can search for internships and receive notifications about appealing opportunities, while companies can publish offers and get alerts when student CVs match their criteria. Once mutual interest is established, the selection phase begins, where the platform assists with interviews and finalizes the process. It also monitors the internship journey, providing feedback and enabling direct communication to address any questions. Additionally, the universities of the students can oversee the process to unsure the process is going smoothly.

A.2. Goals

[G1] All unregistered users must be able to create an account on the platform using their specific email address.

[G2] Students must be able to upload their CVs on the platform, containing their skills, experiences, preferences, and other relevant information.

[G3] Students must be able to search for available internship offers on the platform based

on their preferences, using a simple keyword search.

[G4] Companies must be able to publish internship offers on the platform, specifying the requirements and job descriptions.

[G5] Students must be able to receive notifications when internships that they may be interested in become available.

[G6] Companies must be able to receive notifications when a student's CV matches their internship offer.

[G7] Students must be able to receive recommendations of companies based on statistical analyses of their profiles and the needs of companies.

[G8] Companies must be able to receive recommendations of students based on statistical analyses of students's profiles and their needs.

[G9] Students must be able to proactively apply for internships they are interested in.

[G10] Companies can select students based on their CVs and other profile information.

[G11] Companies must be able to set up the interview process with the students who have been selected.

[G12] During the interview process, students must be able to respond to the company's questions through questionnaires or other communication tools.

[G13] During the interview process, companies must be able to collect the students' responses.

[G14] Companies must be able to send the results of the interviews to the students.

[G15] Students can accept or reject the offer after receiving the interview results.

[G16] Students and companies must be able to view all feedback and suggestions related to internship experiences.

[G17] Students and companies must be able to write feedback and suggestions regarding their internship experiences.

[G18] Students and companies must be able to communicate with each other through the platform regarding all aspects of the internship process.

[G19] Universities must be able to monitor the internship process to track any events.

B.   Scope

B.1.   Scope

Students&Companies (S&C) aims to provide the best matching service between students and companies for internships. The platform will be available to students, companies, and universities.

If it is their first time using the platform, Students looking for internships can create an account using their educational institution's email and select their university from a list of the ones that collaborate with the platform. After creating an account, they need to fill out their profiles with keywords that describe their skills, experiences, and preferences. To complete their profiles, they must also upload their CVs. Otherwise they can log in to the platform using their credentials.

The universities associated with the students through their educational emails will be notified about the students' registration on the platform. The system will then add the registered students to the university's list, allowing the universities to monitor their internship activities.

Companies wishing to announce internship opportunities can create an account on the platform, if they do not already have an account. They need to provide the necessary information for the internship announcement such as the job description, requirements, and the number of interns needed etc. Companies can also specify the keywords that describe the skills they are looking for in students.

The platform will use the keywords in the students' profiles and the companies' internship announcements, along with historical feedback and information collected from previous internships, to recommend the best matches for both parties. Students will receive notifications about recommended internships, and companies will be alerted when existing students with matching CVs meet their needs.

Once students apply for the offers they are interested in, the companies will receive the applications and can select the students they wish to interview. The platform will assist companies in setting up the interview process and will allow them to record and store students' responses using the platform. Students will be able to respond to companies' questions through the tools or channels provided.

At the end of the interviews, companies can send the results to the students. Upon receiving the results, students can decide whether to accept or reject the offer, and the companies will be notified of their decisions. If a student accepts the offer and starts

the internship, the platform will update the internship activities about students at their universities. Students and companies can use the channels provided by the platform to communicate with each other during the internship, and at the end, they can provide feedback and suggestions regarding their experiences. Meanwhile, universities can track the internship process and view the messages and information exchanged between students and companies.

B.2. Phenomena

Referring to the Jackson-Zave distinction between the world and the machine in the context of the S&C platform, the following phenomena are identified, specifying which parts are controlled by the machine and which parts are controlled by the world, shown in table 1.1.

Phenomena based on the Jackson-Zave model

Code	Phenomenon	Shared	Control
P1	**User registration**	Yes	World
P2	**User login**	Yes	World
P3	**Check username and password**	No	Machine
P4	**Student creates CV using text editor**	No	World
P5	**Student uploads CV in profile**	Yes	World
P6	**Student updates profile information**	Yes	World
P7	**Student searches internship available**	Yes	World
P8	**Company publishes internship offers**	Yes	World
P9	**Platform notifies users that a deadline has expired**	Yes	Machine
P10	**Platform suggests recommendations**	Yes	Machine
P11	**Platform adds student to university's list**	No	Machine
P12	**Student applies offer**	Yes	World
P13	**Student rejects or accepts internship**	Yes	World
P14	**Company selects candidates to interview**	Yes	World
P15	**Student participates interview**	Yes	World
P16	**Company sends interview results**	Yes	World
P17	**Stu&Comp write feedback of internship**	Yes	World
P18	**Stu&Comp view feedback of internship**	Yes	World
P19	**Student views the offers' description**	Yes	World
P20	**Company views the students' profile**	Yes	World
P21	**University views the list of its students**	Yes	World
P22	**University tracks the internship process**	Yes	World

Table 1.1: Phenomena in the S&C context

C.   Definitions, Acronyms, Abbreviations

C.1.   Definitions

- **Student:** A person who is looking for internships.

- **Company:** An organization which wants to announce internship opportunities to students.

- **University:** An educational institution that related to students and their internships.

- **User:** A generic term for students, companies, and universities who use the platform.

- **Internship:** A opportunity offered by companies to students to gain practical experience in a real job environment.

- **CV:** Curriculum Vitae, a document that contains all necessary information about students to able to apply for internships.

- **Recommendation:** A suggestion made by the platform to students and companies based on their statistical analysis and simple keyword searches.

- **Selection:** The process of choosing students and companies to process the interview.

- **Feedback:** Comments and suggestions written by students and companies about their internship experiences.

- **Notification:** A message sent by the platform to inform students and companies about important events, such as new internship offers, matching CVs or interview results etc.

- **Interview:** A meeting between students and companies to decide an assignment of the internship offer.

- **Platform:** The Students&Companies (S&C) system that provides the services to students, companies, and universities about internships.

- **Keyword:** A label or tag that describes the skills, experiences, and preferences of students and companies.

C.2. Acronyms

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

C.3. Abbreviations

- **[Gn]:** Used to number the goals, where Gn is the n-th goal.

- **Stu&Comp:** students and companies

D. Revision History

E. Reference Documents

- " The World and the Machine: A model for the functional architecture " by Michael Jackson and Pamela Zave.

- Assignment RDD AY 2024–2025.

F. Document Structure

This document is structured as follows:

- **Section 1: Introduction**
  It contains the purpose, goals, scope, and phenomena identified in the context of the S&C project, including the specification of definitions, acronyms, and abbreviations of the terms used in this document. In addition, it notes the revision history for updates to the document and the reference documents that were used during the development of this document.

- **Section 2: Overall Description**

- **Section 3: Specific Requirements**

- **Section 4: Formal Analysis**

- **Section 5: Effort Spent**

- **Section 6: References**

2 | Overall Description

A. Product perspective

A.1. Scenarios

Scenario 1: Mr.Spongebob registers on the platform

Mr.Spongebob, a final-year student at the University of Bikini Bottom, is looking for an internship to practice the knowledge he's gained. To do so, he asks advice from Professor Puff, who suggests using the Students&Companies platform to search for internship opportunities. Following her advice, Mr.Spongebob registers as a student on the platform, selecting the University of Bikini Bottom from the list of universities and verifying his student status with his educational email and password. Then, he fills in all the required personal information, including his name, date of birth, and other details. He also inserts keywords to describe his skills and the job fields he might be interested in. Finally, after uploading his CV, which contains all the necessary information and details, Mr.Spongebob completes his registration and can begin searching for internships. Meanwhile, Professor Puff, who oversees internship activities using the official account of the University of Bikini Bottom, is notified of Mr.Spongebob's registration.

Scenario 2: Mr.Krabs publishes an internship offer

Due to the rapid evolution of Technology, Mr.Krabs decides to collaborate with his competitor Mr.Plankton, on a new project. They plan to develop a "Hamburger super secret formula detector" that can detect what the customer likes by looking at his facial expressions, in order to to create the perfect personalized hamburger! To achieve this, they need to hire students specializing in Computer Vision, Deep Learning and AI to study the visual data. So Mr.Krabs logs into the Students&Companies platform using the official company account and navigates to the "Publish Internship" section to create a new announcement. He fills in all the required information: the title, location, role, application deadline, number of positions, duration, employment type, description, and

required skills. After that, Mr.Krabs published the internship offer, which can be seen in the "Available Internships" section. Immediately after the publication, he receives a notification of recommended student profiles that may match the offer requirements.

<div align="center">**"Computer Vision and AI Intern"**</div>

Location: Krusty Krab Technology Lab, Bikini Bottom

Role: Intern

Application Deadline: 25th December 2024

Number of Positions: 2

Duration: 6 months

Employment Type: Full-time

Description: We are looking for students who can contribute to the development of the Hamburger super secret formula detector by developing algorithms that collect and analyze visual data. A love for hamburgers is essential!

Required Skills: Computer Vision, AI, Python, Deep Learning

Scenario 3: Mr.Patrick searches internship

Mr.Patrick is very worried because he is in the last semester of his master's degree, so he has to find an internship or he won't be able to graduate in Food Engineering. He remembers he has an account on the Students&Companies platform, which he used to find an internship at the beginning of his studies, so he decides to take another look at the platform. He logs in and updates his profile and CV, adding the new skills he has acquired during his master's degree. He navigates to the search bar and types "Hamburger" to look for internships related to hamburger studies. When he doesn't find anything that interests him, he scrolls through the recommended internships list. Finally, he finds Mr.Krabs' posting and becomes very interested in the project, so he applies for the internship and waits for the company's response. After applying, he can check the status of his application in the "Your Applications" section.

Scenario 4: Krusty Krab Technology Lab Interview

After the application deadline, Mr.Krabs and Mr.Plankton review all the applications received for the intern position. They select the candidates by reviewing their profiles and CVs, and then send them an invitation for an interview. For the first round of interviews, Mr.Plankton decides to formulate a set of short questions to know more about the candidates' skills and experiences. The candidate will be able to respond to these questions through a form inside the platform. In said form Mr.Plankton also includes the

date, time and location of the interview and the necessary information to better prepare the candidates. After sending the invitations, the candidates selected for the interview receive a notification from the platform, who is not selected will receive a notification of rejection. At the end of the interview, Mr.Plankton evaluates the candidates and discusses with Mr.Krabs to decide who to hire. Finally, they send an offer to the best candidates and wait for their acceptance to start the internship.

Scenario 5: Ms.Sandy starts her internship

Ms.Sandy is very passionate about space and is thrilled to have been selected for an internship at the Underwater Space Agency. She receives and accepts an offer from the company. At the same time, the Bikini Bottom University of Aerospace's professor Manta received the notification about the new activity started by Sandy. However, she is a bit anxious, so she logs into the platform and navigates to the "Internship" section to find her assigned mentor's profile. She starts a chat with him to ask some questions about how she should prepare in the coming days and for any advice he can give her to have a good start in the internship.

Scenario 6: Mr.Squidward leaves his feedback

At the end of his internship at the "Krusty Krab Technology Lab" as a data science intern, Mr.Squidward is surprised by the experience he has gained, even though he has several complaints about the heavy workload. He decides to leave a warm message for Mr.Krabs and Mr.Plankton to thank them for the opportunity. After that, he navigates to the "Internship" section to add a review of his internship experience and rate the company. It is also the section where he can check the suggestions left by his mentors regarding his internship, which is only visible to the company and the university.

Scenario 7: Track the internship activities

As the internship period progresses, Professor Puff is responsible for overseeing the students' activities at the University of Bikini Bottom. She is curious to know how the students are doing in their internships, particularly Mr.SpongeBob, who is using the platform for the first time. She logs into the platform with the university credentials and looks at the list of students, searching for SpongeBob's name. She finds, in his active internship section, that he has been selected for an internship at the "Krusty Krab Technology Lab". By reading the feedback left by the company throughout the different stages of the internship, she is very glad to see that SpongeBob is doing well in the field he is

passionate about!

A.2. Domain-level diagram

A.3. Statecharts

The following sections present statechart diagrams for the platform's main processes, including internship recommendations, the internship selection process, and internship status tracking.

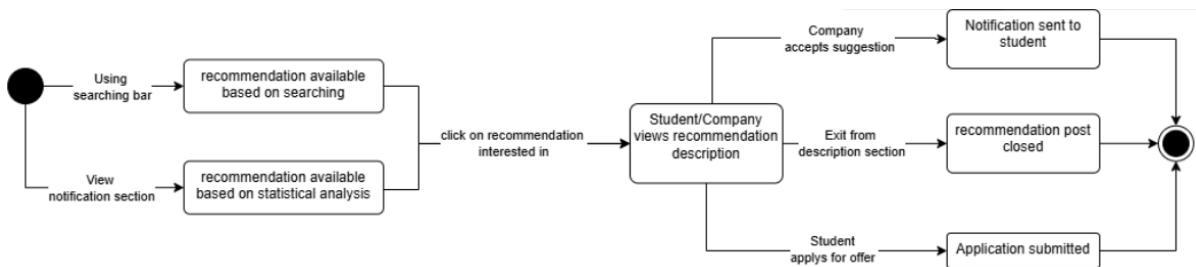## 1. Internship recommendation

Figure 2.1: Statechart diagram for internship recommendation

The recommendation process is a key functionality of the platform. After logging in, both students and companies can use the search system to view recommendations that match their preferences. Alternatively, they can access suggestions in the notification section, which are generated through a statistical analysis of data from profiles and internship details. As illustrated in the statechart diagram, when users find an interesting recommendation, they can click on it to view more details. At this stage, students can apply for the internship, while companies can decide whether to accept the student profile. If accepted, the student will be notified that a company is interested in their profile for a specific internship. Otherwise the student or the company can close the recommendation after reviewing it.
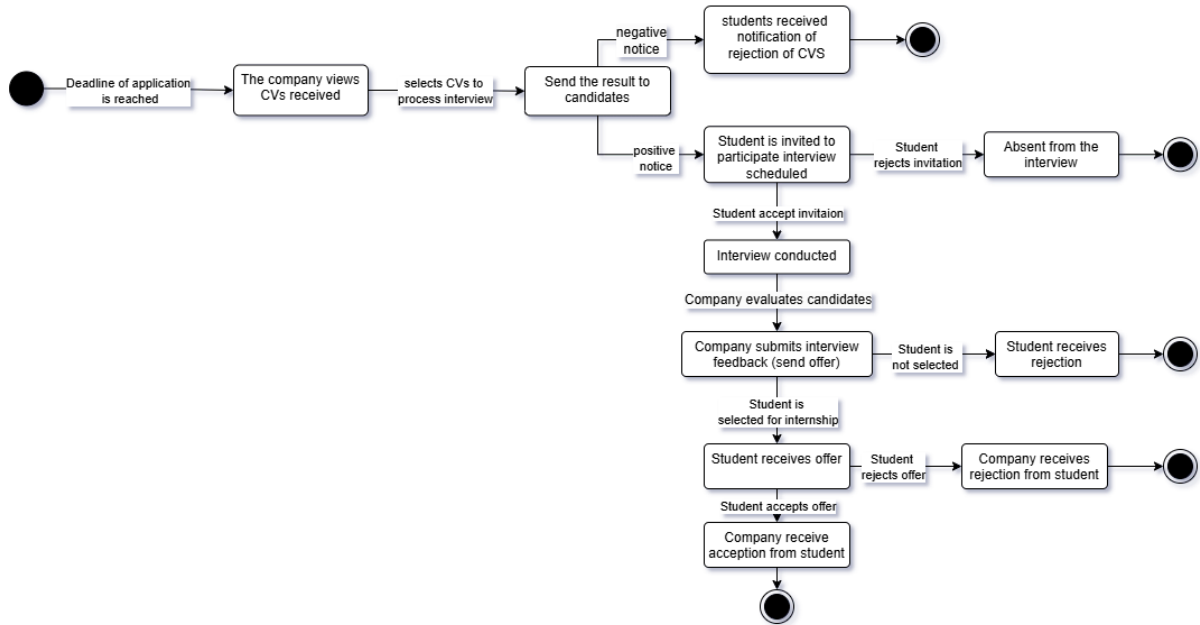
2. Selection process for internship

Figure 2.2: Statechart diagram for selection process for internship

With the selection process, after the application deadline, companies will review all applications received for the intern position and select candidates for the interview stage. Once a decision is made, the company will send an interview invitation to the selected candidates through the platform, while those not selected will receive a notification explaining that, unfortunately, they were not chosen to proceed further. For selected candidates, a chat system between the company and the candidate will be activated to allow both parties to communicate and schedule interview details. If a candidate does not attend the interview, the company will consider this as a rejection of the invitation. After all interviews are completed, the company will evaluate the candidates and decide whom to hire. The selected candidates will receive an offer, and the company will await their acceptance to confirm the internship role. At the same time, candidates not selected at this stage will receive a rejection notification. Once candidates respond to the offer, the company will be notified of their decision.

3. Internship status

Figure 2.3: Statechart diagram for internship status

This statechart diagram will illustrate the internship status tracking process. Once the internship begins, the student's university will be notified, allowing the university to monitor the student's activities and ensure the internship is progressing as expected. During the internship, the student can use a chat feature to communicate with their mentor and provide feedback on their internship experience in the specific internship section. Similarly, the company can use the chat to communicate and leave feedback on the student's performance, offering suggestions for improvement. At the end of the internship, both the student and the company must complete the final evaluation and feedback process, marking the end of the internship phase. The internship will then be officially closed, and all related information will be archived in the database. At this stage, the university will be notified of the internship's completion. The student will find this internship listed as a past activity in their internship history, and the company will have access to this record in their records for future reference.

B.   Product functions

Sign up and login

There are three types of users on the platform: students, companies, and universities. The platform allows users to create an account if they do not already have one. In the first step, each user will be prompted to specify whether they are a student, company, or university. All users will need to set up login credentials with an email address and password. For students, the system will ask them to select their university from a list. If their university is not listed, they will be unable to continue with registration. Students must also verify their status by using their educational email. For companies, multiple accounts can be created under the same organization, with each linked to a different department's unique email address. The

company's identity shall be also verified using its unique EIN number and other required details. Once verified, users can access the platform with their email and password. On first login, the system will require users to complete their profile with essential information to finalize registration. Students, in particular, must upload a CV before accessing other features of the platform. After registration, users can log in simply by selecting their user type and entering their credentials.

Data management system

The platform securely stores all user data in a protected database, including personal information, CVs, chat history, and other relevant data. Specifically, the system retains detailed internship information, such as announcements, applications, interview records, internship status, and feedback, which are used to analyze and optimize the matching algorithm. Additionally, other user data is recorded to provide better personalized recommendations and notifications. The system ensures that all data is encrypted and protected from unauthorized access. Furthermore, users have the option to delete their accounts, modify personal information, and, for students, update their CVs as needed.

Search system

This function allows students to search for internships using keywords such as job title, company name, location, and more. Similarly, companies can search for student profiles using criteria like name, university, skills, and other relevant details. Universities, on the other hand, can search a specific student within their student list by name to monitor activities and access the student's profile. The search system will display a list of recommendations based on the user's preferences and search history. Additionally, users can filter the search results by selecting specific categories to refine their search.

Recommendation system

This feature is one of the platform's main functionalities, offering personalized recommendations to students and companies based on their search preferences and the statistical analysis of data from profiles and internship details. Recommendations can be viewed in the search results or in the notification section. The system is designed to continuously improve the accuracy of these recommendations by analyzing user behavior and feedback in real-time, optimizing the quality of the results. Users can click on a recommendation to view more details about the internship posting or student profile.

Internship application

Through this function, students can apply for internships that interest them after viewing the details of the posting. Once the application deadline has passed, the company will review all received applications and select candidates for the interview stage. The platform will notify students of the results at this phase. If a student's application is accepted, they will be invited for an interview. Otherwise, the student will be notified that their application was rejected. However, the student can still apply for other internships, but cannot reapply for the same internship once rejected.

Internship Posting

Companies can publish internship offers on the platform using this function. In the "Publish Internship" section, companies must provide all required details, including the title, location, role, application deadline, number of positions, duration, employment type, description, and required skills. Once the internship offer is published, the company will receive recommendations for student profiles that match the offer's criteria. Additionally, the company can access the "Available Internships" section and select a specific posting to view the list of applications received and select candidates for the interview stage.

Selection phase Assistance

Once the application deadline has passed, the company can use this function to select candidates and send interview notifications. The system will guide the company through the selection process by providing a list of received applications, allowing the company to review each candidate's profile and CVs. Additionally, the system will offer a chat feature and tools such as questionnaire forms to help the company know more about the candidates before the actual interview will take place. The system will also notify students of the results from the selection phase (application or interview result). If selected for an interview, the chat system will be activated for the student, enabling both parties to communicate and schedule interview details.

Internship Status Tracking

This function allows users to monitor the progress of internships, including the past completed internships and the current active internships. Students can view internship status through their internship history, while companies can access it through their records of the history of their published internships. Universities can monitor student activities through the student list associated with them. The status tracking system is designed to record all important information about the internship and notify the relevant parties of any changes or updates.

Internship Feedback system

This feature is activated when the internship begins. Each specific internship will have a dedicated area for both the student and the company to provide feedback and evaluations. It allows students and companies to share useful information, such as suggestions, key issues, and ongoing feedback, separate from the chat system. This section is designed to record important highlights throughout the internship process. At the end of the internship, the system will prompt both the student and the company to submit their final evaluations or comments. Once the internship is concluded, this feature will be deactivated, and all related information will be archived in the database. The university will evaluate the student's status based on the information provided by this feature.

Chat system

The chat system is an important feature of the platform that allows users to communicate with each other. Unlike a typical chat system, this function is not always active. It is activated once a company selects a student as a candidate for an interview to discuss interview details. If the student is not selected for the final offer or rejects the offer, the specific chat window will be deactivated after the interview. However, if the student accepts the internship offer, the chat system will remain active, allowing both parties to communicate during the internship period and maintain contact afterward for potential future collaboration, such as mentorship or networking. Through the chat system, they can exchange messages and files, while the chat history will be stored in the database for future reference and analysis. The activation and deactivation of the chat system ensures privacy and security, preventing unnecessary communication, such as spam or harassment, before real collaboration begins and filtering out unqualified messages. The key difference between the chat system and the feedback system is that the chat system is real-time and private, accessible only to the two parties involved. In contrast, the information collected through the feedback system is more formal and public. The university can access this data when evaluating the student's performance, and other users can read anonymous comments left by students who participated in internships when reviewing a company's reputation.

Notification system

This function creates a channel for the platform to send notifications to users. Notification types include recommendations, application results, interview invitations, interview results, internship status updates, and other important communications from the platform. For example, when a student start an internship, the university will be notified through the notification system.

Acceptance and Rejection

This function allows users to express their decisions: students can accept or reject internship offers, and companies can accept or reject student applications. Once a student accepts an offer, the company is notified, and the internship officially begins. If a student rejects an offer, the company is notified, and the reserved position is reopened for other candidates. Similarly, if a company rejects a student's application, the student is notified, and the application is marked as rejected. The acceptance and rejection system ensures that both parties are informed of the results and can proceed accordingly. Additionally, this system helps improve the platform's matching algorithm by providing better recommendations in the future, based on the acceptance and rejection rates to better understand user preferences.

C. User characteristics

This section will examine the needs of the platform's primary users: students, companies, and universities. Each user group has specific requirements, and the platform is designed to meet these needs with various features. Here's an overview of what each group expects from the platform:

C.1. Students

Students are the primary users of the platform who are looking for suitable internship opportunities to gain practical experience. They need an intuitive and user-friendly interface that makes it easy to search for internships. Since many students are not familiar with the job market, they require a recommendation system that suggests internships match their skills, preferences, and career goals. They also expect through the platform they will be able to apply for internships that are interested in and to update their profile and CV when they gain new skills or experiences. Furthermore, students want to communicate directly with companies once a collaboration is established. They would like to receive feedback from companies about their performance during the internship, as this helps them improve their skills and future careers. Additionally, they want to share their experiences and leave comments to help other students evaluate potential employers before applying. Finally, students need to be able to track the status of their internships and receive timely notifications, allowing them to take informed action.

C.2. Companies

Companies are the users of the platform that provide internship opportunities to students. They require a platform that allows them to easily publish and manage internship postings, receive applications, and select candidates for interviews. Specifically, companies expect the platform to offer recommendations that match the requirements for the internships they've posted. This helps them identify the most suitable candidates and streamline the selection process. Companies also need an efficient communication system to interact with students for scheduling interviews and discussing internship details. They expect to receive feedback from students on how to improve the company's internship programs and provide evaluations on student performance. Additionally, companies need access to student profiles and CVs to identify the best candidates for the internships. They require the ability to track the status of internships and receive notifications regarding students' decisions on whether to accept or decline an offer. The platform should allow companies to have multiple accounts, especially if they represent different departments, and manage them separately. Furthermore, companies should be able to select student profiles that interest them and contact students through the notification system to promote their internship offers.

C.3. Universities

As users who are closely related to the students, universities need to be able to monitor the activities of students who are registered as their students. They need to be able to track students' internship statuses and receive notifications about updates to students' activities. Additionally, they need to be able to view students' profiles and activity histories to evaluate their performance, using the search bar to find a specific student.

D. Domain Assumptions

3 | Specific Requirements

4 | Formal Analysis Using Alloy

Organize this section according to the rules defined in the project description.

5 | Effort Spent

Section	Jie Chen	Riccardo Bonfanti
1 - Introduction	TBD	5 hours
2 - Overall Description	TBD	TBD
3 - Specific Requirements	TBD	TBD
4 - Formal Analysis Using Alloy	TBD	TBD

Table 5.1: Effort spent for each section

6 | References