Deliverable #1 Template : Software Requirement Specification (SRS)

SE 3A04: Software Design II – Large System Design

February 7, 2025

Tutorial Number: T01
Group Number: G3 Gx
Group Members:

- Group Member Name (as listed in Avenue)

- You do not need to use student #s or macid (keep those private).

IMPORTANT NOTES

- Be sure to include all sections of the template in your document regardless whether you have something to write for each or not

    - If you do not have anything to write in a section, indicate this by the *N/A*, *void*, *none*, etc.

- Uniquely number each of your requirements for easy identification and cross-referencing

- Highlight terms that are defined in Section 1.3 (**Definitions, Acronyms, and Abbreviations**) with **bold**, *italic* or <u>underline</u>

- For Deliverable 1, please highlight, in some fashion, all (you may have more than one) creative and innovative features. Your creative and innovative features will generally be described in Section 2.2 (**Product Functions**), but it will depend on the type of creative or innovative features you are including.

1 Introduction

This SRS will describe the software requiremnets for GeoLens, a community-driven application for identifying locations based on images, descriptitons and discussions. This document outlines the system's overall purpose, the context for building the application, functional and non-functional requirements and user iteraction.

1.1 Purpose

This document serves as a guideline for developers, designers, QA engineers, project managers and other stakeholders, ensuring a clear understanding of the system, including it's objectives, users, expected behavior, and technical constraints. As the project progresses and changes, the document will provide a baseline from which these changes can be compared. This SRS may also aid in risk identification early in the project lifecycle by outlining dependencies and constraints, allowing managers to prevent risks.

1.2 Scope

GeoLens is a community and AI driven application designed to identify locations from images. It consists of several individual software products described below.

The **Forum** UI is the primary interface where users interact with GeoLens. It allows users to upload images of locations for identification, view responses, and engage with the community. If the forum UI can provide ease of use and an interactive experience it will encourage community engagement and bring traffic to the application. The interface facilitates discussions, displays aggregated predictions, and contains gamification elements such as leaderboards. The forum UI should be accessible to all users, intuitive to use and respond to user requests within 100 ms. It does not perform image analysis or identification itself but serves as the user's gateway to the platform.

The **Orchestrator** is responsible for handling submitted images, delegating tasks to experts, and returning the final result to users. The Orchestrator should coordinate system components concurrently, managing task distribution, monitoring progress, and aggregating responses to ensure quick and accurate results. It handles task prioritization, load balancing, and error recovery while maintaining seamless interactions between users and experts. The back end does not analyze images directly but functions as the between layer that processes requests and returns items to the forum.

The **Host DBMS** stores user account information, historical user interactions, reputation scores, previously identified locations and leaderboards. It ensures that the system retains valuable data, in a structured way that is efficiently accessible by other system components. The database should be highly secure, as it contains sensitive user information. The database does not process images or make identifications but acts as the central location for all platform data.

The three **Experts** are as follows:

1. **GeoKnowr AI**

   - Pre-trained image processing model
   - Predicts coordinates where an image was taken

2. **Landmark Recognition**

   - Google images API
   - Search by image to locate a popular landmark

3. **Region Specific AI**

   - Uses a specialized AI model trained for a specific region

- Enhances accuracy for areas with distinct visual features

The primary goal of these experts is to work cohesively to provide an accurate prediction with little delay. GeoKnowr AI aims to deliver an initial estimate of where an image was taken by assigning coordinates. Then the region specific AI can further refine this prediction by applying localized knowledge. If a landmark is present in the image, the Landmark Recognition software should pin point it's location.

1.3 Definitions, Acronyms, and Abbreviations

- **GeoLens:** the system being specified

- **AI:** Aritficial Intelligence

1.4 References

- Provide a complete list of all documents referenced elsewhere in the SRS.

- Identify each document by title, report number (if applicable), date, and publishing organization.

- Specify the sources from which the references can be obtained.

- Order this list in some sensible manner (alphabetical by author, or something else that makes more sense).

1.5 Overview

Section 2 aims to put the value of GeoLens into perspective, relating and contrasting it to other similar products that currently exist. It should also provide a summary of the primary functions of the application and a description of the expected users. This should provide readers with a general understanding of the system, and how users are expected to intereact with it. Finally, constraints and assumptions are listed to clarify the scope of the application and the context in which it operated.

Section 3 presents a use case digram outlining the main functionality and interactions with stakeholders.

Section 4 is a detailed overview of the functional requirements, discussing what the system will do. These requirements will be organized in terms of business events, viewpoints and scenarios. This provides a structured understanding of the system in various contexts.

Finally, section 5 describes the Non-Functional Requirements, focusing on how the system aims to be a valuable service. This section provides a rationale for each requirement, explaining their necessity and benefits.

2 Overall Product Description

2.1 Product Perspective

- If the product is independent and totally self-contained, it should be stated here

- If the SRS defines a product that is a component of a larger system, then this subsection should relate the requirements of that larger system to the functionality of the software being developed. Identify interfaces between that larger system and the software to be developed.

- A block diagram showing the major components of the larger system, interconnections, and external interfaces can be helpful

2.2 Product Functions

- Provide a *summary* of the major functions that the software will perform.

  - **Example**: An SRS for an accounting program may use this part to address customer account maintenance, customer statement, and invoice preparation without mentioning the vast amount of detail that each of those functions requires.

- Functions should be organized in a way that makes the list of functions understandable to the customer or to anyone else reading the document for the first time

- Present the functions in a list format - each item should be one function, with a brief description of it

- Textual or graphical methods can be used to show the different functions and their relationships

  - Such a diagram is not intended to show a design of a product, but simply shows the logical relationships among variables

2.3 User Characteristics

The app is meant to be a user-friendly app and as a result has the following expected qualifications of its users:

1. Education Level: Basic Literacy and Geographical knowledge

- A person with basic literacy skills of reading and writing should be able to utilize this app without any difficulties.

- A person with basic geographical knowledge of the divison of the world into continents, countries, and regions should be able to utilize this app without any difficulties.

2. Experience: Any

- Since the app is meant to be user-friendly, someone who is using the app for the very first time should be able to do so without any major problems.

3. Technical Expertise: Basic knowledge of smartphone usage

- A person having basic experience with the usage of a smartphone should be able to easily use the app.

2.4 Constraints

1. **Budget:** The budget allocated to the project will have a great affect on which technologies may be used in the development of the app, as well as limiting the external integrations that can be used. The indicated budget for the project is $0.

2. **Time:** The time allotted for the project with have a significant affect on the feasible scope of the project. Consequently, this limits the number and quality of features that can be integrated into the app.

2.5 Assumptions and Dependencies

1. Assume that pictures of locations will be able to be located to at minimum country level accuracy.
2. Assume that users encounter pictures of unknown origin (no information about where it was taken).
3. Assume that users wish to know where pictures of unknown origin were taken.
4. Assume that the processing of unauthorized photos of public spaces are legal in all regions in which the app operates.

Other assumptions that, if it fails to hold, could require a change to the requirements:
1. A recent (released within 3 years) version of the Andriod operating system will be available on the device.
2. The device will have internet access if the user wishes to use the app.
3. The app will have access to an on-device photo library if the user wishes to upload a photo.
4. Assume all API dependencies are fully functional during the operation of the product.

2.6   Apportioning of Requirements

1. Further language capabilities

   - The software will be developed only in English for the first version of the system.

2. User rating/rank based on guess accuracy

   - Users will be able to guess on other user's posts as to where they think it is (This does **not** affect the expert determination and is simply to add game-like mechanics). In a future version of the software, each user will have a rating/rank based on how close their guesses are to the expert determination.

3. No question limit for paid tier

   - In a future version of the software, users would be able to purchase a paid premium tier to be able to ask as many questions per day as they'd like.

3 Use Case Diagram
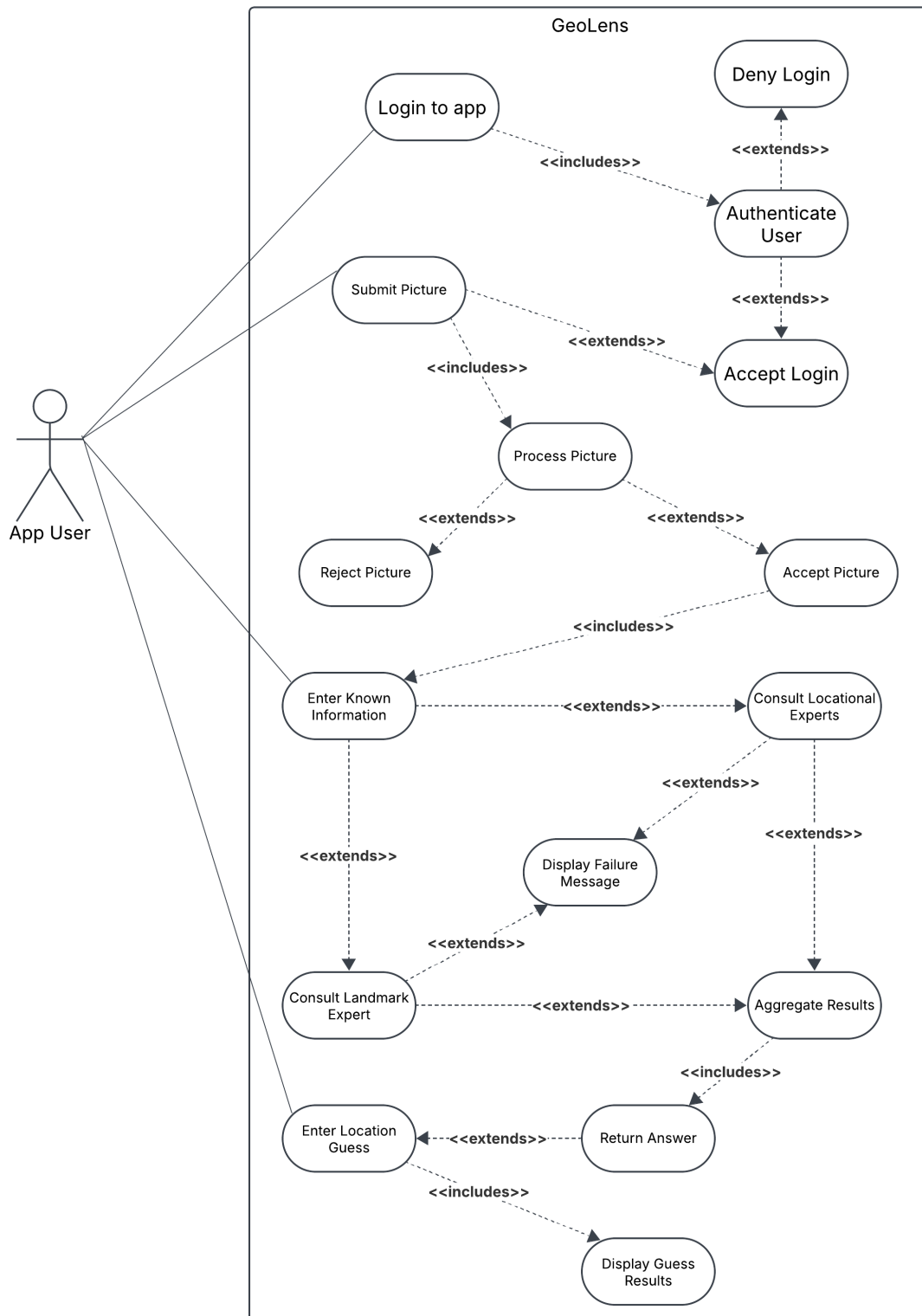
4 Highlights of Functional Requirements

- Specify all use cases (or other scenarios triggered by other events), organized by Business Event.

- For each Business Event, show the scenario from every Viewpoint. You should have the same set of Viewpoints across all Business Events. If a Viewpoint doesn't participate, write N/A so we know you considered it still. You can choose how to present this - keep in mind it should be easy to follow.

- At the end, combine them all into a Global Scenario.

- Your focus should be on what the system needs to do, not how to do it. Specify it in enough detail that it clearly specifies what needs to be accomplished, but not so detailed that you start programming or making design decisions.

- Keep the length of each use case (Global Scenario) manageable. If it's getting too long, split into sub-cases.

- You are *not* specifying a complete and consistent set of functional requirements here. (i.e. you are providing them in the form of use cases/global scenarios, not a refined list). For the purpose of this project, you do not need to reduce them to a list; the global scenarios format is all you need.

- Red text below is just to highlight where you need to insert a scenario - don't actually write it all in red.

Main Business Events: List out all the main business events you are presenting. If you sub-divided into smaller ones, you don't need to include the smaller ones in this list.

Viewpoints: List out all the viewpoints you will be considering.

Interpretation: Specify any liberties you took in interpreting business events, if necessary.

BE1. User Submits a Picture (not region specific)
Pre-Condition: The user must have an account and a working app with internet connection.

    VP1. User
    Main Success Scenario

1. User opens the app on their mobile device.
2. The app prompts the user to enter their login information.
3. User enters their login information.
4. System authenticates the user.
5. System gives user options to choose from (Submit a Picture, Submit a Landmark).
6. User chooses "Submit a Picture".
7. Systems prompts the user to upload a picture within the resolution and format requirements.
8. User uploads picture.
9. System prompts the user to include a general region where the picture is from.
10. User does not input a region.
11. System prompts the user to include comments on where the image is from (Instagram, family photo, etc).
12. User adds comments.
13. User submits the post.
14. System sends data to the general AI.
15. The general AI returns an approximate location, which is passed to the region specific AI.
16. The region-specific AI returns an answer.

17. Answer is displayed to the user.

Secondary Scenario
4.i. System fails to authenticate user. Login failed, retry form step 3.
8.i. User uploads a photo outside quality/format requirements. Retry from step 8.
14.i. System fails to send post to AI.
14.ii. The post is not sent, but the data is saved. Retry from step 13.
14.ii. The post is not sent and information is not saved. Retry from step 7.
15.i. General AI cannot return an answer. Error page is displayed. 16.i. The region-specific AI cannot return an answer. The general answer returned by the general AI is returned to the user.

VP2. Customer Support
4.i. On failure, system prompts user with contact information for Customer Support.
8.i. On failure, system displays image parameters and prompts user with contact information for Customer Support.
14.i. System displays an error page with contact information for Customer Support.
14.ii. System prompts user to retry send, or contact Customer Support.
14.ii. System prompts user to re-input image and data, or contact Customer Support.

Global Scenario:
Pre-Condition: The user must have an account and a working app with internet connection.

1. User opens the app on their mobile device.

2. The app prompts the user to enter their login information.

3. User enters their login information.

4. System authenticates the user.

5. System gives user options to choose from (Submit a Picture, Submit a Landmark).

6. User chooses "Submit a Picture".

7. Systems prompts the user to upload a picture within the resolution and format requirements.

8. User uploads picture.

9. System prompts the user to include a general region where the picture is from.

10. User does not input a region.

11. System prompts the user to include comments on where the image is from (Instagram, family photo, etc).

12. User adds comments.

13. User submits the post.

14. System sends data to the general AI.

15. The general AI returns an approximate location, which is passed to the region specific AI.

16. The region-specific AI returns an answer.

17. Answer is displayed to the user.

Secondary Scenario
4.i. System fails to authenticate the user. System prompts user with contact information for Customer Support. User can retry from step 3.
8.i. User uploads a photo outside quality/format requirements. System displays image parameters. System prompts user with contact information for Customer Support.User can retry from step 8.
14.i. System fails to send post to the forum.

14.ii. The post is not sent, but the data is saved.
System prompts user to contact Customer Support. User can retry from step 13.
14.ii. The post is not sent and information is not saved.
System prompts user to contact Customer Support. User can retry from step 7.
15.i. General AI cannot return an answer. Error page is displayed.
16.i. The region-specific AI cannot return an answer. The general answer returned by the general AI is returned to the user.

BE2. User Submits a Picture (region specific)

    VP1. User

      Main Success Scenario

1. User opens the app on their mobile device.
2. The app prompts the user to enter their login information.
3. User enters their login information.
4. System authenticates the user.
5. System gives user options to choose from (Submit a Picture, Submit a Landmark).
6. User chooses "Submit a Picture".
7. Systems prompts the user to upload a picture within the resolution and format requirements.
8. User uploads picture.
9. System prompts the user to include a general region where the picture is from.
10. User inputs a region.
11. System prompts the user to include comments on where the image is from (Instagram, family photo, etc).
12. User adds comments.
13. User submits the post.
14. System sends data to the appropriate region-specific AI.
15. The region-specific AI returns an answer.
16. Answer is displayed to the user.

      Secondary Scenario
      4.i. System fails to authenticate user. Login failed, retry form step 3.
      8.i. User uploads a photo outside quality/format requirements. Retry from step 8.
      14.i. System fails to send post to AI.
      14.ii. The post is not sent, but the data is saved. Retry from step 13.
      14.ii. The post is not sent and information is not saved. Retry from step 7.
      15.i. The region-specific AI cannot return an answer. Error page is displayed.

    VP2. Customer Support
      4.i. On failure, system prompts user with contact information for Customer Support.
      8.i. On failure, system displays image parameters and prompts user with contact information for Customer Support.
      14.i. System displays an error page with contact information for Customer Support.
      14.ii. System prompts user to retry send, or contact Customer Support.
      14.ii. System prompts user to re-input image and data, or contact Customer Support.

Global Scenario:
Pre-Condition: The user must have an account and a working app with internet connection.

1. User opens the app on their mobile device.

2. The app prompts the user to enter their login information.

3. User enters their login information.

4. System authenticates the user.

5. System gives user options to choose from (Submit a Picture, Submit a Landmark).

6. User chooses "Submit a Picture".

7. Systems prompts the user to upload a picture within the resolution and format requirements.

8. User uploads picture.

9. System prompts the user to include a general region where the picture is from.

10. User inputs a region.

11. System prompts the user to include comments on where the image is from (Instagram, family photo, etc).

12. User adds comments.

13. User submits the post.

14. System sends data to the appropriate region-specific AI.

15. The region-specific AI returns an answer.

16. Answer is displayed to the user.

Secondary Scenario
4.i. System fails to authenticate the user. System prompts user with contact information for Customer Support. User can retry from step 3.
8.i. User uploads a photo outside quality/format requirements. System displays image parameters. System prompts user with contact information for Customer Support.User can retry from step 8.
14.i. System fails to send post to the forum.
14.ii. The post is not sent, but the data is saved.
System prompts user to contact Customer Support. User can retry from step 13.
14.ii. The post is not sent and information is not saved.
System prompts user to contact Customer Support. User can retry from step 7.
15.i The region-specific AI cannot return an answer. Error page is displayed.

BE3. User Submits a Landmark

VP1. User
Main Success Scenario

1. User opens the app on their mobile device.

2. The app prompts the user to enter their login information.

3. User enters their login information.

4. System authenticates the user.

5. System gives user options to choose from (Submit a Picture, Submit a Landmark).

6. User chooses "Submit a Landmark".

7. Systems prompts the user to upload a picture within the resolution and format requirements.

8. User uploads picture.

9. System prompts the user to include comments on where the image is from (Instagram, family photo, etc).

10. User adds comments.

11. User submits the post.

12. System sends data to the landmark-focused AI.

13. The landmark-focused AI returns an answer.

14. Answer is displayed to the user.

Secondary Scenario
4.i. System fails to authenticate user. Login failed, retry form step 3.
8.i. User uploads a photo outside quality/format requirements. Retry from step 8.
12.i. System fails to send post to AI.
12.ii. The post is not sent, but the data is saved. Retry from step 11.
12.ii. The post is not sent and information is not saved. Retry from step 7.
13.i. The landmark-focused AI cannot return an answer. Error page is displayed.

VP2. Customer Support
4.i. On failure, system prompts user with contact information for Customer Support.
8.i. On failure, system displays image parameters and prompts user with contact information for Customer Support.
12.i. System displays an error page with contact information for Customer Support.
12.ii. System prompts user to retry send, or contact Customer Support.
12.ii. System prompts user to re-input image and data, or contact Customer Support.

Global Scenario:
Pre-Condition: The user must have an account and a working app with internet connection.

1. User opens the app on their mobile device.

2. The app prompts the user to enter their login information.

3. User enters their login information.

4. System authenticates the user.

5. System gives user options to choose from (Submit a Picture, Submit a Landmark).

6. User chooses "Submit a Landmark".

7. Systems prompts the user to upload a picture within the resolution and format requirements.

8. User uploads picture.

9. System prompts the user to include comments on where the image is from (Instagram, family photo, etc).

10. User adds comments.

11. User submits the post.

12. System sends data to the landmark-focused AI.

Secondary Scenario
4.i. System fails to authenticate the user. System prompts user with contact information for Customer Support. User can retry from step 3.
8.i. User uploads a photo outside quality/format requirements. System displays image parameters. System prompts user with contact information for Customer Support.User can retry from step 8.
12.i. System fails to send post to the forum.
12.ii. The post is not sent, but the data is saved.
System prompts user to contact Customer Support. User can retry from step 11.
12.ii. The post is not sent and information is not saved.
System prompts user to contact Customer Support. User can retry from step 7.
13.i. The landmark-focused AI cannot return an answer. Error page is displayed.

5 Non-Functional Requirements

- For each non-functional requirement, provide a justification/rationale for it.
  Example:
  SC1. *The device should not explode in a customer's pocket.*
  Rationale: Other companies have had issues with the batteries they used in their phones randomly exploding [insert citation]. This causes a safety issue, as the phone is often carried in a person's hand or pocket.

- If you need to make a guess because you couldn't really talk to stakeholders, you can say "We imagined stakeholders would want...because..."

- Each requirement should have a unique label/number for it.

- In the list below, if a particular section doesn't apply, just write N/A so we know you considered it.

5.1 Look and Feel Requirements

5.1.1 Appearance Requirements

LF-A1.   The system shall have a minimalistic and clean UI.
 Rationale:

LF-A2.   All images in the system must be high-quality with the resolution well-adjusted.

LF-A3.   The system shall use a consistent and legible font.

5.1.2 Style Requirements

LF-S1.   The system shall have both a light and dark mode option.

LF-S2.   The system must follow a gamified design and have visually appealing elements (ex. Leaderboard, user profile).

LF-S3.   The system must scale to the size of the screen.

LF-S4.   The system must use consistent spacing and padding between elements.

5.2 Usability and Humanity Requirements

5.2.1 Ease of Use Requirements

UH-EOU1.   The system's buttons shall be big and bright in colour.

UH-EOU2.   The system shall allow users to complete the identification of a location within four steps.

UH-EOU3.   The system shall allow users to report incorrect results through a feedback tool in the application.

5.2.2 Personalization and Internationalization Requirements

UH-PI1.   The system must be able to support multiple languages.

UH-PI2.   The system shall allow the user to select between the metric or imperial system to display information.

5.2.3 Learning Requirements

UH-L1.   The system shall have a basic tutorial for navigating through the features, which automatically executes the first time a user opens the app and is available at all times within the app.

UH-L2.   The system shall provide short descriptions when the user presses and holds key features, that automatically fade after a short period.

UH-L3.   The system shall have a demo that introduces the user to the app features and allows them to test it out before having to create an account.

5.2.4 Understandability and Politeness Requirements

UH-UP1.   The system shall hide information and aspects of the app construction that are necessary for the user to interact with.

UH-UP2.   The system shall provide positive engagement with the user when they successfully identify a location.

5.2.5 Accessibility Requirements

UH-A1.   The system must be compatible with screen readers.

UH-A2.   The system shall allow built-in zoom-in and zoom-out features.

UH-A3.   The system shall provide high-contrast options that are colorblind-friendly.

5.3 Performance Requirements

5.3.1 Speed and Latency Requirements

PR-SL1.   The system shall have a basic app response time of no longer than 3 seconds.

PR-SL2.   The system shall return location identification results within 5 seconds.

5.3.2 Safety-Critical Requirements

PR-SC1.   The system must securely encrypt all user data.

PR-SC2.   The system must not return locations that reveal people's addresses or sensitive information.

5.3.3 Precision or Accuracy Requirements

PR-PA1.   The system must successfully return the general location of the image processed to within 25 km of the actual area.

PR-PA2.   The system shall have a priority setting to assess the accuracy of each of the API's results.

5.3.4 Reliability and Availability Requirements

PR-RA1.   The system must maintain an uptime of 99%, except during routine maintenance, patch updates, and unexpected situations (ex. power outage).

PR-RA2.   The system shall save and backup the user's progress continuously.

5.3.5 Robustness or Fault-Tolerance Requirements

PR-RFT1.   The system shall be able to handle incorrect inputs or inputs of wrong formats.

PR-RFT2.   The system must retry a failed image input up to three times before alerting the user of an error.

5.3.6 Capacity Requirements

PR-C1.   The system must be able to support at least 10000 concurrent users during peak usage hours.

5.3.7 Scalability or Extensibility Requirements

PR-SE1.   The architecture of the system must be modular and allow APIs to be integrated without major refactoring.

5.3.8 Longevity Requirements

PR-L1.   The system shall have quarterly updates for new and changed locations.

5.4 Operational and Environmental Requirements

5.4.1 Expected Physical Environment

OE-EPE1.   The system should be able to process images in various outdoor conditions.

5.4.2 Requirements for Interfacing with Adjacent Systems

OE-IA1.   The system must be able to send and receive geolocation data with all the connected APIs.

5.4.3 Productization Requirements

OE-P1.   N/A

5.4.4 Release Requirements

OE-R1.   The system must be compatible with Android 14 (API level 34).

5.5 Maintainability and Support Requirements

5.5.1 Maintenance Requirements

MS-M1.

5.5.2 Supportability Requirements

MS-S1.

5.5.3 Adaptability Requirements

MS-A1.

5.6 Security Requirements

5.6.1 Access Requirements

SR-AC1.

5.6.2 Integrity Requirements

SR-INT1.

5.6.3 Privacy Requirements

SR-P1.

5.6.4 Audit Requirements

SR-AU1.

5.6.5 Immunity Requirements

SR-IM1.

5.7 Cultural and Political Requirements

5.7.1 Cultural Requirements

CP-C1.

5.7.2 Political Requirements

CP-P1.

5.8 Legal Requirements

5.8.1 Compliance Requirements

LR-COMP1.

5.8.2 Standards Requirements

LR-STD1.

A Division of Labour

Include a Division of Labour sheet which indicates the contributions of each team member. This sheet must be signed by all team members.