Software Design Document

AI Based Crop Disease Detection System

Submitted by

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Submitted to

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Meeting Details

Sr No	Details	Date	Supervisor Signature

1. Introduction

1.1 Purpose

The purpose of this SDD is to describe the design of the AI-Based Crop Disease Detection System, which detects crop diseases from leaf images and provides treatment suggestions. It serves as a reference for developers, testers, and maintainers of the system.

1.2 Scope

This system supports detection and classification of crop diseases for crops like wheat, rice, maize, tomato, and potato using AI models (CNN). It provides a web interface for users and can later integrate with mobile apps.

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2. System Architecture

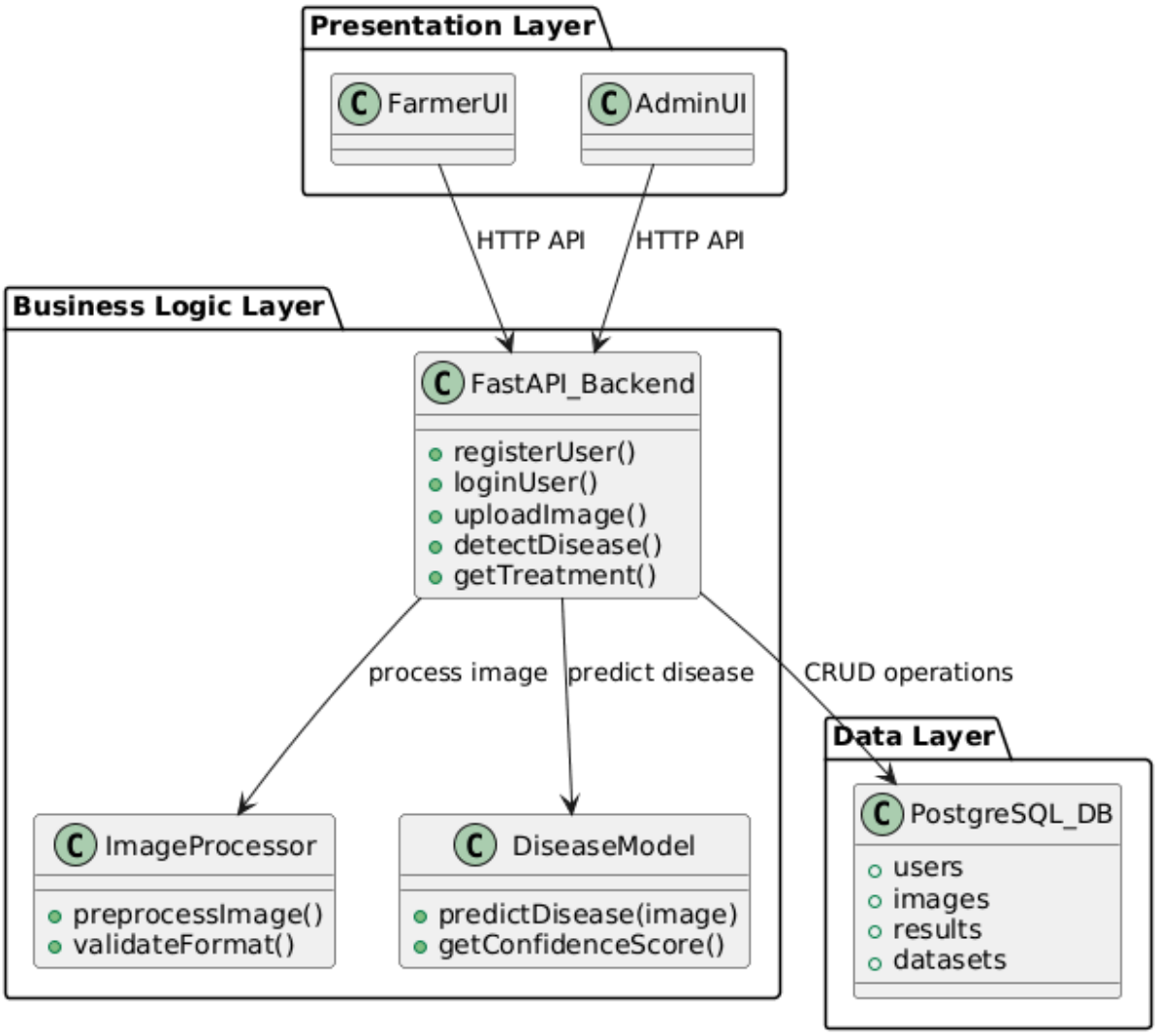
The system follows a **3-tier architecture**:

1. **Presentation Layer:** Web and mobile interfaces for Farmers and Admins (Flutter for mobile, web-compatible UI).

2. **Business Logic Layer:** FastAPI backend handling user management, image processing, and AI model prediction.

3. **Data Layer:** PostgreSQL database for storing users, image uploads, detection results, and datasets.

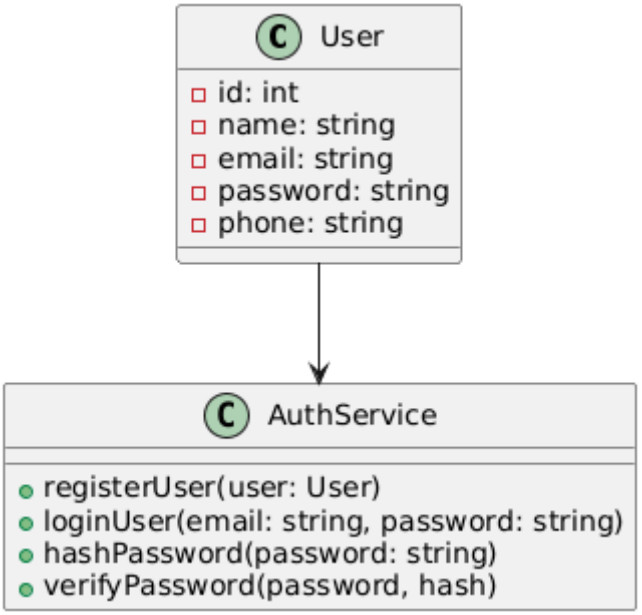
High-Level Architecture Diagram (PlantUML):



3. Module Design

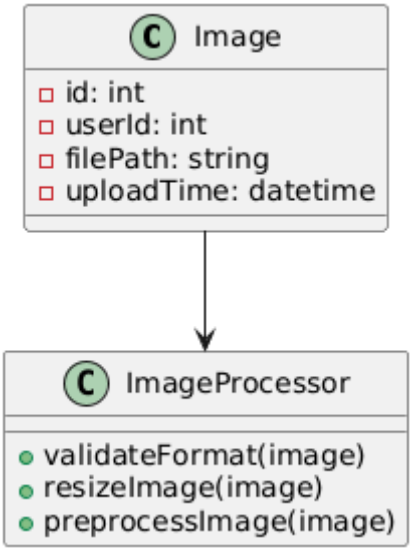
3.1 User Management Module

- **Responsibilities:** Handles user registration, login, authentication.
- **Classes:**



3.2 Image Upload Module

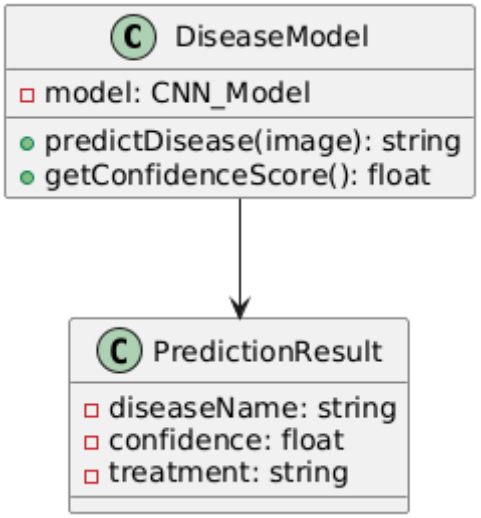
- **Responsibilities:** Accepts leaf images, validates format, stores image in DB/storage.
- **Classes:**



3.3 Disease Detection Module

- **Responsibilities:** Runs the AI model (CNN) on uploaded images and returns disease predictions.

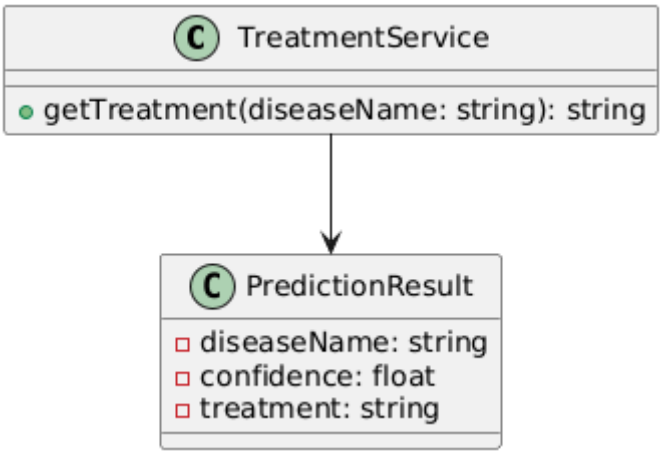
- **Classes:**



3.4 Treatment Module

- **Responsibilities:** Provides disease description and treatment suggestions.

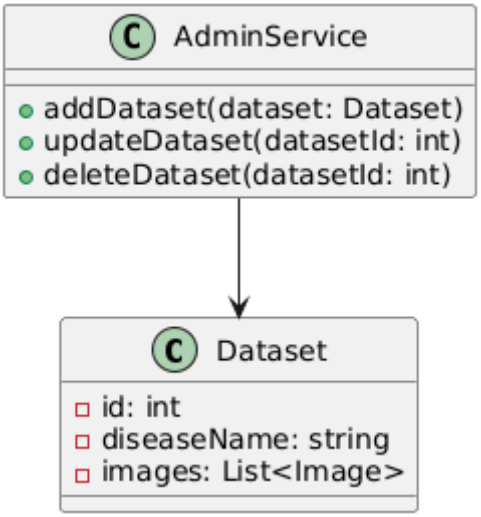
- **Classes:**



3.5 Admin Dataset Management Module

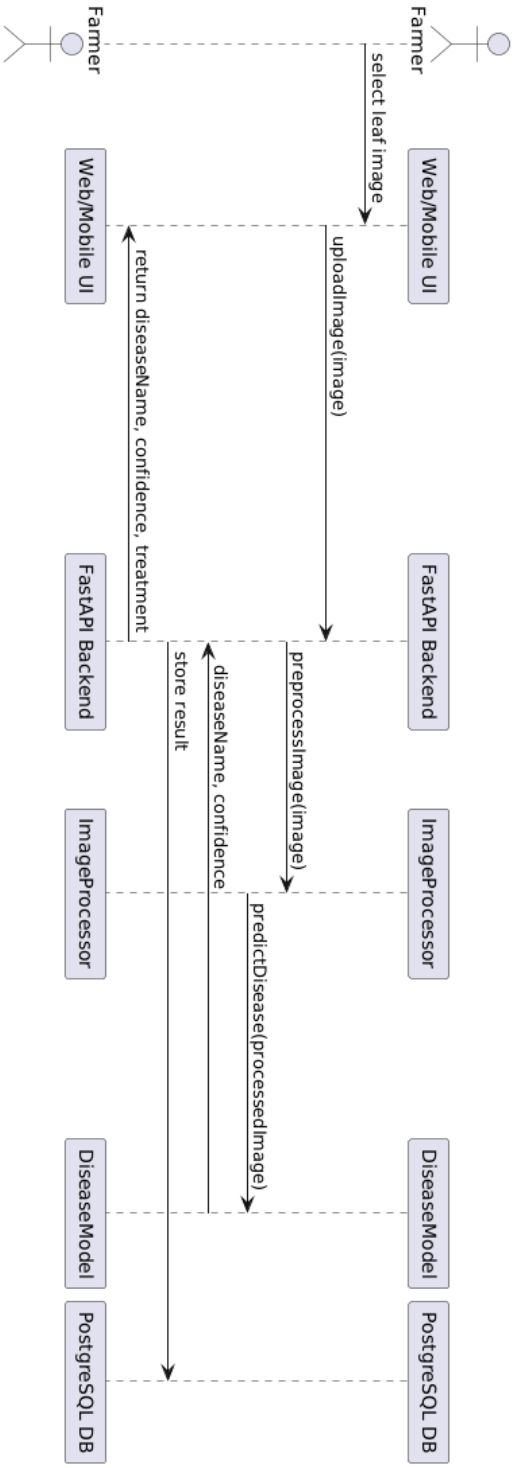
- **Responsibilities:** Admin can manage datasets for training and retraining the AI model.

- **Classes:**

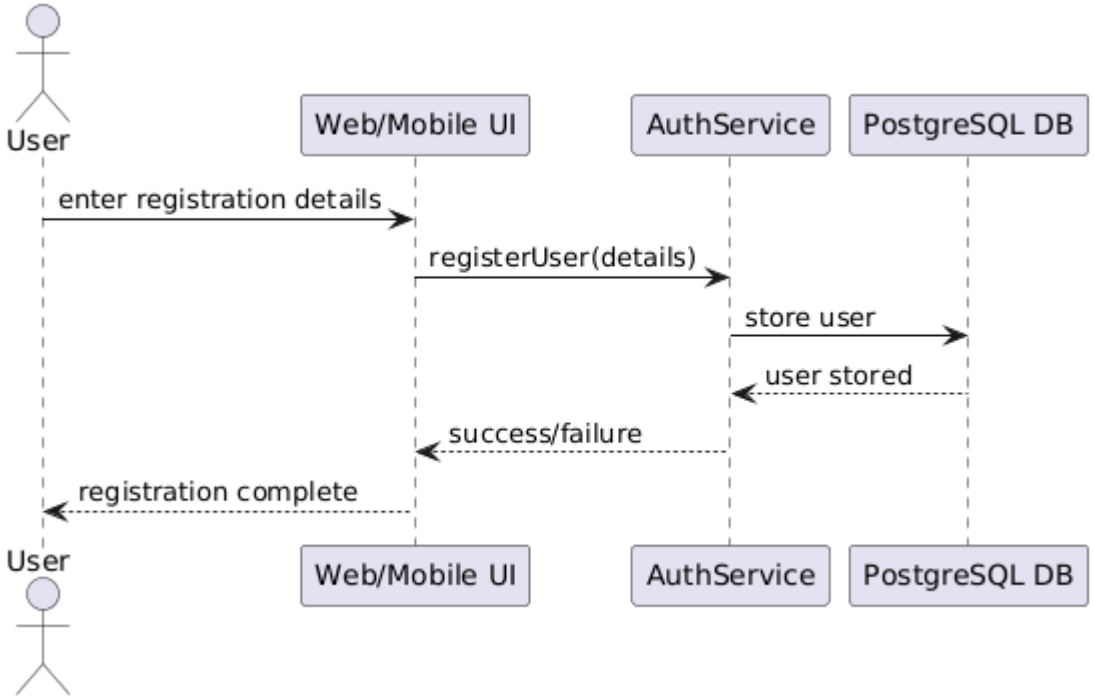


4. Sequence Diagrams

4.1 Upload Leaf Image & Disease Detection



4.2 User Sign-Up

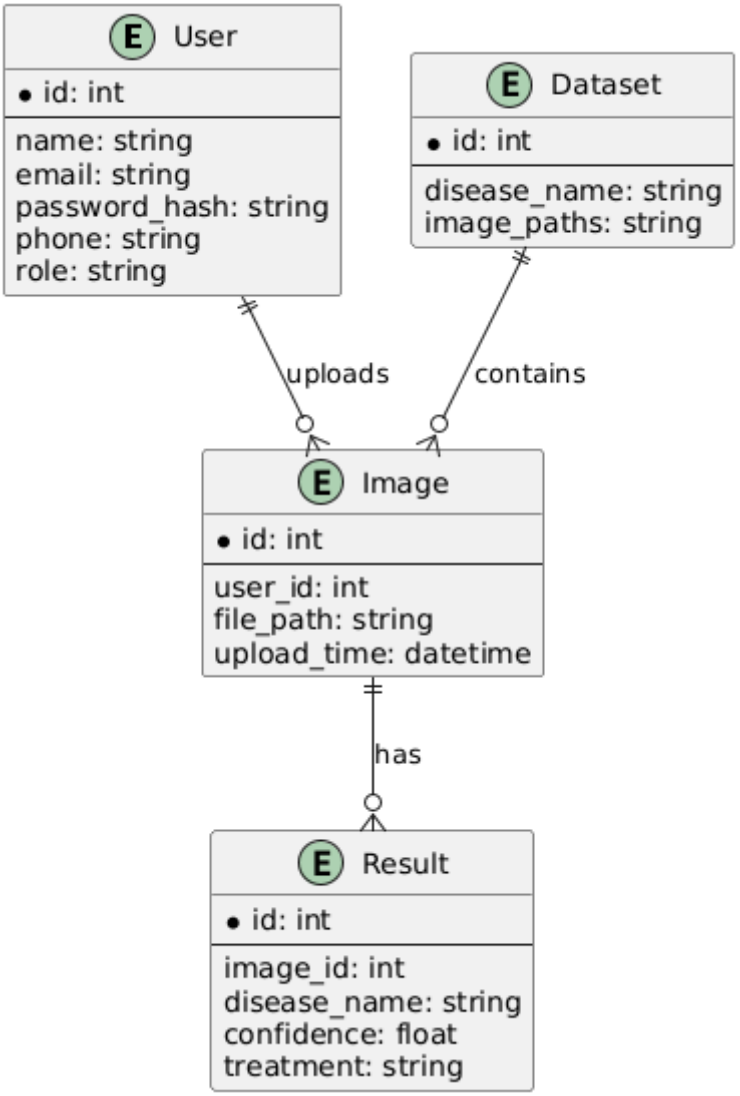


5. Database Design

Tables:

1. **Users**
    - id (PK), name, email, password_hash, phone, role
2. **Images**
    - id (PK), user_id (FK), file_path, upload_time
3. **Results**
    - id (PK), image_id (FK), disease_name, confidence, treatment
4. **Datasets**
    - id (PK), disease_name, image_paths

ER Diagram:



6. Technologies

Layer	**Technology**
Frontend	Flutter
Backend	FastAPI (Python)
AI/ML	TensorFlow, Keras, OpenCV
Database	PostgresSQL
Dataset	PlantVillage
Platform	WebApplication

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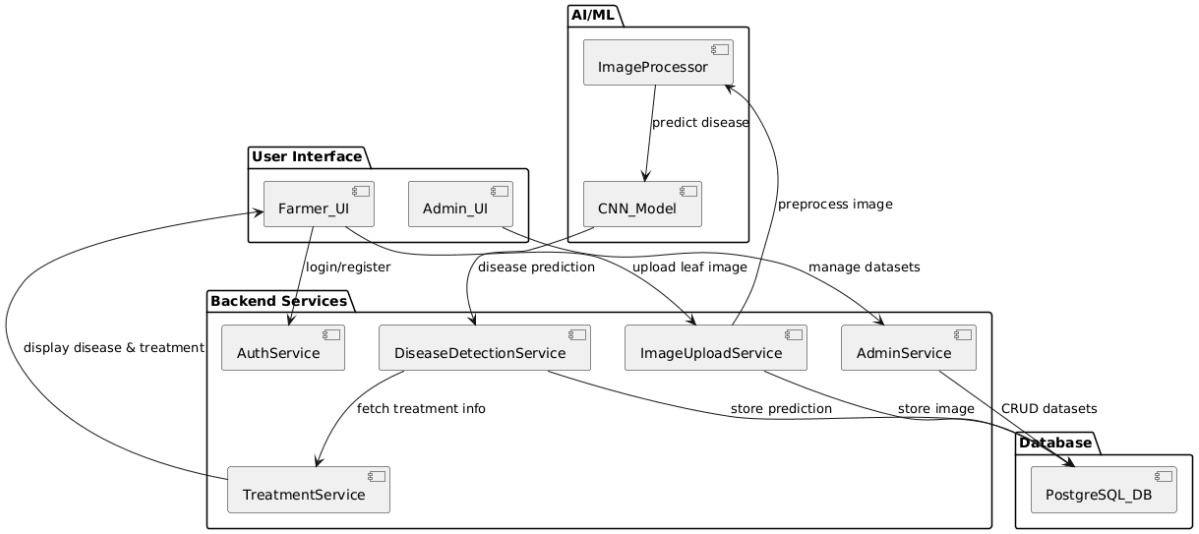
7. Non-Functional Design

- **Performance:** Results within 5 seconds
- **Scalability:** Modular design allows adding new crops and diseases.
- **Security:** Secure password storage, HTTPS, role-based access control.
- **Reliability:** High availability through containerization or cloud deployment.
- **Usability:** Simple, mobile-friendly UI for farmers.

8. Component Diagram – Disease Detection System



9. Activity Diagram – Disease Detection Workflow