Web Services Project

AgriCal: Digital Transformation in Tunisian Agriculture

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Motivation

- Agriculture is a key sector in Tunisia, yet it faces inefficiencies in resource allocation and decision-making.
- Farmers struggle with market fluctuations, climate variability, and lack of access to real-time data.

Challenges

- Limited access to weather forecasts and commodity prices.
- Poor disease detection leading to significant crop losses.
- Lack of a unified digital platform for agricultural stakeholders.

Primary Goal

- Develop a web service that empowers Tunisian farmers with actionable data insights.

Key Features

- Crop Management and Task Scheduling.
- Weather Forecasting and Commodity Price Tracking.
- AI-based Disease Detection and Agricultural Marketplace.
- Community Forum for Knowledge Exchange.

FastAPI

- A high-performance web framework for building APIs.
- Automatic validation and interactive documentation.
- Speed and ease of use.

SQLite

- A file-based relational database used during development for storing data.
- Easy setup without requiring a separate database server.
- Ideal for development and testing environments, with simple setup and management.

JWT

- Secure user authentication and session management.
- Enables users to log in and access protected routes with token-based authentication.

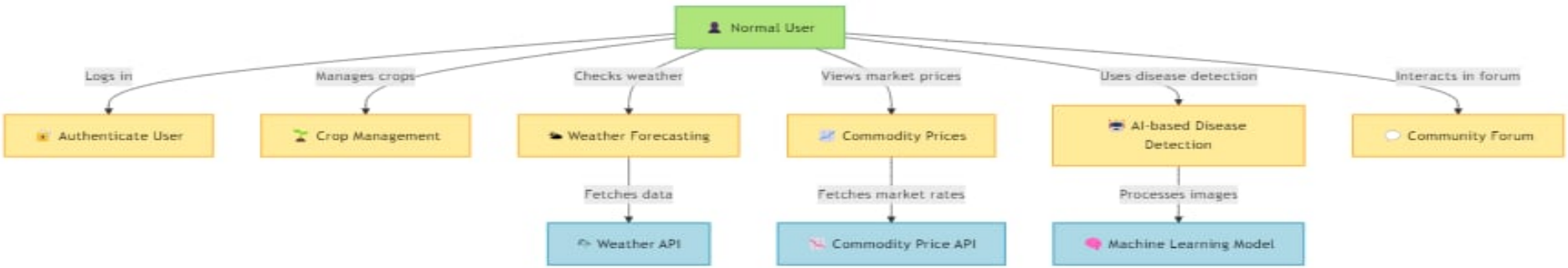
Open-Meteo

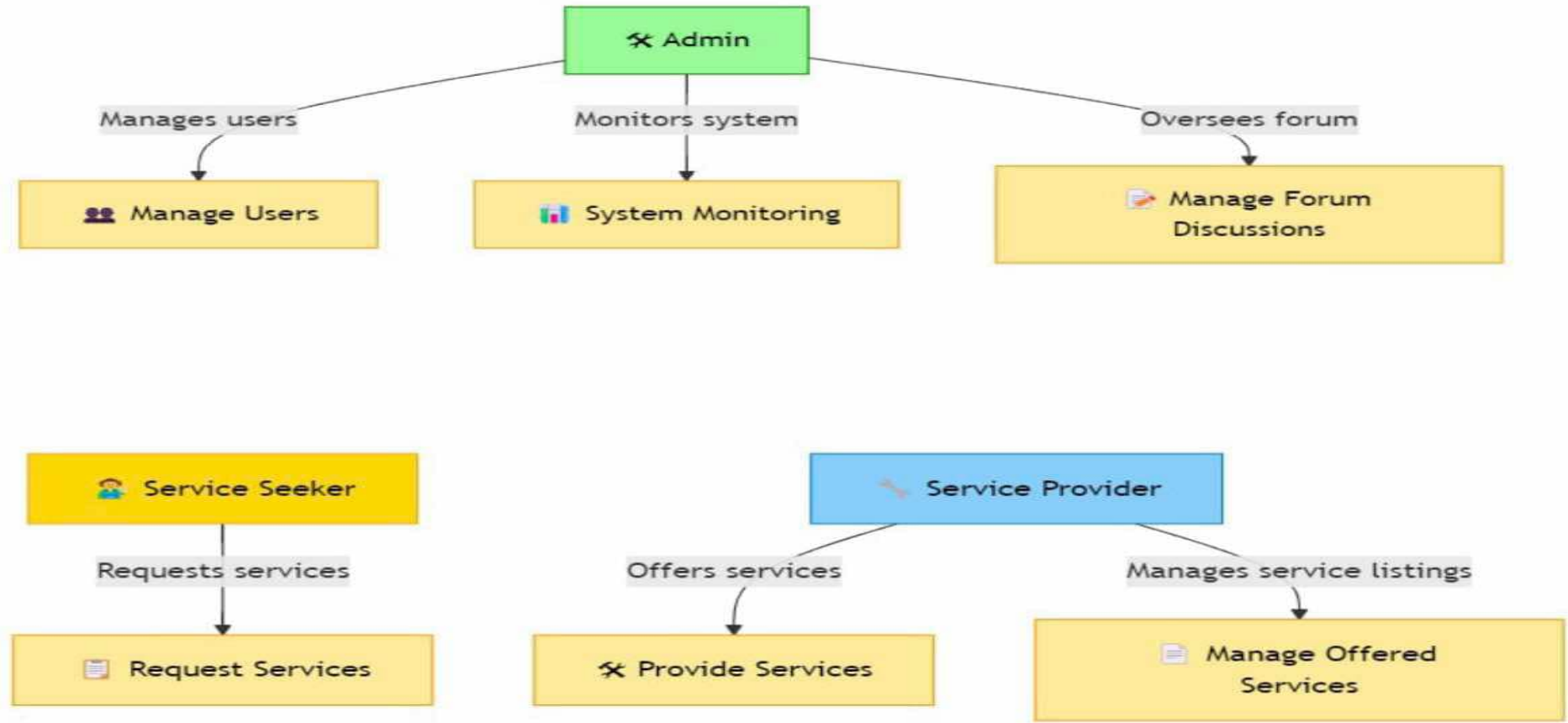
- Open-Meteo: Provides free and fast weather APIs for global forecasting.
- Delivers real-time and hourly weather data, including temperature, humidity, and precipitation predictions.
- Essential for agricultural planning and crop protection against extreme weather conditions.

APISED

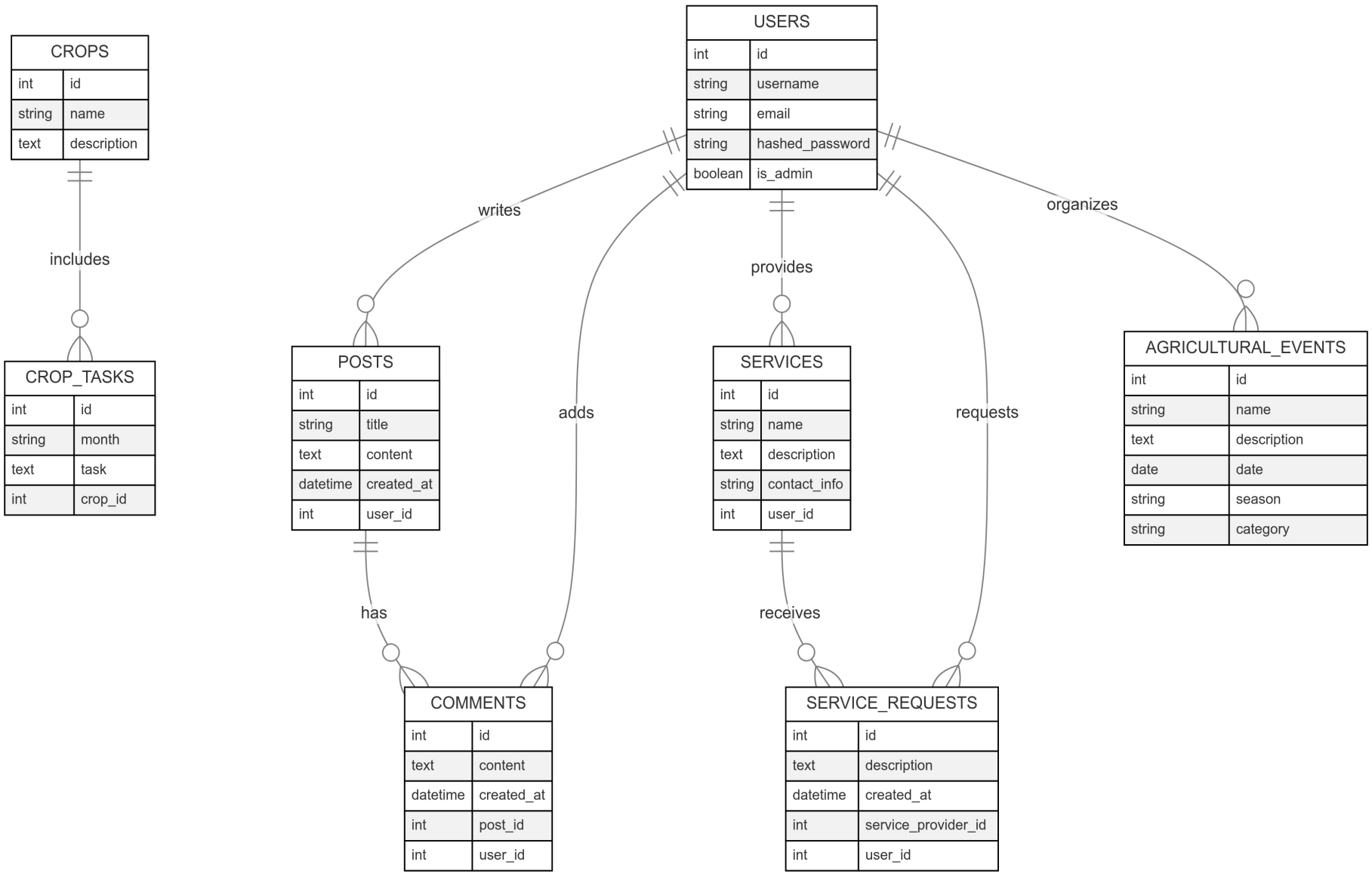
- APISed: A commodity price tracking API providing up-to-date market prices.
- Helps farmers and traders monitor fluctuations in crop and livestock prices.

UML Diagram


Normal User
Logs in
Manages crops
Checks weather
Views market prices
Uses disease detection
Interacts in forum
Authenticate User
Crop Management
Weather Forecasting
Commodity Prices
AI-based Disease Detection
Community Forum
Fetches data
Fetches market rates
Processes images
Weather API
Commodity Price API
Machine Learning Model


Admin
Manages users
Monitors system
Oversees forum
Manage Users
System Monitoring
Manage Forum Discussions
Service Seeker
Service Provider
Requests services
Offers services
Manages service listings
Request Services
Provide Services
Manage Offered Services

Database Structure



CRUD operations for API endpoints:

- **Authentication and User Management:** to handle user registration, login, and authorization.
- **Crop Management and Scheduling:** to track, update, and manage crop cycles.
- **Weather Data Retrieval and Market Tracking:** to provide weather forecasts and market price trends.
- **Disease Detection and Service Provider Management:** to connect farmers with agricultural service providers.

User Management end points

UserLoginAuth

POST /register Register

POST /login Login For Access Token

PUT /update-profile Update Profile

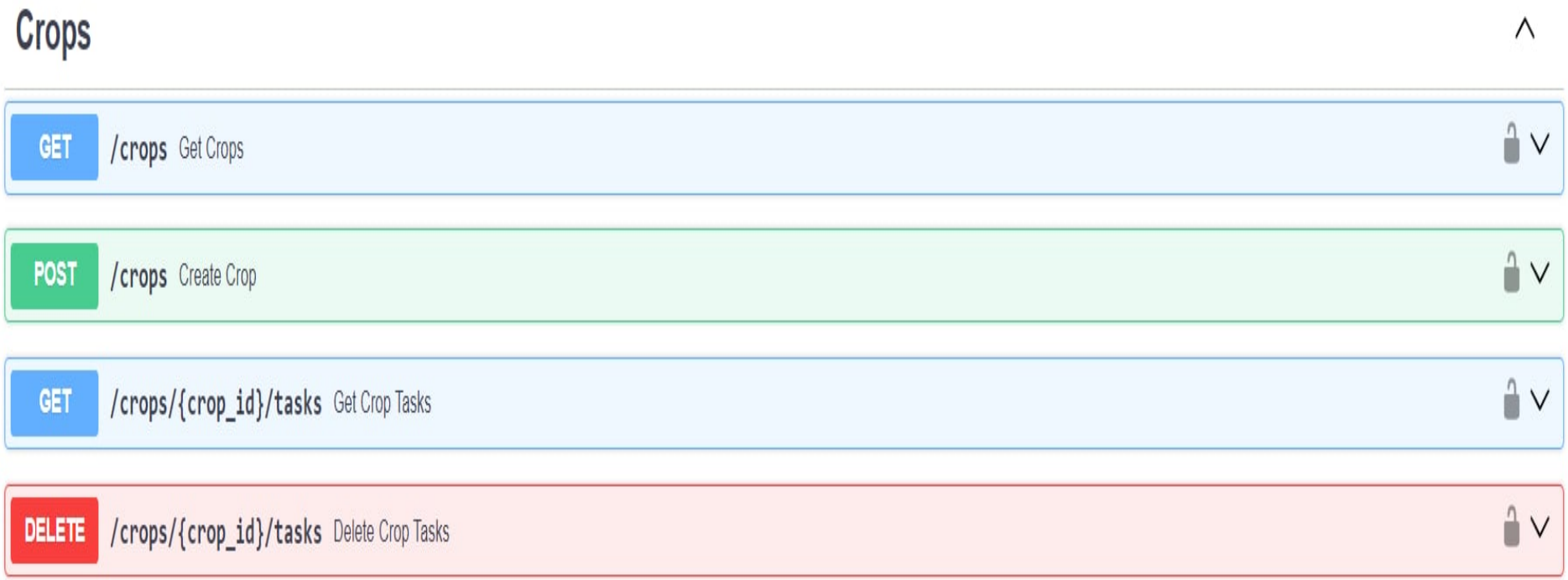
ProfileDetails

GET /profile View Profile

UserManagement

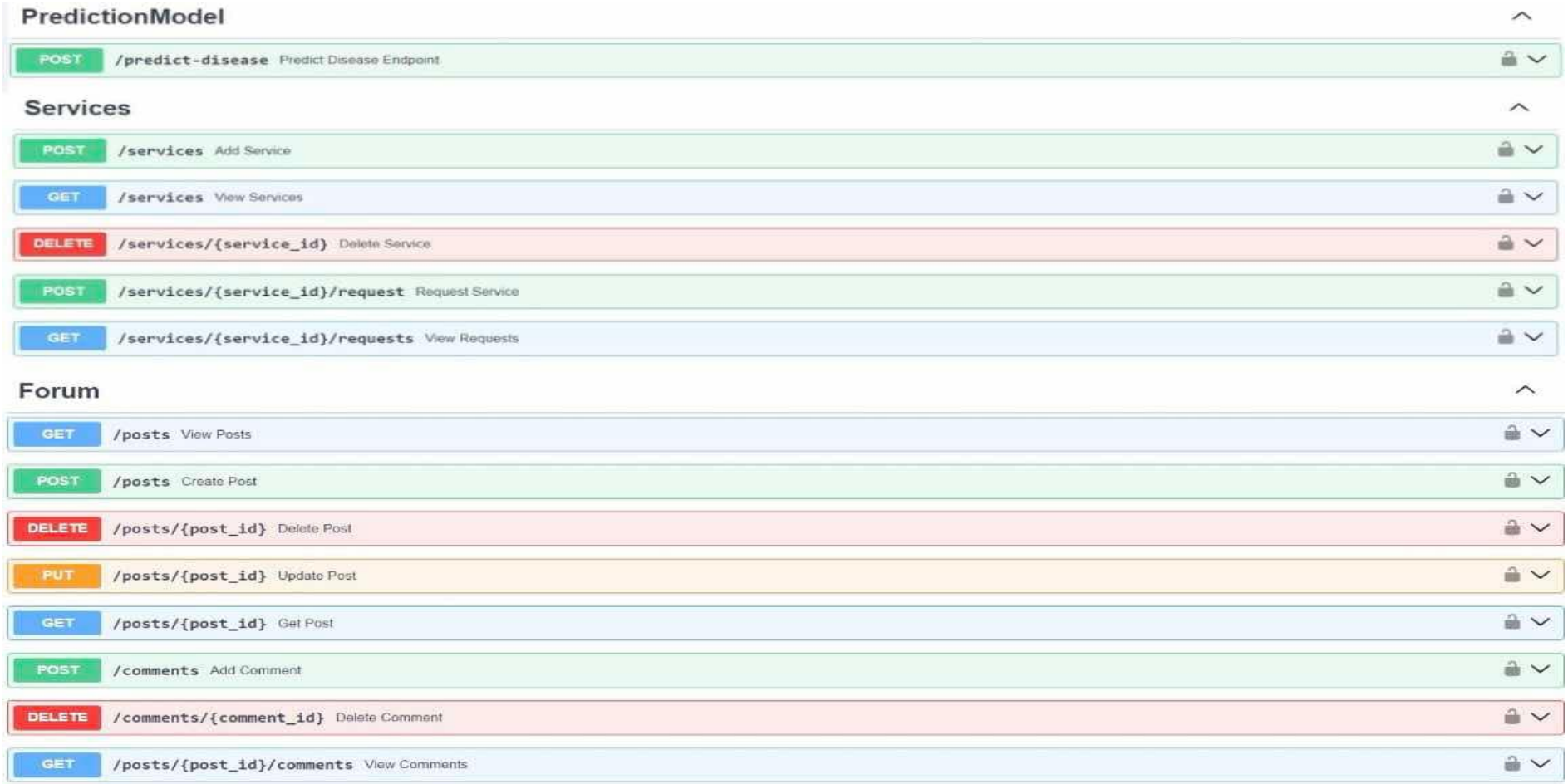
DELETE /users/{user_id} Delete User

Crop Management end points



Weather and Market Tracking end points

Disease Detection and Service Provider end points



- **FastAPI** for backend API development.
- **SQLite** for database management.
- **OAuth2 and JWT** for authentication.
- **Docker** for deployment and scalability.

AgriCal bridges the gap between traditional farming and digital transformation. In other words, it revolutionizes the agricultural sector.

- Optimizes resource allocation, reduces crop losses through early disease detection, and promotes eco-friendly farming practices.
- Provides farmers, with real-time insights for better decision-making.
- Encourages collaboration through the agricultural community forum.

- **AI-Driven Yield Optimization:** Utilize machine learning models trained on Tunisian agricultural data to provide highly accurate yield predictions, helping farmers optimize planting schedules and resource usage.
- **Advanced API Ecosystem:** Expand integrations to include soil nutrient analysis, water management systems, and blockchain-based supply chain tracking for enhanced transparency.
- **Smart Mobile Platform:** Develop an intuitive mobile application that provides real-time alerts, decision support tools, and community-driven agricultural advice tailored to individual farm needs.

Thank You for Your Attention!