Deliverable #1 Template : Software Requirement Specification (SRS)

SE 3A04: Software Design II – Large System Design

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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 provide visibility over software requirements for Gaim, an AI-powered wildlife identification application. This document will discuss the purpose of Gaim, the scope of the application, its objectives, production description, any constraints, user characteristics, product requirements, and use case diagrams.

1.1 Purpose

- The document focuses on software requirements, user characteristics, and use cases for Gaim. This document is intended for internal Gaim stakeholders, including but not limited to, project managers, developers, domain experts, and Gaim team members/investors. No prior readings are required

1.2 Scope

1.2.1 Software Products

1.2.1.1 Decision-Tree Expert (Mammal, Bird, and Fish domain)

This expert gives guided questions that the user can answer. At the end, based on the answers given by the user, generates and gives to the forum its best guess at what the animal could be based on its domain. It also gives an accuracy score to the forum. If it has no animal in its database which meets the required attributes, it returns no answer.

1.2.1.2 Image Expert

Based on a user-uploaded image, this expert generates and gives to the forum its best guess on what the animal could be. At the same time, it generates an accuracy score. If the accuracy score is too low, it returns nothing to the forum.

1.2.1.3 Freeform Writing Expert

Based on user-given freeform text, this expert generates and returns to the forum its best guess to as what the animal could be. At the same time, it generates an accuracy score. If the accuracy score is too low, it returns nothing to the forum.

1.2.1.4 Animal Characteristics DBMS

This service maintains a list of species in Ontario including their attributes, phylogenetic classification, and their at-risk status. It allows other classes to sort and access this information.

1.2.1.5 Forum

The forum accepts responses from the experts as their guesses of what the animal could be, as well as an accuracy score. Based on these accuracy scores, it selects an answer to present to the user.

1.2.1.6 Animal Report Generator

The animal report generator receives the answer from the Forum and generates a report to show to the user about the animal.

1.2.2 Applications

1.2.2.1 Benefits

This product will allow users to be able to more easily identify animals found in Ontario. It will then give them relevant information such as habitat, circadian rhythms, and at-risk status. It will allow users to make informed decisions about their actions surrounding the identified animal.

1.2.2.2 Objectives

This software will reliably generate a report based on any of the available input methods. It will be secure. This product will efficiently determine what animal the user is asking about based on any of the available input methods.

1.2.2.3 Goals

- This product will generate an answer within 10 seconds of completion of user input

- This product will be complete by

- This product will always generate an answer with an accuracy score greater than 90%

- Identify the software product(s) to be produced, and name each (e.g., Host DBMS, Report Generator, etc.)

- Explain what the software product(s) will do (and, if necessary, also state what they will not do).

- Describe the application of the software being specified, including relevant benefits, objectives, and goals.

1.3 Definitions, Acronyms, and Abbreviations

- Gaim: Species classifer application created by team to provide support to hunting communities through identifying endagered animals.

1.4 References

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1.5 Overview

Section 2 discusses the overall product description talking about the product perspective, product functions, user characteristics, assumptions and dependencies, and apportioning of requirements. Section 3 contains the Use Case Diagram for the use case scenario of creating a carpool. Section 4 contains the highlights of functional requirements talking about main business events and viewpoints. Section 5 contains the Non-Functional Requirements talking about Look and Feel Requirements, Usability and Humanity Requirements, Performance Requirements, Operational and Environmental Requirements, Maintainability and Support Requirements, Security Requirements, Cultural and Political Requirements and Legal Requirements. Section 6 contains the innovative feature of our design. Lastly, Section A contains the Division of Labour.

2 Overall Product Description

2.1 Product Perspective

- The product consists of three core modules: Identifying Species, Account Services, and Community Discussion. Each module provides specific functionalities such as species identification through various inputs, user account management, and engagement within the hunting and conservation community.

- The system is designed to identify endangered and out-of-season species across three primary domains: aerial, aquatic, and land. It operates independently as a self-contained application, providing users with multiple methods to identify species—image submission, textual description, and structured surveys.

- However, the system can also function as a component within a larger environmental monitoring or conservation ecosystem. In such cases, it would interface with external databases, governmental wildlife agencies, and research institutions to enhance species identification accuracy and data integration.
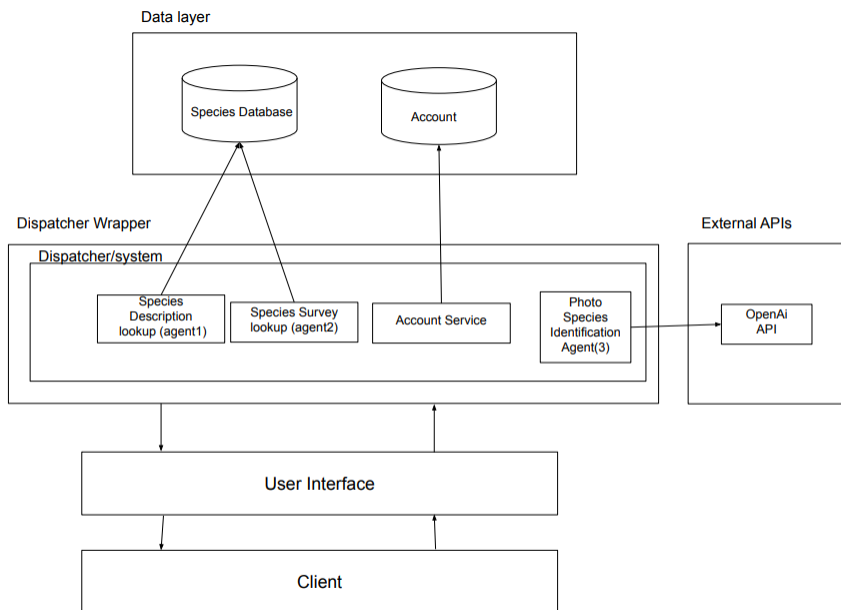
2.2 Product Functions

The goal of the system is to identify endangered and out of season species for 3 main domains: aerial, aquatic, and land. There will be 3 main methods for identifying specifics and a backend decision tree to determine accuracy and provide a result. The methods will be: description, survey and image. The main modules of this app will be the following: Identifying species (submitting photo, writing a description, filling

a questionnaire, getting result, viewing accuracy score), Account Services (creating an account, viewing past inquiries, updating information, logging in), Community Discussion (asking questions, posting pictures, liking other users posts in the hunting community).

Modules	Functions
Identify Species: Image	Write Description: Allows the user to submit a description of the animal they have seen
	View Result: Allows user to see the identified species and corresponding accuracy score
	Save Result: Allows user to store output
Identify Species: Description	Submit Image: Allows the user to upload an image of animals they see
	View Result: Allows user to see the identified species and corresponding accuracy score
	Save Result: Allows user to store output
Identify Species: Survey	Fill out Questionnaire: Allows user to submit inquiry based on predesigned questions
	View Result: Allows user to see the identified species and corresponding accuracy score
	Save Result: Allows user to store output
Account Services	Create Account: Allows the user to create an account
	Update Account: Allows the user to update their account information
	Login: Allows user to login/logout of their account
	Search History: Allows user to view past searches
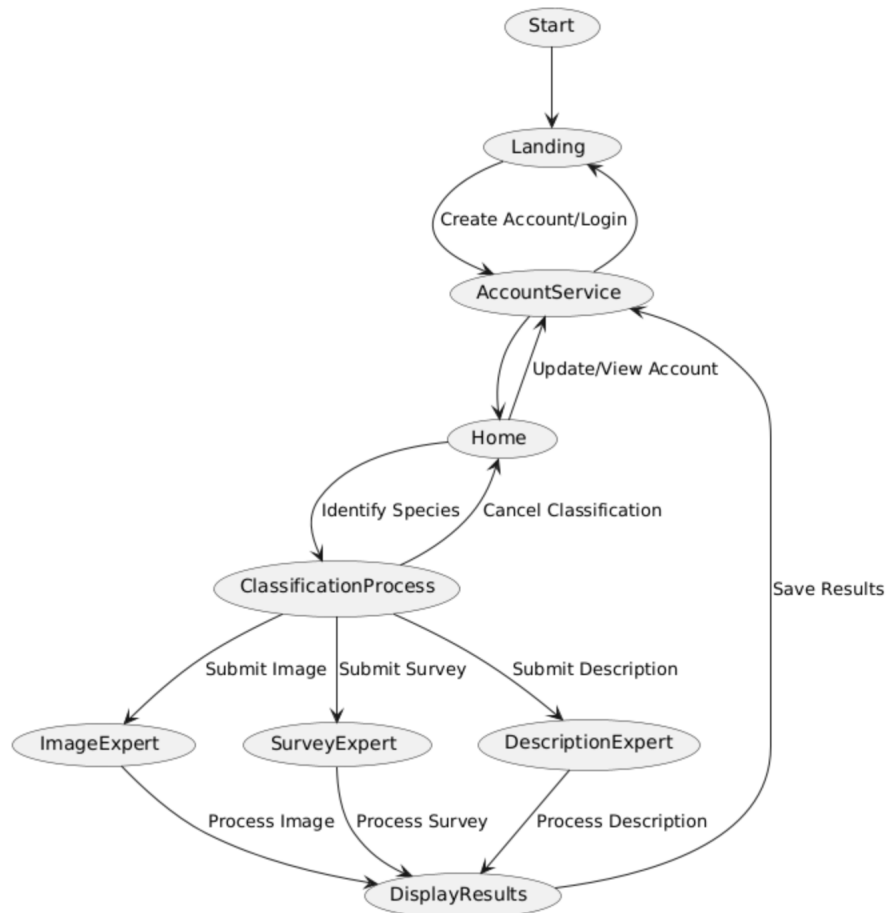
2.3 User Characteristics

2.3.1 Hunters

Hunters primarily live in rural areas, sometimes with limited access to educational resources and diverse perspectives. For this reason, they have a majority lower education level as those who leave behind their provincial life to gain education in the city may decide to stay there and live behind their rural life of hunting. They have much experience with wildlife and its behaviours, many having learned hunting from their parents who in turn learned it from their parents before them. They have, in general, a deep respect for wildlife and a vast knowledge of species and their behaviours. However, they may be limited in their knowledge of which species are currently designated to be at risk.

2.3.2 Nature Enthusiasts

Nature enthusiasts cover a broad spectrum of people from casual national park-goers to experienced portagers. Their education level varies from those who have not graduated high school to those with PhDs and MDs. However, in Canada it tends towards those with undergraduate degrees as that is the most common education level. Their experience level varies greatly, however it would tend towards those who camp once or twice a year. Potentially, they have attended a seminar run by the national parks and are able to identify a small subset of species. In majority, our user can identify broad spectrums of species (such as moose, deer, squirrel, bird), but is unable to tell the different nuances between species.

- Describe those general characteristics of the intended users of the product including educational level, experience, and technical expertise

- Since there will be many users, you may wish to divide into different user types or personas

2.4 Constraints

1. **Data Availability:** The accuracy of Gaim depends on an up-to-date and comprehensive database of wildlife species, including their characteristics and at-risk status. Obtaining and maintaining such a database may require collaboration with wildlife organizations and adherence to licensing restrictions. Especially since this is supposed to be Ontario-specific, it will be difficult to obtain such a database.

2. **Internet Dependency:** Even though some features can be used locally, features such as cloud-based image processing, AI model updates, and community discussions require an active internet connection. Users in remote locations with limited to no internet connectivity may experience reduced to no functionality.

3. **Regulatory and Ethical Constraints:** Since the application deals with wildlife identification, it must comply with Canadian environmental laws and conservation policies. The app must ensure that it does not inadvertently promote illegal activities such as hunting endangered species. Even though the app will provide endangerment status, the list will need to be up-to-date and may require regular checks to stay updated.

4. **AI Model Accuracy and Bias:** The AI models used for species identification must be trained with diverse datasets to avoid misclassifications. Ensuring high accuracy while maintaining real-time performance is a key challenge, as incorrect identifications may mislead users. This can be especially critical with endangered species and protected species.

5. **Scalability:** As Gaim gains more users, the system must be capable of handling increased data processing demands and community interactions. Future versions may require cloud infrastructure scaling, which could introduce additional costs.
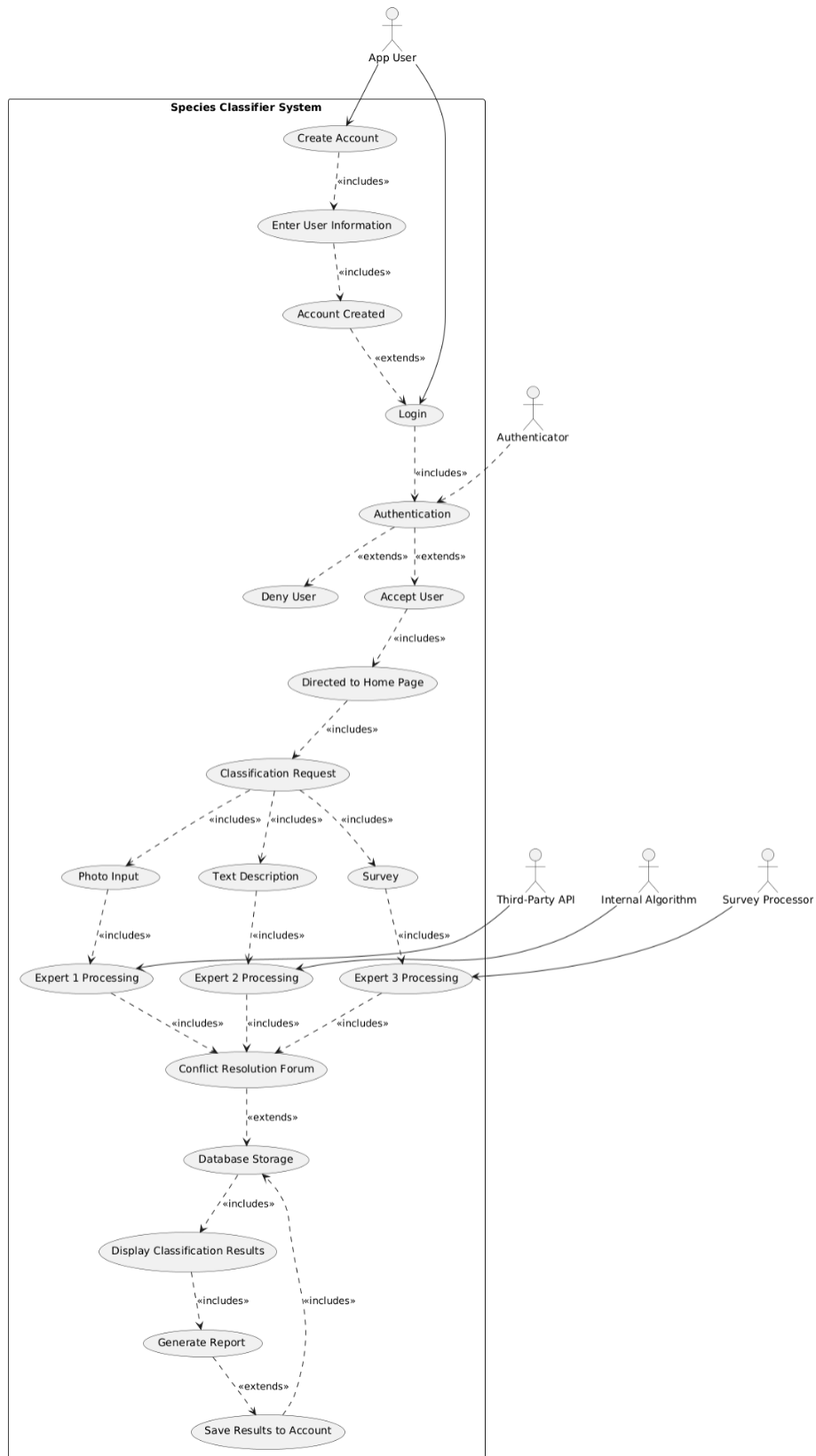
2.5 Assumptions and Dependencies

- Audio recordings are clear and free of excessive background noise.

- Images and videos are of sufficient resolution, clarity, and lighting for accurate identification.

- The app will only be used in Canada (no need to consider species from other regions).

- We have access to cloud or local computational resources to handle image and sound processing.

- Assume APIs are secure and functional

- Assume user has internet connection

2.6 Apportioning of Requirements

- The first version of the app will not take into consideration animals whose appearances change by season.

- The first version of the app will be developed in English.

- Verify with wildlife experts to check accuracy of our results.

- Expand database to take into account species from other regions as the app grows.

3 Use Case Diagram

App User

Species Classifier System

Create Account

«includes»

Enter User Information

«includes»

Account Created

«extends»

Login

Authenticator

«includes»

Authentication

«extends» «extends»

Deny User | Accept User

«includes»

Directed to Home Page

«includes»

Classification Request

«includes» «includes» «includes»

Photo Input | Text Description | Survey

Third-Party API | Internal Algorithm | Survey Processor

«includes» «includes» «includes»

Expert 1 Processing | Expert 2 Processing | Expert 3 Processing

«includes» «includes» «includes»

Conflict Resolution Forum

«extends»

Database Storage

«includes»

Display Classification Results

«includes» «includes»

Generate Report

«extends»

Save Results to Account

4   Highlights of Functional Requirements

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. Business Event Name #1

    VP1. Viewpoint Name #1
       Insert Scenario Here

    VP2. Viewpoint Name #2
       Insert Scenario Here

    Global Scenario:
    Insert Scenario Here

BE2. Business Event Name #2

    VP1. Viewpoint Name #1
       Insert Scenario Here

    VP2. Viewpoint Name #2
       Insert Scenario Here

    Global Scenario:
    Insert Scenario Here

BE3. Submitting a photo #3

    Precondition: The user has an account and is logged into the system. The user has captured or selected an image of an animal to be analyzed.

    VP1. User #1

       Main Success Scenario:
1. User opens the application on their mobile device.
2. System requires the user to log in and displays the login fields.
3. User enters their account credentials.
4. System authenticates the user.
5. User selects the "Identify Species" option.
6. System prompts the user to upload an image from their gallery or take a new photo.
7. User selects or captures an image.
8. System uploads the image and begins processing using the Image Recognition Expert.
9. Image Recognition Expert generates a prediction of the species along with an accuracy score.
10. The system forwards the prediction and accuracy score to the central forum.
11. The forum waits for inputs from the other experts before finalizing a decision.
12. System displays a "Processing Submission" status to the user.
13. Once all expert opinions are collected, the forum finalizes the species identification.
14. System displays the identified species, confidence level, and additional relevant details to the user.

Secondary Scenarios:

- 4i. System fails to authenticate the user.

  4i.1 System fails to authenticate the user.

  4i.2 System prompts the user to reset their password or contact support.

- 8i. User submits an invalid or blurry image.

  8i.1 System detects that the image is too blurry or invalid.

  8i.2 System prompts the user to submit a clearer image.

- 9i. Image Recognition Expert fails to generate a prediction.

  9i.1 System fails to generate a prediction due to insufficient data.

  9i.2 System notifies the user and suggests using another identification method (e.g., text description or survey).

- 13i. Other experts fail to provide input to the forum.

  13i.1 The forum detects missing inputs from other experts.

  13i.2 The system returns a partial result based on available data and notifies the user.

VP2. Ads Team #2

12i.1 System logs the user's engagement with the image submission feature.

12i.2 If applicable, the system selects wildlife-related advertisements based on the submission context.

12i.3 The system ensures that advertisements do not disrupt the user experience.

VP3. Marketing Team #3

12i.4 System tracks user engagement data related to photo submissions.

12i.5 System collects data for analytics to improve user experience and optimize future marketing strategies.

VP4. Accounting Team #4

NA

VP5. Environment Canada #5

8ii.1 System flags any identified endangered or protected species.

8ii.2 System flagged submissions for regulatory tracking.

8ii.3 If applicable, the system notifies the appropriate authorities about the flagged species.

VP6. National Parks/Hunting Organization (Ontario Federation of Anglers and Hunters) #6

8iii.1 System logs identified species data for conservation efforts and hunting regulations.

8iii.2 If the species is considered *unhuntable* due to conservation laws, the system notifies the user.

8iii.3 System provides relevant legal hunting information based on the identified species.

Global Scenario:

Pre-condition: User is logged in and submits a photo for species identification.

Main Success Scenario:

  i. User uploads or captures an image.

  ii. System processes the image using AI models.

  iii. System submits results to the forum.

  iv. Forum consolidates data from all identification experts.

  v. Final species prediction is displayed to the user.

vi. User can choose to submit the identification result to the community.

Secondary Scenarios:

- If the system fails to authenticate the user, it prompts for login recovery.
- If the image is invalid, the user is asked to submit another one.
- If the Image Recognition Expert fails, the user is advised to use another input method.
- If some experts fail to respond, the forum provides an answer based on available data.

BE4. Submitting a survey #4

Precondition: The user has an account and is logged into the system. The user has chosen to identify an animal using the survey-based method.

VP1. User #1

Main Success Scenario:

1 User opens the application on their mobile device.
2 System requires the user to log in and displays the login fields.
3 User enters their account credentials.
4 System authenticates the user.
5 User selects the "Identify Species" option.
6 System prompts the user to choose a method: Image-based or Survey-based identification.
7 User selects the Survey-based identification.
8 System initiates the Decision-Tree Expert and starts the questionnaire.
9 System presents the first question, prompting the user with a yes/no or multiple-choice format.
10 User responds to each question, and based on the responses, the Decision-Tree Expert dynamically adjusts the next question.
11 The Decision-Tree Expert continues until it determines a probable species or exhausts all questions.
12 System generates a prediction of the species along with an accuracy score.
13 The system forwards the prediction and accuracy score to the central forum.
14 The forum waits for inputs from the other experts before finalizing a decision.
15 System displays a "Processing Submission" status to the user.
16 Once all expert opinions are collected, the forum finalizes the species identification.
17 System displays the identified species, confidence level, and additional relevant details to the user.

Secondary Scenarios:

- 4i. System fails to authenticate the user.
  4i.1 System fails to authenticate the user.
  4i.2 System prompts the user to reset their password or contact support.
- 8i. User provides inconsistent or conflicting answers in the survey.
  8i.1 System detects logical inconsistencies in the user's responses.
  8i.2 System prompts the user to review their answers or restart the survey.
- 12i. Decision-Tree Expert fails to generate a prediction.
  12i.1 System fails to determine a probable species due to insufficient matching data.
  12i.2 System notifies the user and suggests using another identification method (e.g., image-based or freeform text description).
- 13i. Other experts fail to provide input to the forum.
  13i.1 The forum detects missing inputs from other experts.

13i.2 The system returns a partial result based on available data and notifies the user.

VP2. Ads Team #2

12i.3 System logs the user's engagement with the survey submission feature.

12i.4 If applicable, the system selects wildlife-related advertisements based on the submission context.

12i.5 The system ensures that advertisements do not disrupt the user experience.

VP3. Marketing Team #3

12i.6 System tracks user engagement data related to survey submissions.

12i.7 System collects data for analytics to improve user experience and optimize future marketing strategies.

VP4. Accounting Team #4

NA

VP5. Environment Canada #5

8ii.1 System flags any identified endangered or protected species.

8ii.2 System logs flagged submissions for regulatory tracking.

8ii.3 If applicable, the system notifies the appropriate authorities about the flagged species.

VP6. National Parks/Hunting Organization (Ontario Federation of Anglers and Hunters) #6

8iii.1 System logs identified species data for conservation efforts and hunting regulations.

8iii.2 If the species is considered *unhuntable* due to conservation laws, the system notifies the user.

8iii.3 System provides relevant legal hunting information based on the identified species.

Global Scenario:

Precondition: The user has an account and is logged into the system.

Main Success Scenario:

(a) User selects survey-based species identification.

(b) System presents a series of questions dynamically based on the Decision-Tree Expert.

(c) User completes the survey.

(d) System generates a species prediction and accuracy score.

(e) System submits results to the forum.

(f) Forum consolidates data from all identification experts.

(g) Final species prediction is displayed to the user.

(h) User can choose to submit the identification result to the community.

Secondary Scenarios:

- If the system fails to authenticate the user, it prompts for login recovery.
- If the survey responses are inconsistent, the user is asked to review or restart the survey.
- If the Decision-Tree Expert fails to generate a prediction, the user is advised to use another input method.
- If some experts fail to respond, the forum provides an answer based on available data.

BE5. Editing Account #5

> **Precondition:** Has an account and is trying to change account details.

> **VP1.** User #1
> > **Main Success Scenario:**
> > 1 User navigates to the "Edit Account" page.
> > 2 User modifies account details (e.g., name, email, password).
> > 3 System validates the input.
> > 4 If validation succeeds, the system updates the database.
> > 5 User receives a confirmation message.
> > 6 If validation fails, the system displays an error message and prompts the user for corrections.
> >
> > **Secondary Scenarios:**
> > - 4i. User provides invalid input.
> >   4i.1 System detects invalid input.
> >   4i.2 System prompts the user to correct the information and retry.

> **VP2.** Ads Team #2
> > i. N/A (The Ads Team has no role in the editing account process.)

> **VP3.** Marketing Team #3
> > i. N/A (The Marketing Team does not directly interact with the editing account system.)

> **VP4.** Accounting Team #4
> > i. (a) User updates billing information.
> > ii. (b) The system validates the changes.
> > iii. (c) The accounting team's module is updated to reflect new details.
> > iv. (d) Confirmation is sent to the user.

> **VP5.** Environment Canada #5
> > i. N/A (Environment Canada has no involvement in the editing account process.)

> **VP6.** National Parks/Hunting Organization (Ontario Federation of Anglers and Hunters) #6
> > i. N/A (This organization has no involvement in the editing account process.)

Global Scenario:

Precondition:

Main Success Scenario:

(a) User accesses the "Edit Account" page.

(b) User modifies account details.

(c) System validates the input.

(d) If validation succeeds, the system updates the database.

(e) User receives a confirmation message.

(f) If validation fails, the system displays an error message and prompts the user for corrections.

Secondary Scenarios:

- If the user provides invalid input, the system prompts for corrections.
- If billing information is updated, the accounting module is notified.

BE6. Login #6

    Precondition: Has an account and is trying to log in.

    VP1. User #1

        Main Success Scenario:

          1 User navigates to the login page.

          2 User inputs their credentials (email/username and password).

          3 System validates the credentials.

          4 If credentials match, access is granted, and the user is redirected to their dashboard.

          5 If credentials do not match, the system displays an error message and allows the user to retry or reset the password.

        Secondary Scenarios:

          • 4i. User has overdue payments.

           4i.1 System flags the account and restricts access until the payment issue is resolved.

           4i.2 User is notified of the restriction and given options to settle the issue.

    VP2. Ads Team #2

        i. N/A (The Ads Team has no role in the login process.)

    VP3. Marketing Team #3

        i. N/A (The Marketing Team does not directly interact with the login system.)

    VP4. Accounting Team #4

        i. (a) User with overdue payments attempts to log in.

        ii. (b) The system flags the account and restricts access until the payment issue is resolved.

        iii. (c) User is notified of the restriction and given options to settle the issue.

    VP5. Environment Canada #5

        i. N/A (Environment Canada has no involvement in the login process.)

    VP6. National Parks/Hunting Organization (Ontario Federation of Anglers and Hunters) #6

        i. N/A (This organization has no involvement in the login process.)

Global Scenario:

Precondition:

Main Success Scenario:

(a) User navigates to the login page.

(b) User inputs their credentials.

(c) System validates the credentials.

(d) If credentials match, access is granted, and the user is redirected to their dashboard.

(e) If credentials do not match, the system displays an error message and allows the user to retry or reset the password.

Secondary Scenarios:

• If the user has overdue payments, the system flags the account and restricts access until payment is settled.

• User is notified of the restriction and provided with payment options.

BE7. Viewing a Report #7

    Precondition: The user has already taken a picture of an animal and the forum has generated a report.

VP1. User #1

  Main Success Scenario:
  1 The user opens the app and logs in.
  2 The system authenticates the user and displays the dashboard.
  3 The user selects "View Report" from the options.
  4 The system displays a list of available reports.
  5 The user selects a specific report from the list.
  6 The system retrieves the report details and displays them to the user, including the animal's name, species, habitat, diet, and conservation status.

  Secondary Scenario:
  4i System fails to retrieve the list of reports.
    4i.1 The system displays an error message.
    4i.2 The user is prompted to try again or contact customer support.
  5i System fails to display the report content.
    5i.1 System displays a "Report Unavailable" message.
    5i.2 The user is prompted to reload the report or connect with customer support.

VP2. Ads Team
N/A

VP3. Marketing Team
N/A

VP4. Accounting Team
N/A

VP5. Environment Canada
N/A

VP6. National Parks/Hunting Organization
N/A

Global Scenario:
Precondition: The user has an account and is logged into the system. A report has already been generated for the image taken by the user.

Main Success Scenario:

(a) User selects "View Report" from the dashboard.

(b) The system retrieves and displays the report information, including the animal's details such as species, habitat, and diet.

(c) User reviews the report.

(d) User may choose to share the report with the community.

Secondary Scenarios:

- If the system fails to authenticate the user, it prompts for login recovery.

- If the report fails to load, the user is prompted to refresh or contact customer support.

- If the report data is incomplete, the system displays a warning and suggests a re-scan.

BE8. Saving a Report #8

Precondition: The user is viewing a generated report and wants to save it for offline access or future reference.

VP1. User #1

Main Success Scenario:

   1 The user opens the app and logs in.
   2 The system authenticates the user.
   3 The user views the generated report.
   4 The user selects the Save Report option
   5 The system prompts the user to choose a format (e.g., PDF, Image) and confirm the save.
   6 The user confirms the action.
   7 The system saves the report to the user's device and provides a success message.

Secondary Scenario:

   3i User selects an unsupported format.
      3i.1 System displays an "Unsupported Format" message and prompts the user to select a valid format.
   4i System fails to save the report.
      4i.1 System displays a "Save Failed" error message.
      4i.2 User is prompted to try saving again or contact customer support.

VP2. Ads Team
N/A

VP3. Marketing Team
N/A

VP4. Accounting Team
N/A

VP5. Environment Canada
N/A

VP6. National Parks/Hunting Organization
N/A

Global Scenario:
Precondition: The user has an account and is logged into the system, and a report has already been generated.
Main Success Scenario:

   1 The user opens the app and logs in.

   2 The system authenticates the user.

   3 The user views the generated report.

   4 The user selects the Save Report option

   5 The system prompts the user to choose a format (e.g., PDF, Image) and confirm the save.

   6 The user confirms the action.

   7 The system saves the report to the user's device and provides a success message.

Secondary Scenario:

3i User selects an unsupported format.

    3i.1 System displays an "Unsupported Format" message and prompts the user to select a valid format.

4i System fails to save the report.

    4i.1 System displays a "Save Failed" error message.

    4i.2 User is prompted to try saving again or contact customer support.

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.

5.1.2 Style Requirements

LF-S1.

5.2 Usability and Humanity Requirements

5.2.1 Ease of Use Requirements

UH-EOU1.

5.2.2 Personalization and Internationalization Requirements

UH-PI1.

5.2.3 Learning Requirements

UH-L1.

5.2.4 Understandability and Politeness Requirements

UH-UP1.

5.2.5 Accessibility Requirements

UH-A1.

5.3 Performance Requirements

5.3.1 Speed and Latency Requirements

PR-SL1. The response time of all external APIs (expert calls, database updates, report generation, etc.) should be within 0.5 seconds.
Rationale: The average API response time is between 100ms to 500ms [1] and this is known as the typical expectation of performance. A response time in this range is expected by industry standards and is required for a competitive user experience. We would ideally want limited delays, to promote efficiency and satisfaction, and this API response time will ensure that.

PR-SL2. App start-up time should be around 2 seconds.
Rationale: The average start-up time in the industry is around 1.5 to 4 seconds [2]. This is the time frame that most systems and users typically wait for. Creating an application that does not fit these requirements will cause us to lose user interest.

PR-SL3. Account updates should be within 3 seconds.
Rationale: When a user updates their account to save a report, update personal data or look for items previously stored our system should efficiently fetch this information from our database. This is the most time it should take for old information to be requested, searched and displayed on the user screen [3].

5.3.2 Safety-Critical Requirements

PR-SC1. The app should provide safe suggestions for user reports.
Rationale: Since our app targets natural areas and focuses on the hunting community recommendations we give during our report generation must be as safe as possible. Focus there is always room for the unexpected but without safety, we lose the trust of our users.

5.3.3 Precision or Accuracy Requirements

PR-PA1. The app must be accurate in image classification around 85 percent.
Rationale: The goal of this app is to ensure species are correctly identified. While this application can be used by a diverse demographic, the hunting community is a large potential user base. For their specific needs, it is essential to ensure accuracy when looking at animal classification based on submitted images. The goal of our product should aim for the current industry standard which is 85 percent [4].

PR-PA2. The app must be accurate in description classification by 80 percent.
Rationale: Classification models that take in description input have an average 80 percent accuracy rate in responses [5]. This is something we should aim to uphold in the internal model to ensure we are consistent with industry standards.

5.3.4 Reliability and Availability Requirements

PR-RA1. The system must have an availability of 99.999
Rationale: 99.999 is a well-known figure for availability in the software industry [6]. An application or product should almost always be available to users and all updates and fixes should be done intelligently during off hours or in chunks (so the entire service is not unavailable all at once).

5.3.5 Robustness or Fault-Tolerance Requirements

PR-RFT1. The system must be able to handle unexpected inputs.
Rationale: If a user accidentally submits an invalid input or unexpected entry to any of our experts our product should be able to respond and prompt the user for more information. We need to ensure that expected crashes do not occur due to minor input errors.

PR-RFT2. The system must allow users to view saved reports even when there is no network.
Rationale: While it may not always be possible to make new searches in areas with no network it should be possible to view previous searches made. Especially for those hunting wifi and network is not a 100 percent ensured guarantee so having that option to view previous searches is a huge advantage.

5.3.6 Capacity Requirements

PR-C1. The system must be able to 5 simultaneous users.
Rationale: Ideally the system would be able to work with hundreds if not thousands of users at once. However, given the scope and time frame of the project, this number is more verifiable with the current team size.

5.3.7 Scalability or Extensibility Requirements

PR-SE1. The system must adhere to solid principles and design patterns.
Rationale: To ensure the application is best set up for long-term growth we must adhere to correct solid principles and design patterns when designing and ultimately building this product. The goal would be to create an effective application that is low coupled, correctly implemented independent modules and open for extensibility in the future.

5.3.8 Longevity Requirements

PR-L1. The system must update species information every month (update new animals in the area, seasonality, etc.)
Rationale: There are continuous discoveries, regulation changes and seasonal differences to keep in mind for species classification. It is essential that our database updates during key moments and ensures our lists of species and huntable species are accurate and up to date.

5.4 Operational and Environmental Requirements

5.4.1 Expected Physical Environment

OE-EPE1. N/A

5.4.2 Requirements for Interfacing with Adjacent Systems

OE-IA1. The system must send and receive information from the user to our backend database and external API experts (e.g. for image classification).
Rationale: To have a well-functional appreciation our system must be able to communicate effectively based on user input and return an accurate response from external connectors.

5.4.3 Productization Requirements

OE-P1. N/A

5.4.4 Release Requirements

OE-R1. The app must be compatible with Android 14 and above and Apple iOS 17 and above. **Rationale:** This will ensure the most range to reach the most number of users.

5.5 Maintainability and Support Requirements

5.5.1 Maintenance Requirements

MS-M1. Requirement: The system must have monthly software updates to fix security vulnerabilities, fix bugs, and enhance performance.

MS-M2.   Rationale: Regular updates keep the system secure.

5.5.2   Supportability Requirements

MS-S1.   Requirement: The system should have automated error reporting to detect failures within 5 minutes.
Rationale: Helps identify and fix issues quickly by having alerts on critical failures.

5.5.3   Adaptability Requirements

MS-A1.   Requirement: The system must be designed to be compatible with the latest Android version.
Rationale: Increases usability in the application.

MS-A2.   Requirement: The UI should be designed with modular components to be easily and quickly replaced in case of redesigns or accessibility service needs.
Rationale: Keeps the system adaptable to future needs and changes.

5.6   Security Requirements

5.6.1   Access Control Requirements

SR-AC1.   Requirement: The system must implement Role-Based Access Control (RBAC) to define permission levels (e.g., Admin, Registered User, Guest).
Rationale: Limits unauthorized access to sensitive functionalities, reducing security risks.

SR-AC2.   Requirement: Multi-Factor Authentication (MFA) should be required for admin and high-privilege accounts.
Rationale: Strengthens authentication security and prevents unauthorized account takeovers.

5.6.2   Integrity Requirements

SR-INT1.   Requirement: All sensitive data must be encrypted using AES-256 for storage and TLS 1.3 for data transmission.
Rationale: Ensures standard data security for storing user information.

5.6.3   Privacy Requirements

SR-P1.   Requirement: The system must follow PIPEDA (Personal Information Protection and Electronic Documents Act) by obtaining explicit user consent before collecting personal data.
Rationale: Ensures legal compliance and protects user privacy rights.

5.6.4   Audit Requirements

SR-AU1.   Requirement: The system must keep audit logs for a minimum of one year, tracking users and developments.
Rationale: Necessary for security incidents and meets compliance requirements.

5.6.5   Immunity Requirements

SR-IM1.   Requirement: Regular penetration testing should be conducted at least quarterly to identify security weaknesses.
Rationale: Ensures ongoing security resilience by proactively addressing potential threats.

5.7 Cultural and Political Requirements

5.7.1 Cultural Requirements

CP-C1.   The system should integrated Indigenous and Local Knowledge (ILK).
Rationale: The system shall incorporate Indigenous and local knowledge in its wildlife identification processes, ensuring that traditional ecological knowledge is respected and utilized appropriately. Integrating ILK enhances accuracy and cultural relevance in wildlife identification while recognizing the contributions of traditional knowledge systems in conservation efforts [7].

CP-C2.   The system should have at minimum bilingual support of English and French for Cultural Accessibility.
Rationale: The system shall provide multilingual support, to accommodate users from diverse cultural backgrounds and as well as include Canada's two national languages. Offering multilingual access ensures inclusivity and allows users from different linguistic groups to engage effectively with the system, fostering broader participation in conservation initiatives [8].

CP-C3.   The system shall avoid the use of imagery, terminology, or content that could be considered culturally insensitive or offensive to any user group.
Rationale: Ensuring cultural sensitivity helps prevent alienation of user communities and promotes a respectful and inclusive environment for conservation efforts [9].

5.7.2 Political Requirements

CP-P1.   The system shall adhere to all federal and provincial regulations concerning species protection.
Rationale: This includes restrictions on hunting, tracking, and photographing endangered animals. Ensuring compliance with these laws supports conservation efforts and mitigates potential legal risks [10].

CP-P2.   The system shall facilitate secure data sharing with governmental and non-governmental environmental agencies.
Rationale: Some of these are the Environment Canada and the Ontario Ministry of Natural Resources. This data-sharing process ensures that conservation efforts are well-informed and that wildlife populations are effectively monitored [11].

5.8 Legal Requirements

5.8.1 Compliance Requirements

LR-COMP1.   All personal information collected, including data shared with third parties for processing, must be securely stored and protected.
Rationale: This is in compliance with PIPEDA (Personal Information Protection and Electronic Documents Act) Fair Information Principle 1 - Accountability [12].

LR-COMP2.   The purpose for collecting personal information, including information shared with third parties, must be clearly identified before or at the time of collection.
Rationale: This aligns with PIPEDA Fair Information Principle 2 - Identifying Purposes, ensuring transparency in data collection [13].

LR-COMP3.   The system shall obtain explicit user consent for collecting, processing, or sharing personal data.
Rationale: This follows PIPEDA Fair Information Principle 3 - Consent, ensuring users are aware and agree to how their data is being used [14].

LR-COMP4.   The system shall only collect data necessary to fulfill its core functions and services.
Rationale: This complies with PIPEDA Fair Information Principle 4 - Limiting Collection, preventing unnecessary data accumulation [15].

LR-COMP5.   Personal data must only be used or disclosed for the purpose for which it was collected, unless
the user consents otherwise or under legal obligations.
Rationale: This aligns with PIPEDA Fair Information Principle 5 - Limiting Use, Disclosure,
and Retention, ensuring responsible data management [16].

LR-COMP6.   The system must comply with the Canadian Anti-Spam Legislation (CASL), ensuring that
users do not receive unsolicited messages without prior consent.
Rationale: CASL prohibits sending commercial messages without user consent, protecting
users from spam and unwanted communications [17].

LR-COMP7.   The system shall comply with the Species at Risk Act (SARA), ensuring that data related to
endangered species is handled in a manner that does not violate conservation laws.
Rationale: SARA prohibits activities that may negatively impact endangered species and
their habitats [18].

5.8.2 Standards Requirements

LR-STD1.   The system shall not use notifications for promotional or advertising purposes unless explicitly
enabled by the user.
Rationale: This follows Google's Play Store guidelines for app quality and user experience [19].

LR-STD2.   The system shall ensure that all touch targets within the mobile application are at least 48dp
in size to ensure accessibility for users with motor impairments.
Rationale: This is a standard usability requirement recommended by Google for accessibility
compliance [20].

LR-STD3.   Any personal or sensitive user data shall not be logged in system logs or application-specific
logs.
Rationale: This standard ensures compliance with security and privacy best practices outlined
by Google and OWASP [21].

LR-STD4.   The system shall store all sensitive user data in encrypted internal storage rather than external
or publicly accessible storage.
Rationale: This follows Google's recommended security practices to protect user privacy and
prevent data leaks [22].

6   Innovative Feature

The chosen innovative feature to implement is a comprehensive report generation system. When a user takes
a picture of an animal, the app would not only identify the species but also provide in-depth information
on the animal's habitat, diet, behavior, and conservation status. This will be especially useful for the app's
target demographic, hunting enthusiasts and wildlife professionals who would benefit greatly from having a
convenient and centralized source of information. Additionally, this transforms the app from just simple a
tool for identification into a powerful resource for wildlife education and exploration. This enables the general
public to take advantage of our informative reports, resulting in an interactive learning tool for everyone.
This is heightened by the the ability to save and share the reports, allowing users to contribute show their
cool reports to friends, or even simply just log their wildlife encounters.

Some alternative features are as follows:

- Chatbot for more user interactivity, customer support, etc

- AI-Powered Behavior Prediction (feeding, hibernating, migrating)

- Interactive Educational Content (Videos based on user's pictures and location)

- Community Discussion and Forum

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.