GROUP 69.

Farm Fusion

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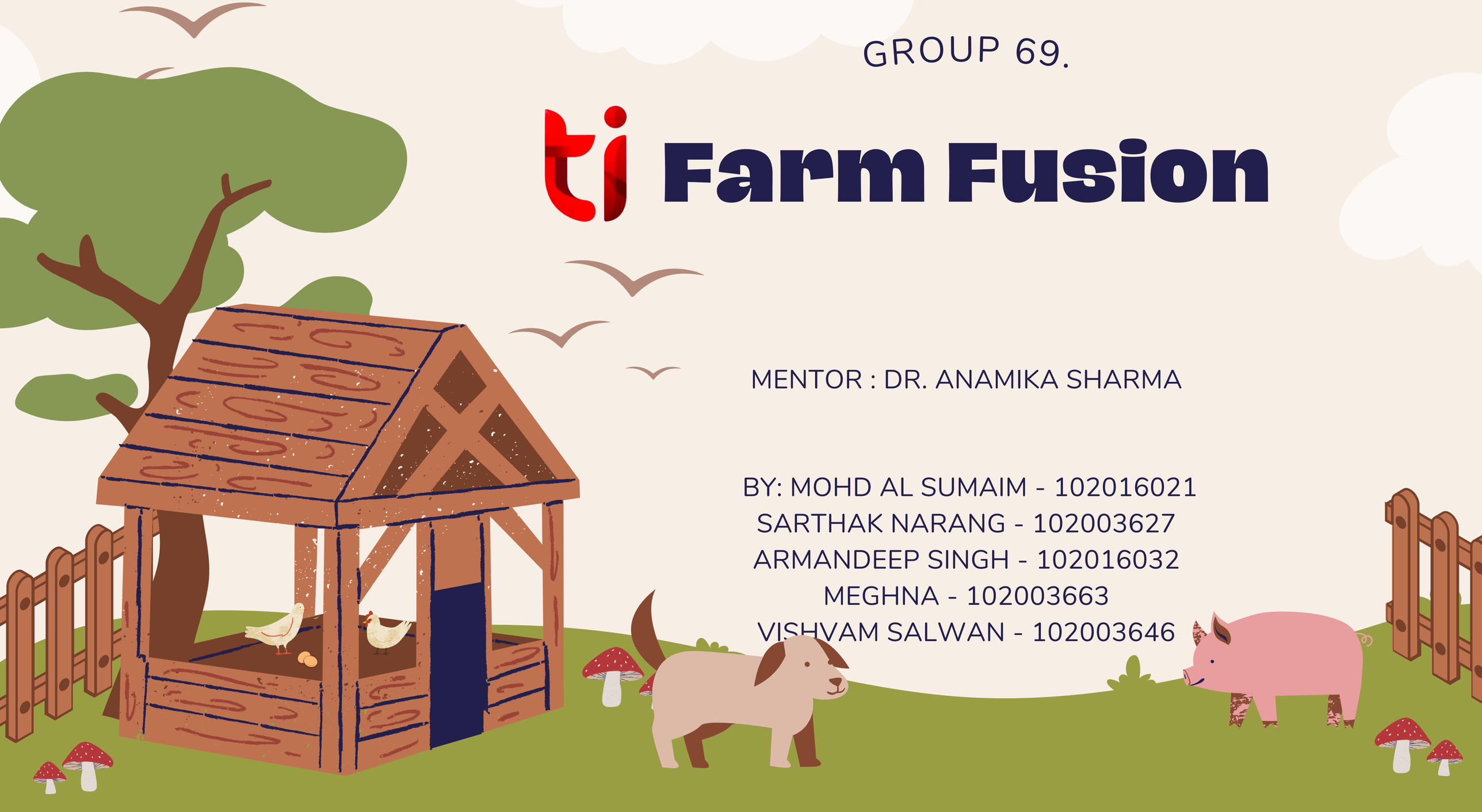

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Background

MOTIVATION FOR PROJECT:

- Absence of direct farmer-to-consumer sales.
- Barriers hindering small-scale farmers.
- Need of technology revolutionizing farming practices.
- Enable farmers to reach a broader market through the online platform.

GOALS:

- Creating an e-tail platform for buying and selling agriculture products.
- Predict fair market prices based on quality measures and current market trends
- Empower farmers with valuable soil health insights through sensor-based hardware.
- Facilitate informed decisions on crop selection, resource allocation, and cultivation practices.

Scope and Utility

Scope:

- Soil Profiling
- Crop Quality Detection and Price Prediction
- Machine Learning Recommendation System
- E-commerce Integration

Utility:

- Technology shift in agriculture sector
- Features collaboration and knowledge sharing
- Empowering data- driven analysis in farming
- Fostering trust and satisfaction among customers

Objectives

A explore the diverse algorithms for crop quality classification and price prediction

B source relevant image dataset and scrape dataset for price prediction

C provide personalized crop and fertilizer recommendations

D enhance the e-commerce platform appeal by introducing innovations

E design a testing toolkit for soil profiling, monitoring and continuous feedback

F propose an effective technique to predict prices to benefit both sellers and customers

Literature Survey

Sobhana et al. [1] - Automated Seed Quality Prediction:

- Addressed the risk of farmers replacing good quality seeds with damaged ones during manual collection.
- Proposed a computer vision and deep learning solution to predict seed quality.
- Utilized OpenCV for seed detection and a convolutional neural network for predicting seed purity, reducing manual labor.

Chen et al. [2] - Vendor Evaluation Model:

- Proposed a case-based distance approach for evaluating agricultural product vendors in China.
- Utilized MCDA for ranking decisions, enhancing efficiency and effectiveness.
- Flexible model construction with potential to simplify and improve current vendor evaluation models.

Patel et al. [3] - Transparent E-commerce in Agriculture:

- Highlighted challenges in the traditional agriculture trading process involving middlemen.
- Advocated for a transparent e-commerce solution to ensure fair returns for farmers.
- Emphasized the need for minimal or no brokerage, promoting farmer profitability.

M. Pyingkodi et al. [4]: Soil Profile Significance

- Soil quality and fertility determination using sensors and continuous transmission.
- NPK sensors for quick measurement of nitrogen, phosphorus, and potassium.
- Use of kernel density estimation algorithm and machine learning for nutrient level analysis.

Tools and Techniques

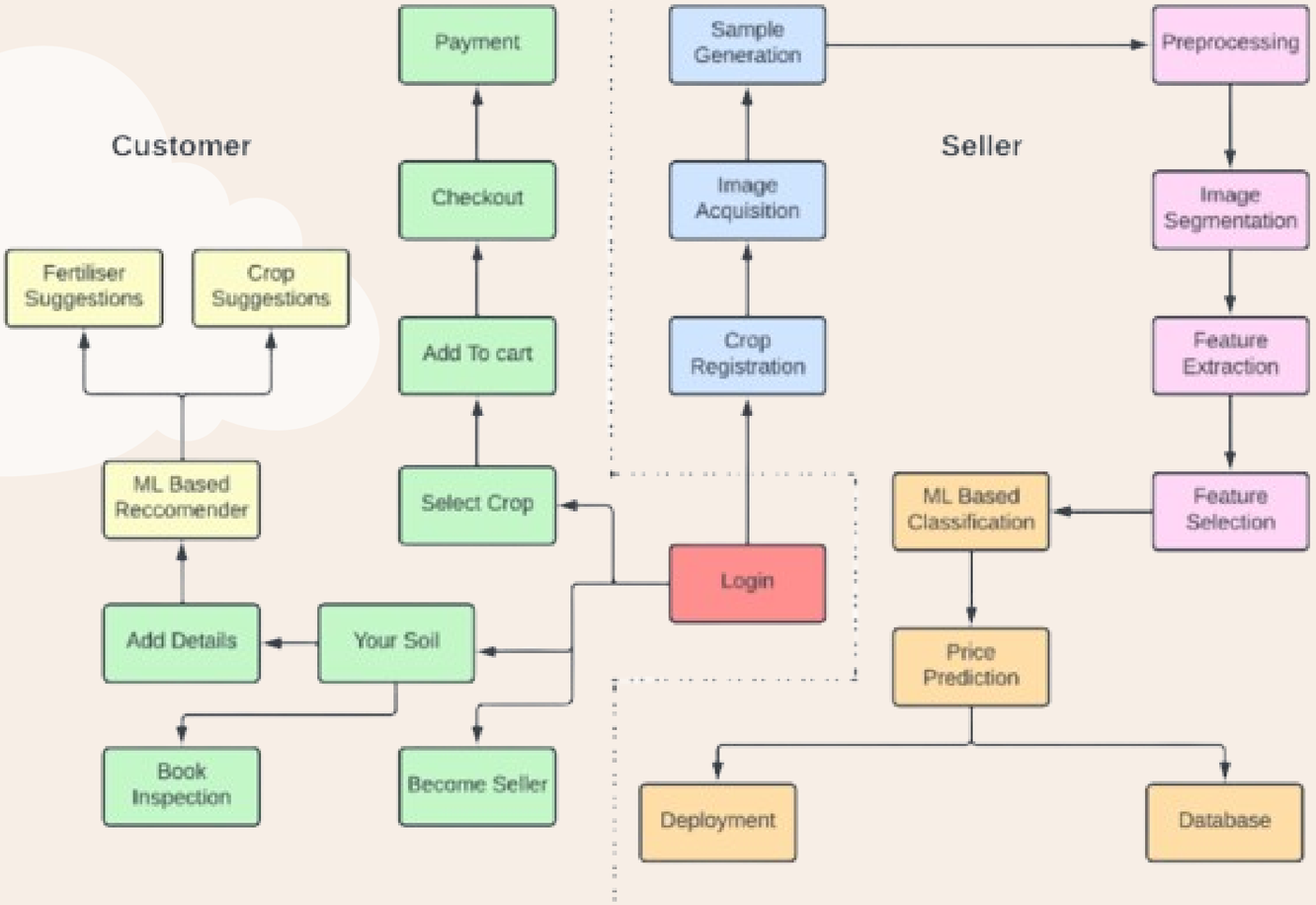
Software:

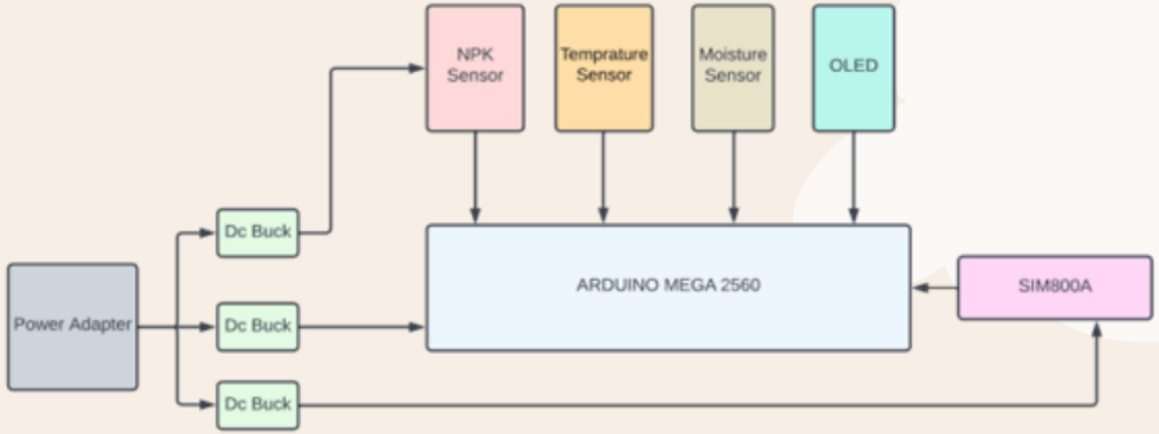
Prog Lang : Python, JavaScript, HTML and CSS
Web Dev Frameworks : Flask, React
ML libraries : TensorFlow, PyTorch
DBMS : NoSQL, MongoDB
VCS : Github
Hosting : Docker, AWS Lambda
Design : StarUML, Project Libre, Figma, Canva
Environment: VS Code, Jupyter , PyCharm, Google Collab

Hardware :

Arduino 2560
NPK sensor
RS485 Modbus Module
SIM 800A
OLED O.96" Display
Soil Moisture Sensor
DS18B20 Temperature Sensor
LM2596 DC Buck

Architecture

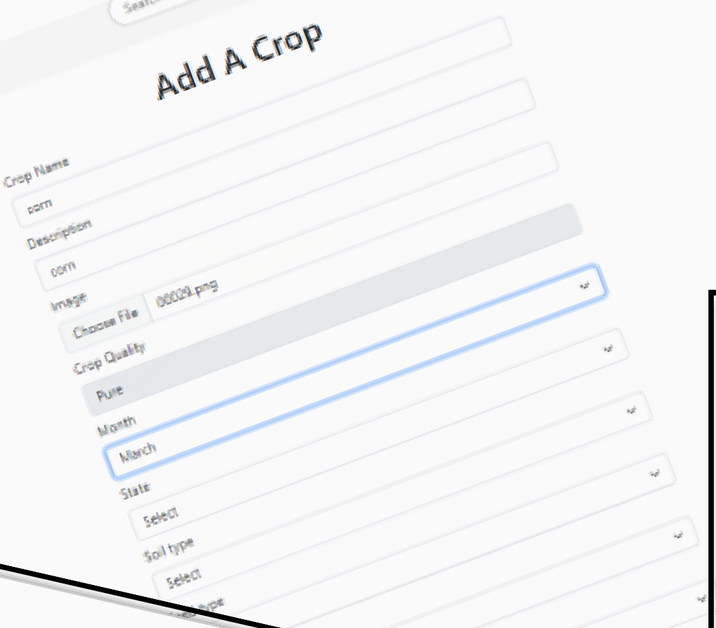




Software

Hardware

Snapshots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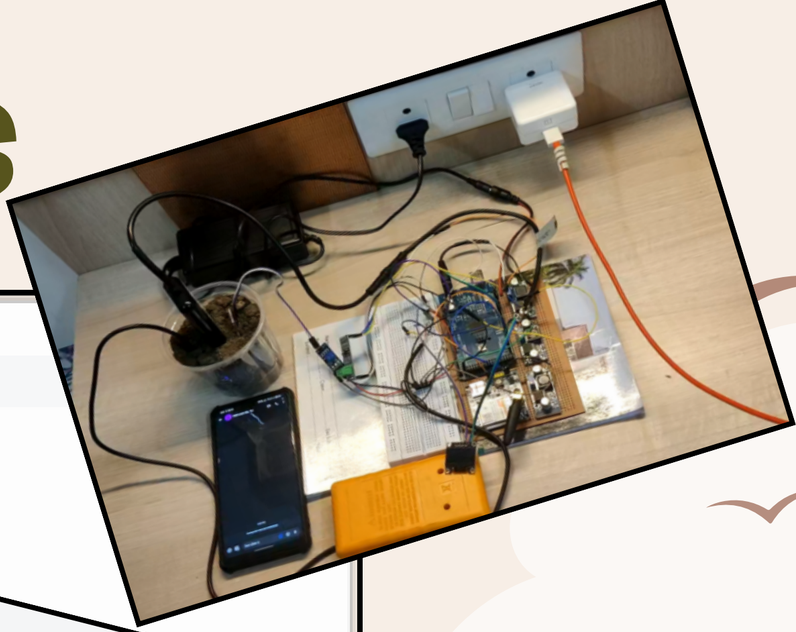

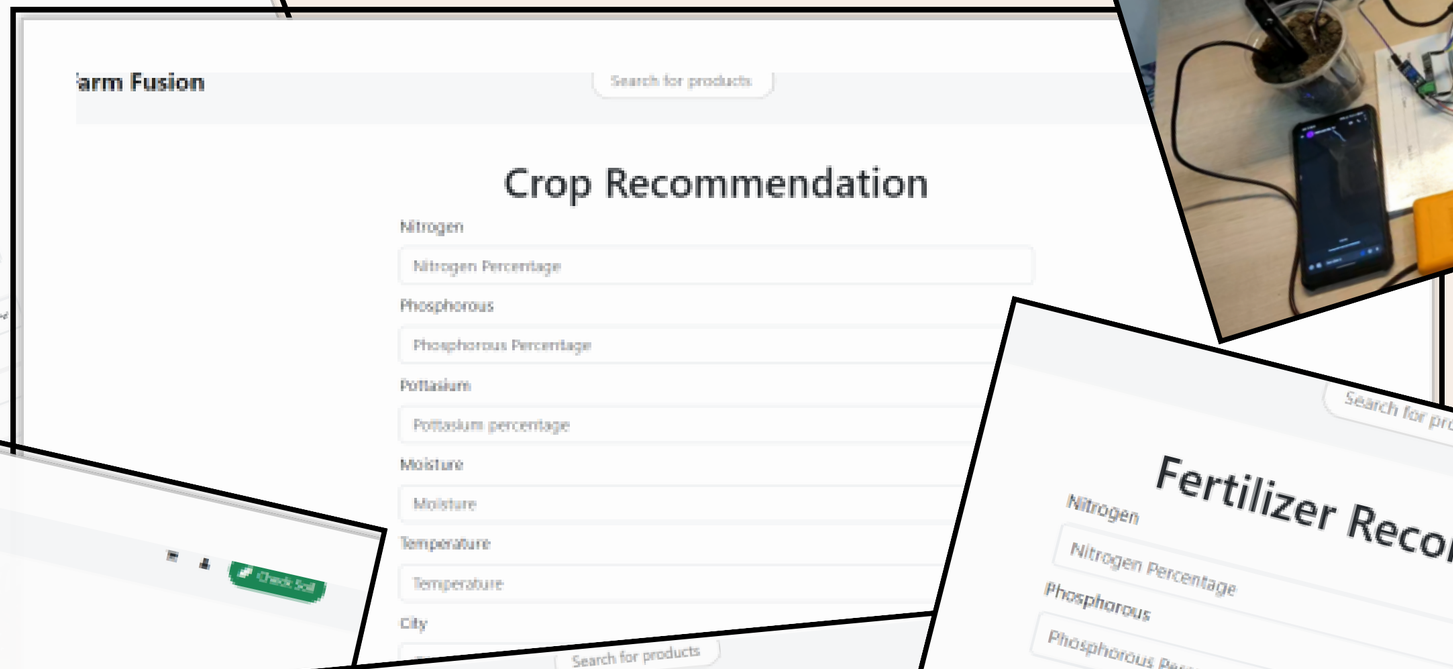
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Crop Recommendation
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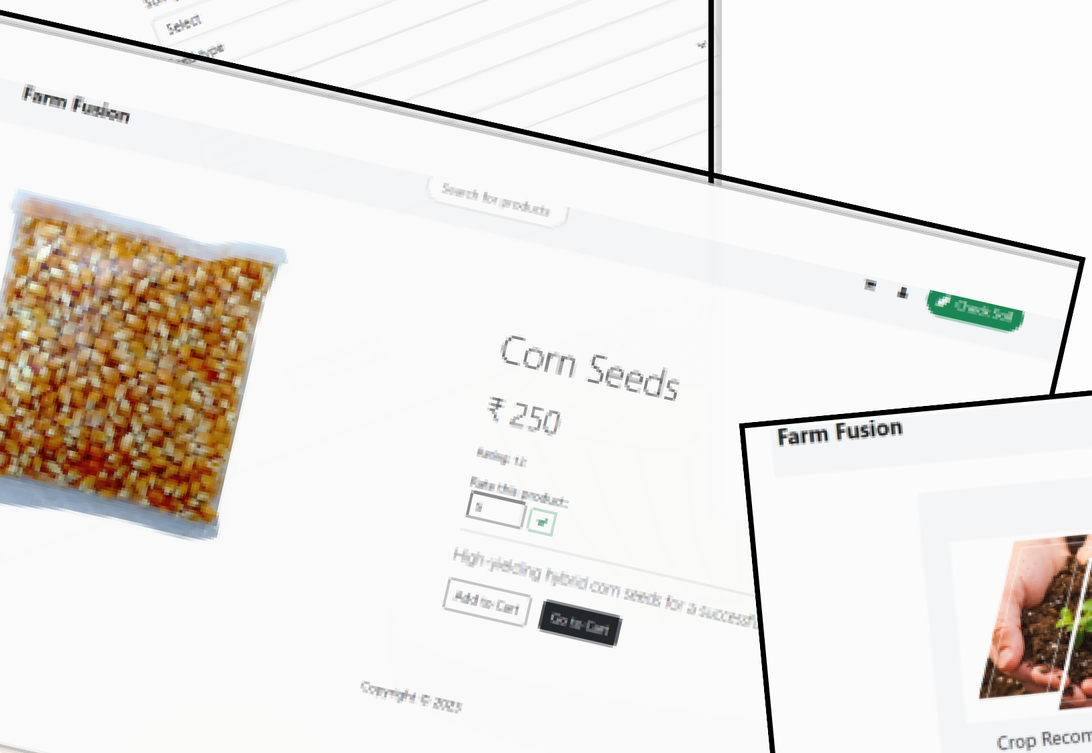
Farm Fusion
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Check Soil
Corn Seeds
₹ 250
Rate this product:
High-yielding hybrid corn seeds for a successf
Add to Cart
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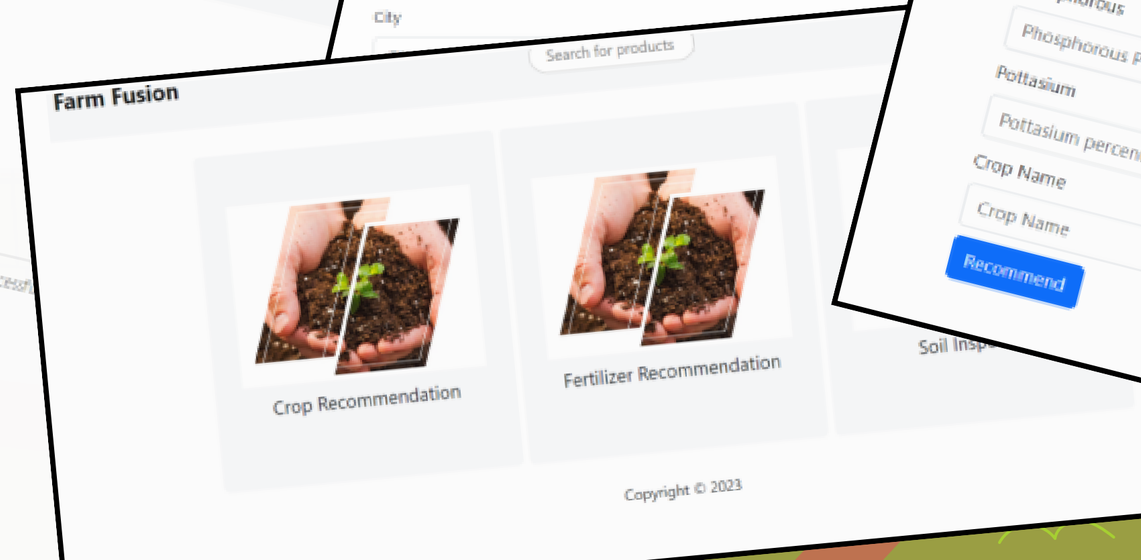
Farm Fusion
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Crop Recommendation
Fertilizer Recommendation
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Search for products
Fertilizer Recommendation
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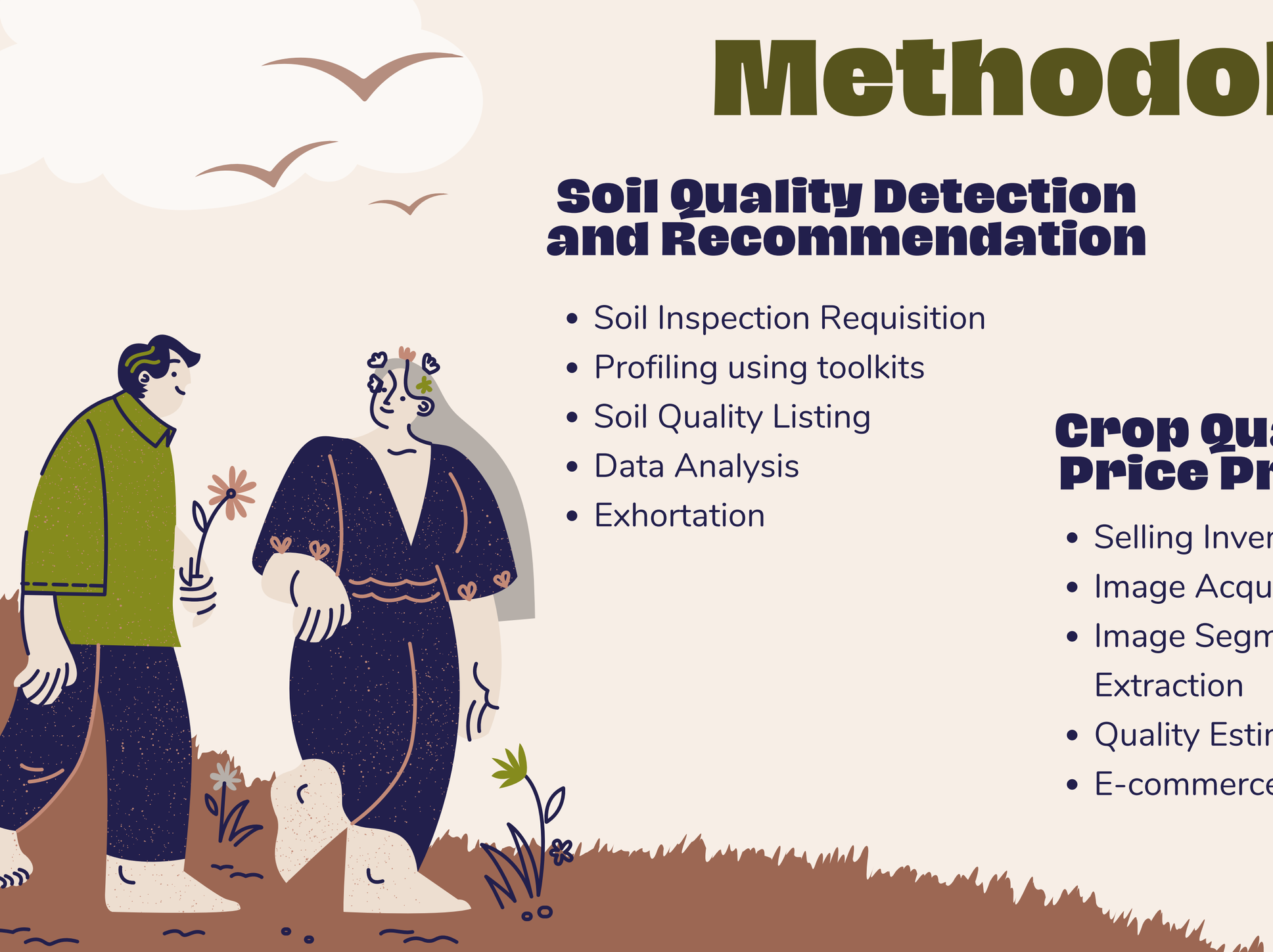
Methodology



Soil Quality Detection and Recommendation

- Soil Inspection Requisition
- Profiling using toolkits
- Soil Quality Listing
- Data Analysis
- Exhortation

Crop Quality and Price Prediction

- Selling Inventory Creation
- Image Acquisition and Pre-Processing
- Image Segmentation and Feature Extraction
- Quality Estimation and Price Prediction
- E-commerce Integration

Algorithmic Techniques

Crop Quality

Approach:

Trained on the Convolutional Neural Network (CNN) Model with VGG4.

Implementation:

- Initializes and trains the CNN model with 15 epochs.
- Makes predictions on the testing set and evaluates the model using mean squared error.

Crop Recommendation

Approach:

Trained on multiple models including Decision Tree, Gaussian Naïve Bayes, SVM, Logistic Regression, Random Forest, and XGBoost.

Optimal Model:

- Random Forest with 20 estimators and a random state of 0.
- Achieves accurate crop recommendations based on input parameters

Crop Price Prediction

Approach:

Trained on the Random Forest Regressor Model with 100 estimators and a random state of 0.

Implementation:

- Initializes and trains the Random Forest Regressor.
- Makes predictions on the testing set and evaluates the model using mean squared error.

Fertilizer Prediction

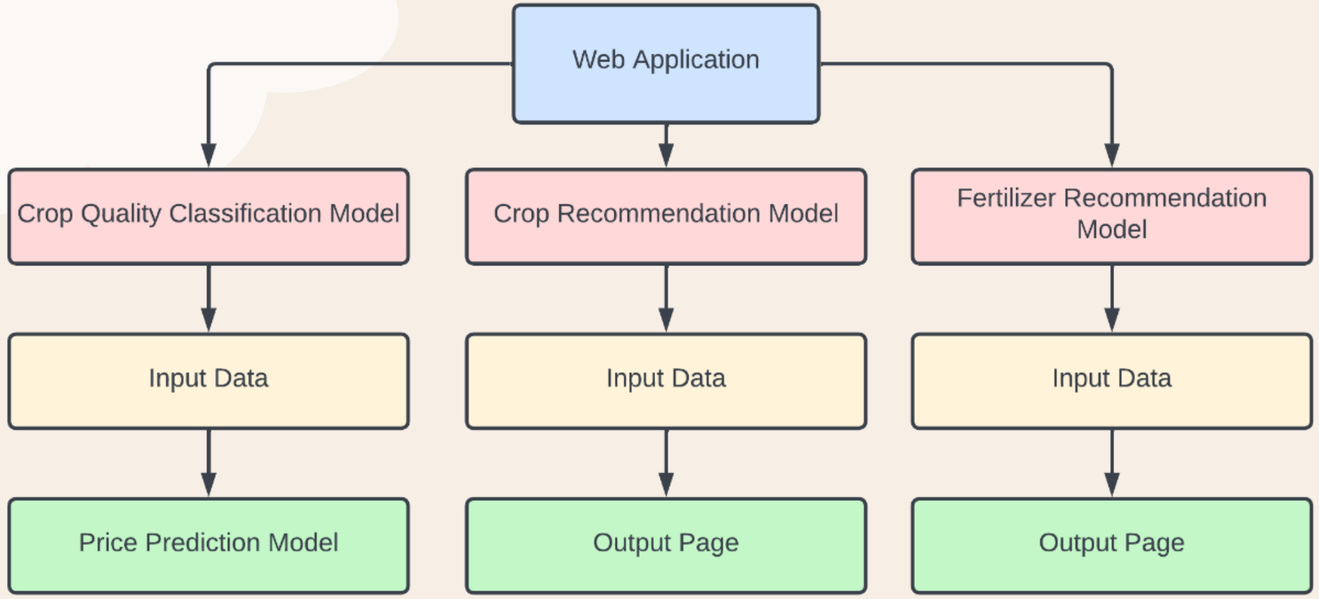
Approach: Uses logistic regression to predict fertilizer suggestions in a ratio of N:P:K = 4:2:1.

Functionality:

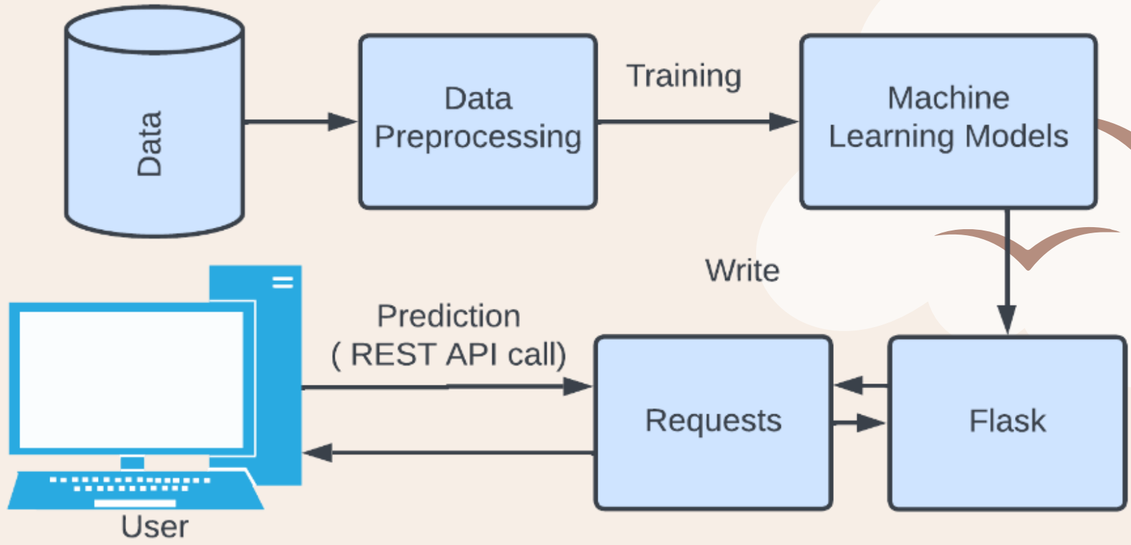
- Predicts a correction ratio based on user-inputted values.
- Maps the ratio to an intent with suggestions for improving soil quality.

Model Design

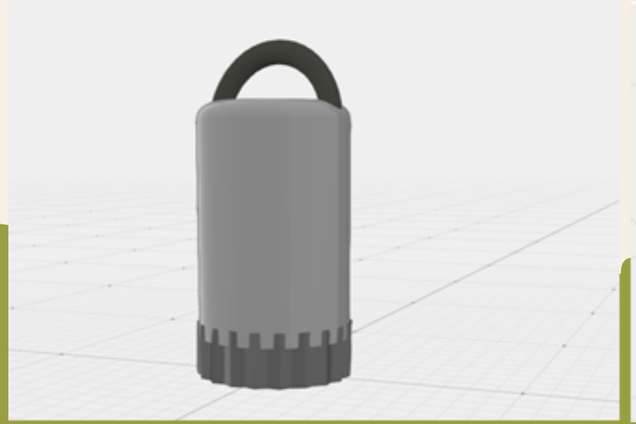
frontend:

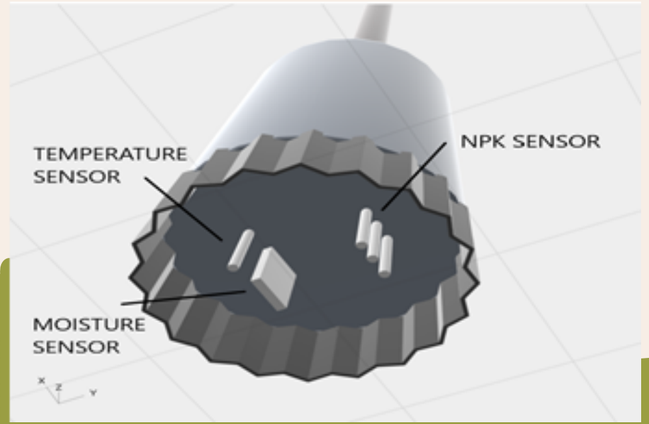


backend:



hardware:





Key Highlights

Inception:

Identification of Agricultural Challenges:

- Recognized barriers faced by farmers in traditional markets.
- Explored potential of e-commerce and machine learning in agriculture

Research and Planning:

Literature Review:

- Conducted an extensive review of existing agro-tech research.
- Identified gaps and opportunities for innovation.

Formulation of Project Goals:

- Soil quality detection, crop quality assessment, transparent e-commerce integration and soil data analysis

Developemnt Phase:

Methodology Design:

- Comprehended methodology for soil and crop quality assessment, and e-commerce integration.
- Outlined algorithmic approaches for machine learning models.

Hardware and Software Integration:

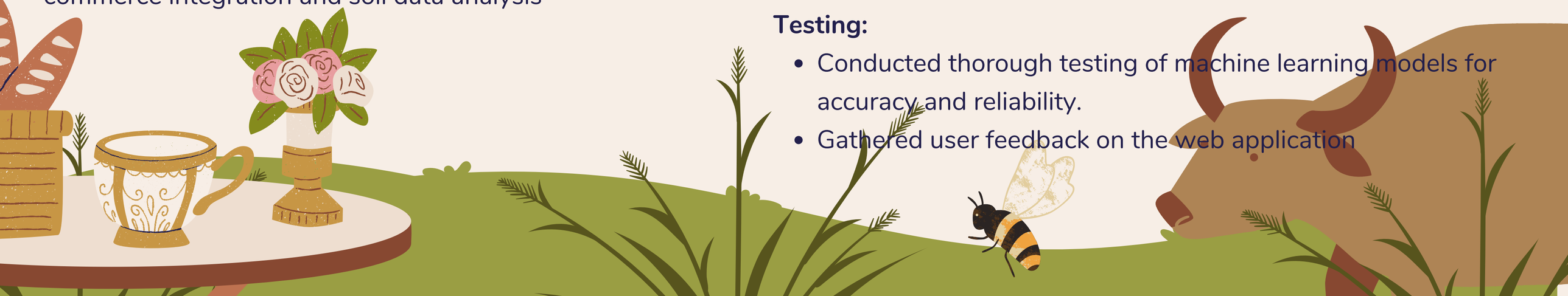
- Integrated sensor-based hardware for soil quality detection.
- Implemented machine learning models for crop and fertilizer recommendations.

Web Application Development:

- Utilized MERN and Flask for a robust and user-friendly web app.
- Created 8 routes and controllers to handle functionalities.

Testing:

- Conducted thorough testing of machine learning models for accuracy and reliability.
- Gathered user feedback on the web application

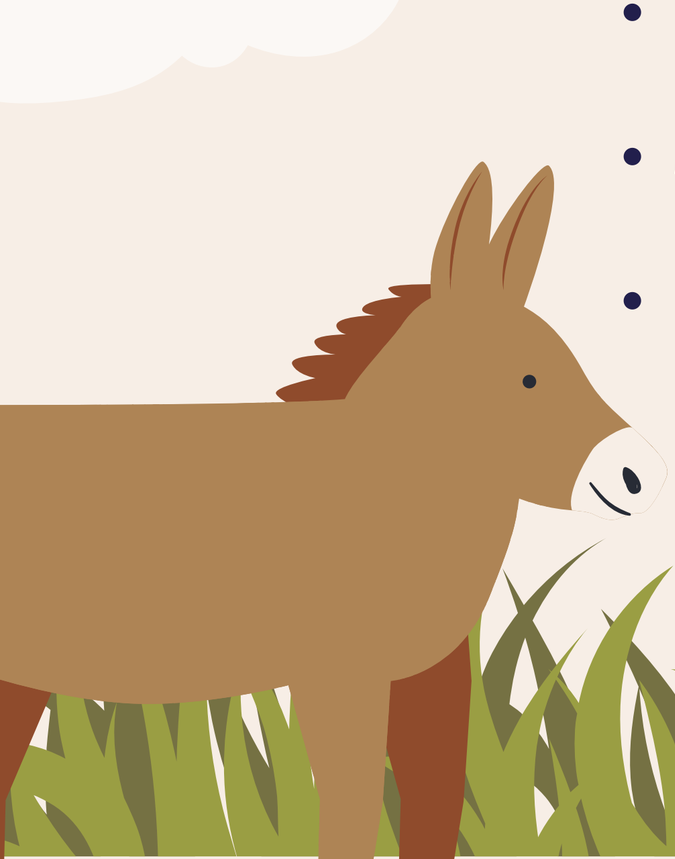


Professional and Technical Learnings

- Technology and Agriculture Synergy
- Interdisciplinary Collaboration
- Innovation with Purpose
- Community Engagement
- Agile Methodology
- Continuous Adaptation
- Machine Learning Realities
- Documentation and Knowledge Sharing

Individual Roles

- **Sarthak** — Lead Developer, Hardware, Documentation
- **Al-Sumaim** — ML, Web-Dev, Documentation
- **Vishvam** — Hardware, Dcoumentation
- **Armandeep** — Data Analysis, Data Gathering
- **Meghna** — UI/UX, Literature Survey



THANK YOU!