RMIT UNIVERSITY

School of Science, Engineering & Technology

Advancing sustainability and transparency through mobile-enabled sensor data analytics

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Background & Motivation

Farmalytic is a project focuses on improving agriculture in Vietnam in relation to rising global concerns regarding the safety, sustainability, and traceability of food and its supply chains. Traditional methods are still very much reliant on intuition and visual inspections. In light of these issues, we aim to design and create an application which it is hoped would enhance the productivity as well as the competitiveness of Vietnam's agricultural industry.

Objectives

Our aim to further enhance Vietnam's agriculture abilities by:

- Increase product safety and Quality: Through the use of multiple sensors.
- Save time: Can track through multiple farms from the app.
- Tracking: Receive daily informations about farms to be make better decisions and solutions to tackle any problems.

Methodology

- **System Design**

Establish system architecture with React Native for the UI, FastAPI for the backend, user information with Supabase, InfluxDB for time-series sensor data, and AWS IoT Core for cloud communication.
Create a database schema for user verification, sensor data, and system resources.
Add Grafana for the real-time environmental data visualization.

- **App Development**

Develop the mobile application with React Native for broader accessibility.
Add user verification and a secure log in with Supabase.
Design views for the parameters (temperature, humidity, soil pH, UV index).
Create navigation from the metrics to detail pages to recommended pages powered by AI (PyTorch).

- **AI and Recommendation Engine**

Generate text-based farming recommendations from the sensor data using PyTorch models.
Develop plans for recommended extensions from outside trusted sources in later iterations.
Add time-range filters for recommendation (1 day, 7 days, 30 days).

Technology	Tools	Alternatives	Justification
Front End	React Native	Flutter, Native iOS/Android	Selected for cross-platform compatibility and UI responsiveness, particularly for integrating real-time dashboard updates
Back End	Fast API	Node.js (Express), Django	Async support and suitable for ML integration
Database	InfluxDB, Supabase	Firebase, MongoDB	Supabase provides InfluxDB optimized for time-series sensor data, along with PostgreSQL and authentication.
Communication	MQTT	HTTP, CoAP	Reliable and lightweight for real-time communication
AI/ML	PyTorch	TensorFlow, Scikit-learn	PyTorch is flexible, research-friendly, good mobile deployment
Visualization	Grafana	Power BI, Tableau	Grafana is open-source, customizable, and ideal for time-series data. It is good for dashboards used for server-side monitoring
DevOps	Docker	Kubernetes, Vagrant	Docker simplifies deployment and testing
Cloud Deployment	AWS IoT Core	Google Cloud IoT	Scalable cloud architecture and MQTT are seamlessly integrated with AWS IoT Core

Experiment and result

Coding Result: Sensors has successfully operated with clear transfer and storages of data received through multiple testing, percise control through either app-based or physical controller. And real-time notifications and adjustment via Wifi.
Data Observation: Data sending path and storage are successful and can be observed through Supabase's web application interfaces.