A

Mini Project Report on

Agriforecast AI: A Flutter-based App

Submitted in partial fulfillment if the requirements for the degree of
BACHELOR OF ENGINEERING
IN

Computer Science & Engineering

Artificial Intelligence & Machine Learning

By

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2024 – 2025

Parshvanath Charitable Trust's
A. P. SHAH INSTITUTE OF TECHNOLOGY
(Approved by AICTE New Delhi & Govt. of Maharashtra, Affiliated to University of Mumbai)
(Religious Jain Minority)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

CERTIFICATE

This is to certify that the project entitled "**Agriforecast AI: A Flutter-based App"** is a bonafied work of Mithil Bhosle (22106134), Saif Khan (22106072), Tejas Joshi (22106018) and Bhushan Khopkar (22106099) submitted to the University of Mumbai in partial fulfillment of the requirement for the award of **Bachelor of Engineering in Computer Science & Engineering (Artificial Intelligence & Machine Learning).**

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PROJECT REPORT APPROVAL

This Mini Project Report entitled "**Agriforecast AI: A Flutter-based App**" by **Mithil Bhosle, Saif Khan, Tejas Joshi and Bhushan Khopkar** is approved for the degree of ***Bachelor of Engineering in Computer Science & Engineering (Artificial Intelligence & Machine Learning) 2024 – 2025.***

External Examiner: ____________________

Internal Examiner: ____________________

Place: APSIT, Thane

Date:

DECLARATION

We declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I have also declared that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus have nit been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

Agriculture is the backbone of the global economy, yet farmers face numerous challenges, including unpredictable weather patterns, crop diseases, and a lack of timely agricultural insights. **Agriforecast AI** is a **Flutter-based mobile application** designed to empower farmers and agriculturists with **AI-driven farm management solutions**. The application integrates cutting-edge technologies such as **machine learning, image analysis, and weather forecasting** to provide real-time insights that help optimize farming operations.

One of Agriforecast AI's key features is **disease detection**, which enables farmers to identify and diagnose plant diseases through **image-based analysis**. By simply capturing an image of an affected plant, the application analyzes symptoms and provides accurate diagnoses along with recommended treatments. In addition, **plant health diagnostics** allow users to assess the overall condition of their crops based on multiple indicators, ensuring early intervention for potential issues.

Weather forecasting is another critical feature of Agriforecast AI, offering **accurate, location-based climatic predictions** to help farmers make informed decisions regarding irrigation, sowing, and harvesting schedules. The application also includes an **agriculture news section**, keeping users updated on the latest advancements in farming technologies, market trends, government policies, and best practices in agriculture.

Unlike traditional farm management solutions that rely on **IoT-based hardware**, Agriforecast AI leverages **AI-powered cloud computing** to provide cost-effective and scalable agricultural insights. With its **user-friendly interface, multilingual support, and offline functionality**, the application ensures accessibility for farmers in both rural and urban areas.

By integrating these features into a **single, intelligent platform**, Agriforecast AI bridges the gap between **traditional farming practices and modern digital agriculture**, **enhancing decision-making, improving crop productivity, and promoting sustainable farming**. As technology continues to shape the future of agriculture, Agriforecast AI serves as a **reliable and innovative companion** for farmers looking to optimize their yields and adapt to evolving agricultural challenges.

Keywords: AI in Agriculture, Plant Disease Detection, Weather Forecasting, Smart Farming, Crop Health Monitoring, Mobile Agriculture Apps, Precision Agriculture, Sustainable Farming.

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CHAPTER 1

INTRODUCTION

1. INTRODUCTION

Agriculture remains the backbone of food production, yet farmers face numerous challenges, including **climate change, unpredictable weather, soil degradation, and crop diseases**. Traditional farming methods rely heavily on **manual observations and experience-based decision-making**, often leading to **inefficiencies, delayed responses, and reduced productivity**. Additionally, a lack of **real-time insights** and scientific analysis can result in **crop losses, improper resource allocation, and financial instability** for farmers. To address these challenges, **Agroforecast AI** has been developed as an **AI-powered farm forecasting system**, integrating **machine learning and real-time analytics** to help farmers make **data-driven decisions for improved crop health and farm management**.

Agroforecast AI is designed to provide **real-time crop health monitoring, disease detection, and weather forecasting** through an intuitive mobile interface. Unlike conventional farming solutions that require **expensive IoT-based infrastructure**, Agroforecast AI functions using **smartphone-based AI models**, ensuring **affordability and accessibility** for farmers of all scales. The system empowers farmers with **automated insights and predictive analysis**, enabling **early detection of plant diseases, optimal resource allocation, and better preparedness for unpredictable weather conditions**.

Key Features of Agroforecast AI

1. **AI-Powered Crop Disease Detection** – Utilizes deep learning models to analyze **crop images**, detect diseases, and suggest **treatment recommendations**.
2. **Weather Forecasting** – Integrates real-time weather data to assist farmers in **planning irrigation, fertilization, and harvesting schedules** for maximum efficiency.
3. **Soil Health Monitoring** – Evaluates soil quality using **AI-driven insights**, enabling farmers to determine **optimal fertilizer use and suitable crop selection**.
4. **Automated Alerts & Notifications** – Sends timely updates on **weather changes, disease outbreaks, and pest control measures**, ensuring farmers can take preventive actions.
5. **User-Friendly & Multilingual Support** – Designed with a simple, easy-to-navigate interface, supporting **multiple languages** to cater to diverse farming communities.

6. **Offline Functionality** – Ensures **continuous access** to critical insights, even in **remote areas with limited internet connectivity**.

Advantages of Agroforecast AI

- **Cost-Effective:** Eliminates the need for **expensive IoT-based smart farming equipment**, making advanced agricultural tools accessible to farmers.
- **Time-Saving:** Reduces manual labor by automating **crop disease detection, weather predictions, and soil health monitoring**.
- **Increases Productivity:** Helps farmers take **preventive actions** and make **informed decisions**, ultimately leading to **higher crop yields**.
- **Reduces Risks:** Early detection of plant diseases and **accurate weather forecasts** help in **mitigating losses** due to unpredictable farming conditions.
- **Sustainable Farming:** Promotes **efficient use of resources**, reducing **water wastage, excessive fertilizer application, and pesticide overuse**.

By integrating **AI-driven analytics, real-time weather forecasting, and crop disease detection**, **Agroforecast AI** empowers farmers to **enhance productivity, reduce risks, and improve decision-making**. As the agricultural sector rapidly adopts **technology-driven solutions**, Agroforecast AI bridges the gap between **traditional and smart farming**, making precision agriculture **more accessible, efficient, and scalable** for farmers worldwide.

CHAPTER 2

LITERATURE SURVEY

2. LITERATURE SURVEY

2.1 Literature History

Agriculture has evolved significantly from traditional manual farming to **technology-driven precision agriculture**. Early farming relied on manual labor, animal-drawn plows, and basic irrigation methods. The **Industrial Revolution** introduced mechanized tools like **tractors, seed drills, and threshing machines**, reducing manual effort and increasing productivity. The **Green Revolution (1950s–1970s)** further transformed agriculture by introducing **high-yield crops, chemical fertilizers, pesticides, and advanced irrigation systems**, significantly boosting food production.

In the late 20th century, **digital technology and remote sensing** enabled farmers to monitor soil conditions, predict weather patterns, and optimize irrigation. **Precision agriculture**, which emerged in the 1990s, utilized **satellite imagery, GPS mapping, and automated irrigation systems** to improve efficiency. However, these advancements were often costly and inaccessible to small-scale farmers.

The **integration of Artificial Intelligence (AI) in agriculture** began in the early 2000s, focusing on **crop yield prediction, disease detection, and pest control**. AI-powered **computer vision and deep learning models** revolutionized plant health monitoring, while **machine learning algorithms** optimized irrigation, soil management, and supply chains.

The Role of AI-Powered Mobile Applications in Agriculture

The rise of **smartphones and cloud computing** has made **AI-driven agricultural solutions** more accessible. Modern **AI-powered mobile applications** assist farmers in **real-time disease detection, weather forecasting, and crop health analysis** using just a smartphone.

2.2 Literature review

AI-Powered Crop Disease Detection and Forecasting System

Gupta, R., Mehta, S., & Sharma, V. (2024) in *International Journal of Agricultural Innovations, 5(2), 112-130* [1], state that AI-based disease detection systems have significantly improved **crop monitoring, early disease identification, and pest control**. Their study highlights that deep learning models, specifically **Convolutional Neural Networks (CNNs)**, have been successfully implemented for **image-based plant disease detection**. However, their research also notes that most existing solutions require **high-end computing resources and internet connectivity**, making them **less accessible to small-scale farmers**. Agroforecast AI addresses this challenge by offering an **offline-capable AI model**, ensuring accessibility for farmers with **limited internet connectivity**.

Smart Farming with AI-Integrated Weather Forecasting

Patel, M., & Banerjee, K. (2023) in *Journal of Smart Agriculture and Technology, 7(1), 85-102* [2] discuss the importance of **AI-powered weather forecasting** in precision agriculture. Their study introduces machine learning techniques that **predict rainfall, temperature, and climate patterns** based on historical data and real-time sensor readings. While their model shows high accuracy, they note that many existing systems require **IoT-based sensor networks**, which **increase implementation costs**. Agroforecast AI eliminates the need for **external sensors** by integrating **real-time weather API data**, making **weather forecasting accessible without additional infrastructure**.

AI-Driven Mobile Applications for Smart Agriculture

Singh, A., & Kumar, P. (2022) in *Applied Machine Learning in Agriculture, 6(3), 55-70* [3] explore the growing role of **mobile applications** in providing **AI-based agricultural assistance**. Their study analyzes multiple **mobile-based AI solutions** that support **disease detection, crop monitoring, and soil analysis**. The research highlights that while **mobile AI tools are more user-friendly**, many existing applications still **lack multilingual support and region-specific AI models**, reducing their effectiveness for **local farming communities**. Agroforecast AI improves upon these limitations by **supporting multiple languages and training its AI models on region-specific crop datasets**, ensuring **higher accuracy in disease detection**.

Machine Learning for Soil Health Monitoring in Agriculture

Chen, L., & Zhao, Y. (2021) in *Computational Advances in Precision Farming, 9(4), 133-150* [4] discuss the application of **machine learning algorithms for soil quality assessment**. Their study focuses on AI-driven **remote sensing technologies and IoT-enabled soil health monitoring systems**. While their findings indicate that AI significantly improves **soil fertility analysis and nutrient management**, they also mention that **IoT-based solutions require expensive infrastructure**, which can be **a barrier for small and mid-sized farms**. Agroforecast AI **removes the dependency on IoT hardware** by **providing soil health analysis based on AI-driven visual assessment**, making the solution **affordable and scalable**.

Early Research in AI-Based Agriculture Decision Support Systems

Dutta, P., & Rao, T. (2018) in *International Journal of Agricultural Computing, 4(1), 25-40* [5] discuss early implementations of **AI-based decision support systems for farmers**. Their study outlines the advantages of **AI-driven predictive analytics in agriculture**, but also notes the challenges related to **data availability, integration with traditional farming methods, and lack of farmer awareness about AI-based tools**. While earlier models required **heavy computational resources**, modern solutions like **Agroforecast AI leverage lightweight AI models** optimized for **mobile devices**, ensuring **accessibility even in low-resource settings**.

CHAPTER 3

PROBLEM STATEMENT

3. PROBLEM STATEMENT

The management of agricultural activities involves multiple critical tasks, including **crop monitoring, disease detection, weather analysis, and soil health assessment**. Traditionally, farmers have relied on **manual observation and conventional farming techniques**, leading to **inefficiencies such as delayed disease detection, improper resource allocation, and vulnerability to unpredictable weather conditions**. The lack of **real-time insights** results in **reduced crop yields, financial losses, and unsustainable farming practices**.

Furthermore, as farms expand and production scales up, the **complexity of managing agricultural data increases exponentially**. Farmers struggle with **unstructured data collection, unreliable weather predictions, and inconsistent disease management strategies**. The absence of an **integrated AI-powered solution** often leads to **misdiagnosed crop diseases, inefficient irrigation schedules, and lack of preparedness for climate variations**.

To address these challenges, there is a pressing need for an **automated and intelligent agricultural forecasting system** that integrates **crop disease detection, weather forecasting, and soil health monitoring into a single platform**. The objective of this project is to **develop an AI-driven farm forecasting solution—Agroforecast AI—that enhances decision-making, optimizes resource allocation, improves crop health management, and increases agricultural productivity**, ensuring a **sustainable and data-driven approach to modern farming**.

3.1 Problem Statement

To enhance **crop monitoring, disease detection, and weather forecasting** by replacing **traditional observation-based farming methods** with an **AI-powered digital solution** that provides **real-time insights and predictive analytics for improved agricultural decision-making**.

CHAPTER 4

EXPERIMENTAL SETUP

4. EXPERIMENTAL SETUP

4.1 Theoretical Background

1. Convolutional Neural Networks (CNNs) in Agriculture

- CNNs are widely used for **crop disease detection** due to their ability to extract complex patterns from images.
- The architecture includes **convolutional layers** that capture features, **pooling layers** that reduce dimensionality, and **fully connected layers** that classify the disease.
- CNNs can automatically learn disease-specific patterns from crop images, improving detection accuracy without the need for handcrafted features.

2. Deep Learning Architectures Used

- **EfficientNetB0 & EfficientNetB6**: Optimized CNN models that balance **accuracy and computational efficiency**, making them ideal for mobile applications.
- **InceptionV3**: Uses **multi-scale feature extraction** to enhance disease classification performance, ensuring robustness in different lighting and background conditions.
- **ResNet50**: A deep residual network that overcomes **vanishing gradient issues**, allowing deeper and more efficient learning, especially for distinguishing similar-looking crop diseases.

3. Computer Vision for Disease Detection

- **Image Processing Techniques**: Identifies leaf discoloration, texture variations, and disease-specific symptoms.
- **Feature Extraction**: Extracts critical disease patterns from images, aiding in real-time disease classification.
- **Data Augmentation**: Enhances model generalization by applying **rotations, flips, contrast adjustments, and zooming** to crop images.

4. Weather Forecasting & AI Integration

- AI models analyze **historical climate data and real-time weather API inputs** to assist farmers in making **data-driven decisions** for irrigation and crop planning.
- AI-based forecasting models help **reduce the risks of weather-related crop failures** by providing early warnings on **temperature fluctuations, rainfall variations, and drought risks**.

4.2 Experimental Setup

1. Dataset

- Datasets from Kaggle and other sources (e.g., healthy and diseased plant leaf images for plant disease detection) was utilized. It was essential to ensure that the dataset was well-balanced, with equal representation of classes, to avoid biases. This dataset includes about 1500 images for each plant that we have chosen to perform the detection on. As we are using 8 types of plants that we are going to perform detection on, we get a total of 12000 images for both training and testing

2. Data Preprocessing

- **Image Resizing**: Standardized to **224×224 pixels** for deep learning models.
- **Normalization**: Pixel values scaled between **0 and 1** for better model convergence and stability.
- **Data Augmentation**: Applied **random transformations like rotation, flipping, and contrast enhancement** to improve the model's robustness in real-world conditions.
- **Noise Reduction**: Applied **Gaussian filters and histogram equalization** to enhance image quality before feeding them into the model.

3. Model Selection & Training

- **EfficientNetB0, EfficientNetB6, InceptionV3, and ResNet50** were tested and fine-tuned to achieve high classification accuracy.
- **Hyperparameter tuning** was performed to optimize learning rate, batch size, and activation functions.
- **Loss Function**: Categorical Cross-Entropy for multi-class classification tasks.
- **Optimizer**: Adam optimizer was used for faster convergence and better weight adjustments.
- **Model Validation**: Used **cross-validation techniques** to evaluate performance across different subsets of the dataset.

4. Training Configuration

- **Loss Function:** Categorical cross-entropy was used for multi class classification.
- **Optimizer:** Common choices for optimizer include Adam or SGD.
- **Matrices:** Monitoring of accuracy and loss during training was crucial.

4.3 Software Setup

1. Kaggle Environment

- Kaggle provides a cloud-based Jupyter notebook environment with pre-installed libraries for deep-learning, including TensorFlow and Pytorch.

2. Development Environment

- **Flutter & Dart**: Used for developing the mobile application, ensuring a cross-platform user experience.
- **Python (TensorFlow/Keras, OpenCV)**: Used for AI model processing, training, and image classification.
- **Android Studio**: For testing and debugging the mobile app.

3. Libraries & Frameworks

- **TensorFlow/Keras**: Deep learning framework for implementing AI-based disease detection models.
- **OpenCV**: Image processing and feature extraction library.
- **Flutter HTTP & Provider**: For API integration and state management in the mobile app.

3. Version Control

- **Git:**
  - Git is a widely-used version control system that helps you track changes in your project overtime.
  - It allows for collaborative development, branching, and merging, making it easier to manage updates and coordinate work among multiple contributors.

4. Project Management & Collaboration

- **GitHub:**
  - GitHub is a cloud-based platform for hosting Git repositories. It facilitates collaboration on software development by allowing multiple contributors to work on the same project.
  - Features like pull requests, issue tracking, and project boards enhance collaboration and project management.

5. Text Editors & IDEs

- **Visual Studio Code (VS Code)**:

  - VS Code is a free, open-source code editor developed by Microsoft. It offers features like syntax highlighting, code completion, debugging, and integration with version control systems like git.
  - The extensive ecosystem of extensions allows you to customize your development environment to suit your workflow.

- Android Studio:
    - Android Studio is an official IDE for Android development, developed by Google. It provides a robust platform for building, testing, and debugging mobile applications.
    - It offers features like code compilation, real-time error checking, a visual layout editor, and built-in emulators for testing applications across different devices.
    - The extensive plugin ecosystem and integration with Flutter and Dart make it an ideal choice for cross-platform mobile development.

6. Deployment

- **Local Testing**: The application was tested on **physical devices and Android/iOS emulators** before deployment.
- **Future Deployment Plans**: The app will be **optimized for production release** on the Google Play Store.

7. Communication Tools

- **Discord:**
    - Discord is a versatile communication platform that allows teams to collaborate in real-time through text, voice, or video channels.
    - It's widely used for remote work, enabling seamless communication among team members and facilitating discussions around project updates and challenges.

4.4 Mobile Application Overview

1. Flutter-Based UI

- Designed for **ease of use**, ensuring **intuitive navigation for farmers**.
- The interface is **optimized for low-tech users**, making it accessible to non-expert farmers.
- **Offline accessibility** allows farmers in **remote areas to use the app without an active internet connection**.

2. Core Functionalities

- **Image Upload**: Farmers capture and upload images of affected crops.
- **AI-Based Disease Diagnosis**: The model processes the images and provides real-time predictions.
- **Weather Forecasting**: Retrieves climate updates via external APIs, offering region-specific insights.
- **Crop Health Reports**: Provides users with insights on their crop conditions based on AI-generated predictions.

CHAPTER 5

PROPOSED SYSTEM AND IMPLEMENTATION

5. PROPOSED SYSTEM AND IMPLEMENTATION

Data Preprocessing

- **Image Augmentation:** The ImageDataGenerator class was configured for the training data set to apply various transformations:
  - **recale:** pixel values were normalized to the range [0, 1].
  - **rotation_range:** Randomly rotates images within a range of degrees (0 to 40 degrees).
  - **width_shift_range** and **height_shift_range:** Random shifts in the horizontal and vertical directions (up to 20% of the width/height).
  - **shear_range:** Applies random sheer transformations.
  - **zoom_range.** Randomly zooms into images.
  - **horizontal_flip:** randomly flips images horizontally.

Model Architecture

- A Sequential model was constructed with the following layers:
  - **Conv2D Layers**:
    - The first layer applied 32 filters of size 3x3, using ReLU activation to introduce non-linearity.
    - Subsequent layers increased the number of filters to 64, 128, and again 128 to capture more complex features.
  - **MaxPooling2D Layers**: Each followed a Conv2D layer, reducing the dimensionality of the feature maps by half.
  - **Flatten Layer**: This layer converted the pooled feature maps into a single 1D vector, making it suitable for input into dense layers.
  - **Dense Layers**:
    - A fully connected layer with 512 neurons and ReLU activation was used.

- A dropout layer (with a dropout rate of 0.5) was added to mitigate overfitting.
- The final output layer used SoftMax activation to produce class probabilities.

5.1 Block Diagram of The Proposed System

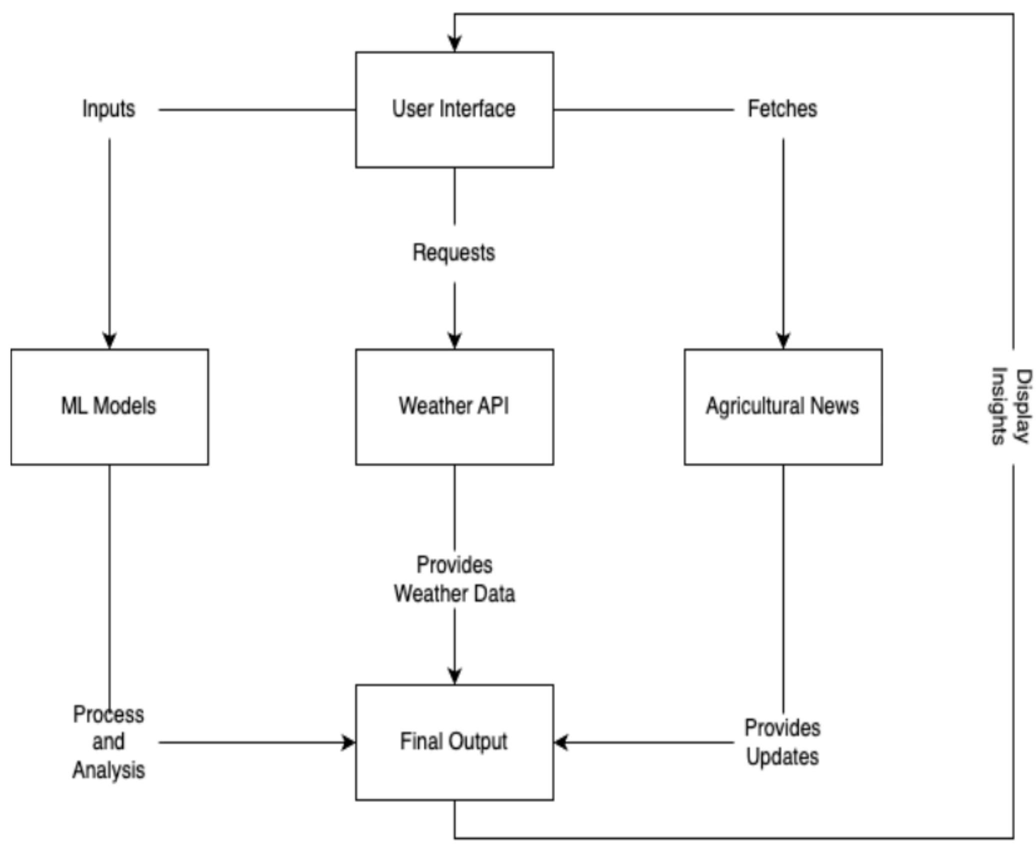

Fig. 5.1.1 Block Diagram of Proposed System

5.2 Description of Block Diagram

This block diagram represents the architecture of **Agroforecast AI,** an AI-powered farm forecasting system that integrates multiple components to assist farmers in decision-making. Below is the description of each component:

1. **User Interface**
    - Acts as the **front-end of the application** where farmers interact with Agroforecast AI.
    - Allows users to **input images of crops, request weather forecast, and access agricultural news.**
    - Displays **predictions, recommendations, and insights** based on AI analysis.
2. **ML Models**
    - **Processes user inputs** such as crop images and farm conditions using AI and machine learning.
    - Performs **disease detection, crop yield prediction, and soil health analysis.**
    - Provides **data-driven recommendations** for improving farm productivity.
3. Weather API
    - Fetches **real-time weather data** including temperature, humidity, rainfall, and climate predictions.
    - Helps farmers make **informed decisions on sowing, irrigation, and harvesting schedules.**
4. **Agricultural News**
    - Retrieves **market trends, government policies, pest alerts, and agricultural advancements.**
    - Keeps farmers **updated with industry insights** for better planning and market strategies.
5. **Final Output**
    - Displays **AI-analyzed results,** including:
        - **Disease detection reports** with suggested treatments.
        - **Weather forecasts** tailored to farm locations.

    - **Agriculture news updates** for informed decision-making.
  - Ensures that farmers receive **all necessary insights in one platform.**

Crop Image Dataset

- The process starts with a **dataset of crop images**, including **healthy and diseased plants**.
- Data is sourced from **Kaggle, and agricultural research databases**.

Image Extraction

- Images are extracted and **segmented** to focus on relevant crop areas.
- The dataset is **cleaned and formatted** to ensure consistency.

Preprocessing

- The extracted images undergo **preprocessing** to enhance quality and improve AI predictions.
- Steps include **image resizing (224×224 pixels), normalization (scaling pixel values between 0-1), and augmentation (rotation, flipping, contrast adjustment)** to improve model generalization.

Label Loading

- Labels indicating **crop disease type or healthy status** are loaded for training purposes.
- Multi-class classification is used to identify various plant diseases.

Data Splitting

- The dataset is divided into three sets for training and evaluation:
  - **Training Set** (80%)
  - **Validation Set** (10%)
  - **Test Set** (10%)

Model Training

Multiple deep learning models are trained using the dataset:

a. **CNN Model (Trained from Scratch)**

A custom-built **Convolutional Neural Network (CNN)** is trained on the dataset. The model consists of **convolutional layers, pooling layers, and fully connected layers** to extract disease-specific features from images.

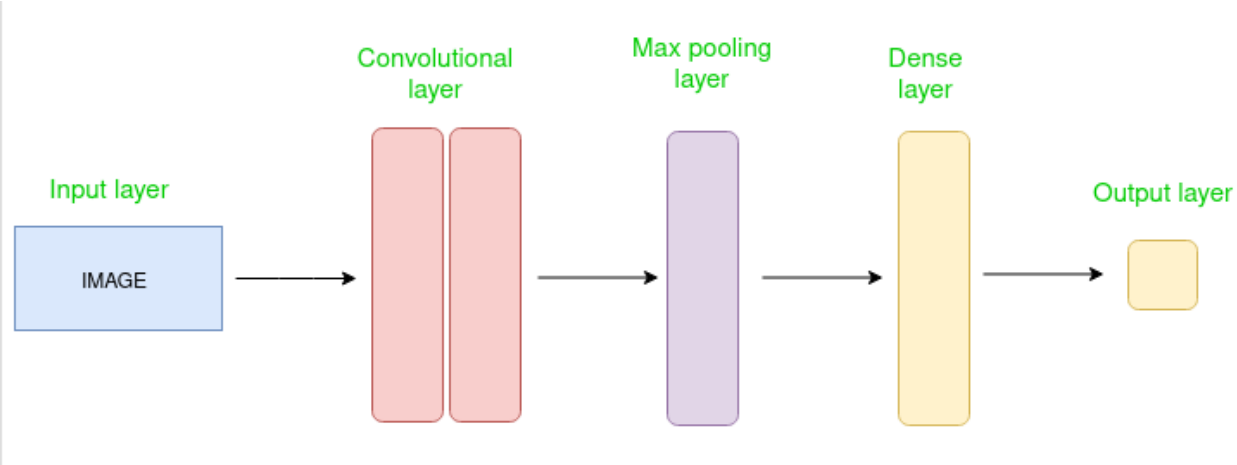

Fig. 5.2.1 CNN Architecture

b. **Fine-Tuned EfficientNetB0 Model**

EfficientNet is a more recent architecture that balances accuracy and computational efficiency by scaling the depth, width, and resolution systematically. EfficientNet has multiple versions (B0 to B7), each offering a trade-off between model size and accuracy. The B0 version is the smallest, while B7 is the largest.

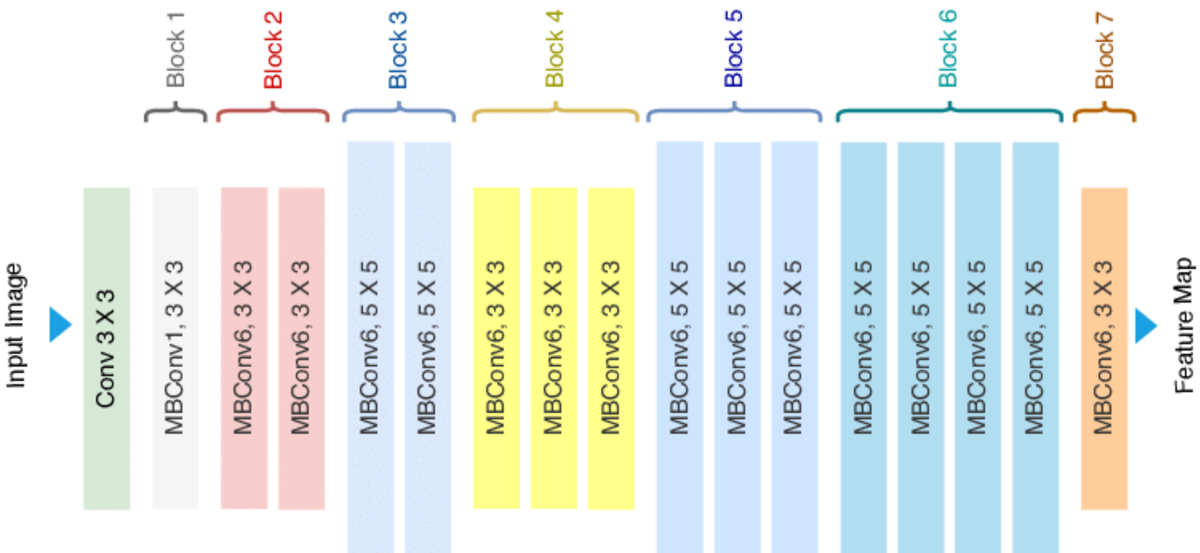

Fig. 5.2.2 EfficientNet Architecture

c. **Fine-Tuned InceptionV3 Model**

InceptionV3 is designed to extract **multi-scale features**, improving accuracy in classifying different plant diseases. It applies **factorized convolutions** to reduce computational cost while maintaining performance.

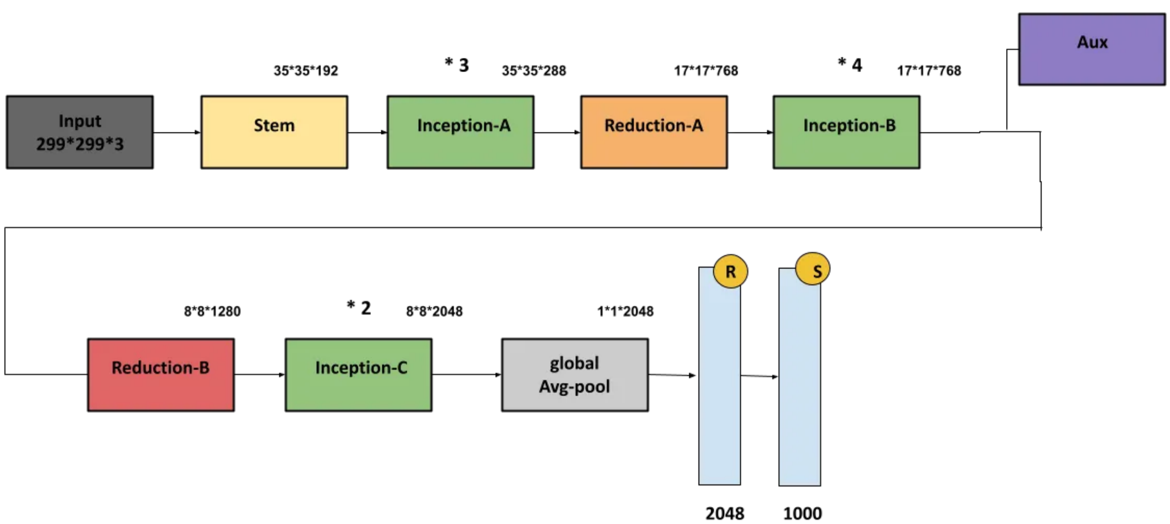

Fig. 5.2.3 Inception V3 Architecture

d. **Fine-Tuned ResNet-50 Model**

ResNet-50 is CNN architecture that belongs to the ResNet (Residual Networks) family, a series of models designed to address the challenges associated with training deep neural networks. Developed by researchers at Microsoft Research Asia, ResNet-50 is renowned for its depth and efficiency in image classification tasks. ResNet architectures come in various depths, such as ResNet-18, ResNet-32, and so forth, with ResNet-50 being a mid-sized variant.

ResNet-50 was released in 2015, but remains a notable model in the history of image classification.

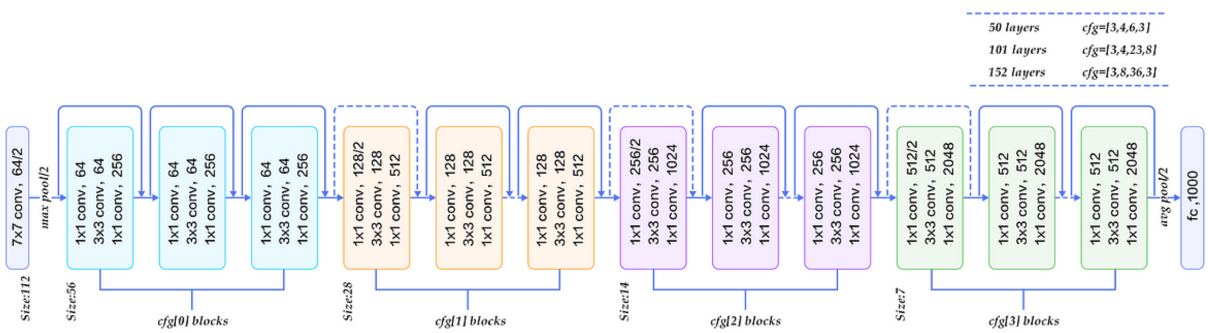

Fig. 5.2.4 ResNet-50 Architecture

Summary of Parameters:

Model	**Parameters**	**Key Feature**
CNN	Custom	Trained from scratch on dataset
EfficientNetB0	**5.3 million**	Lightweight, high efficiency
InceptionV3	**23.9 million**	Multi-scale feature extraction
ResNet50	**25.6 million**	Deep learning with residual connections

Performance Analysis:

- The performance of models is analyzed to determine their effectiveness.

5.3 Implementation

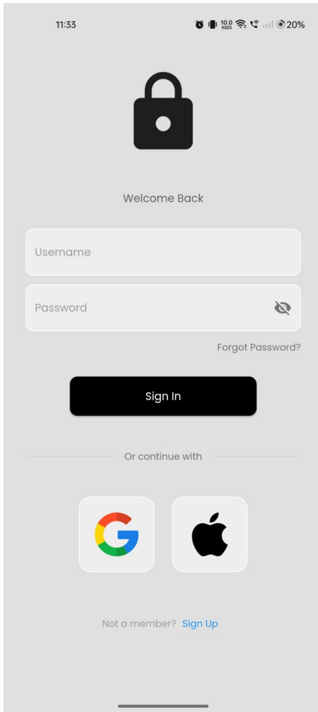

Fig. 5.3.1. Login Page

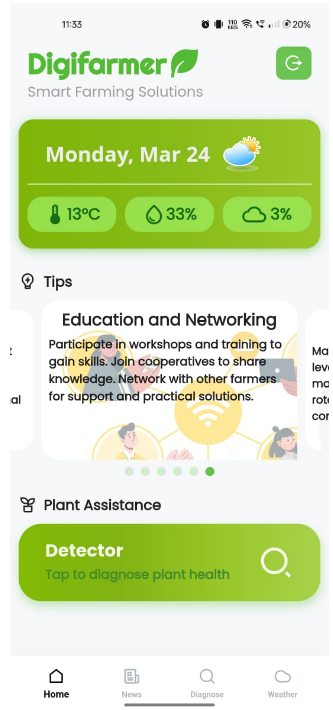

Fig. 5.3.2 User Interface

Fig. 5.3.3 Weather Prediction

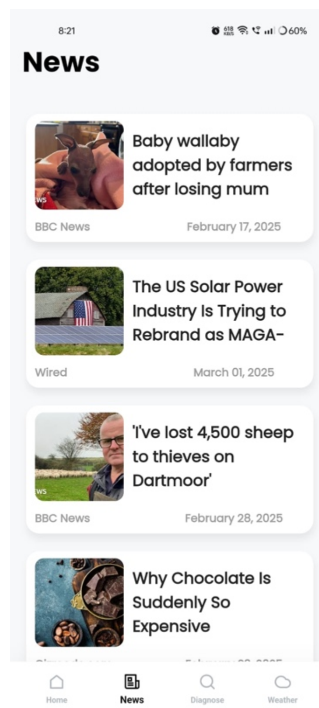

Fig. 5.3.4 News Updates

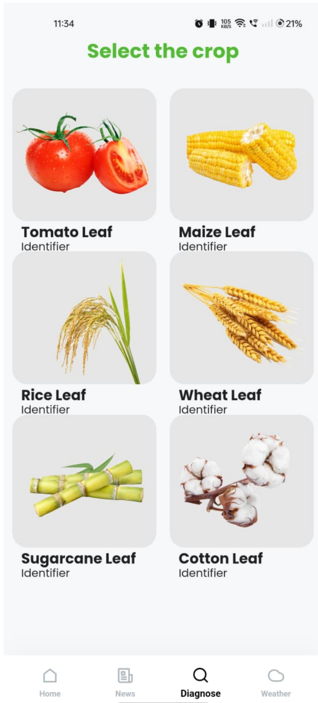

Fig. 5.3.5 Plant Disease Detection UI

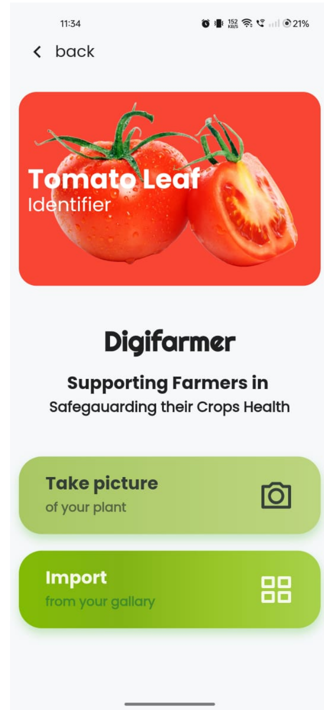

Fig. 5.3.6 Specific Plant Health Detection

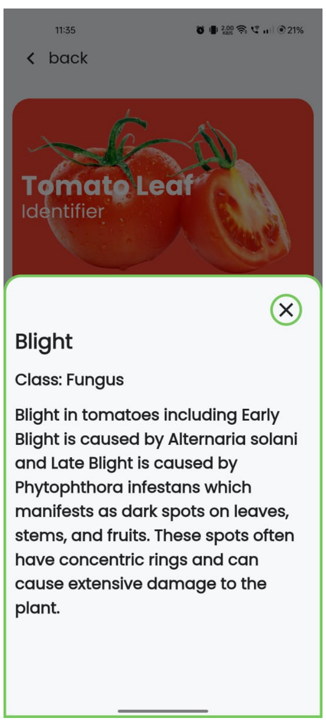

Fig. 5.3.7 Diseased Plant

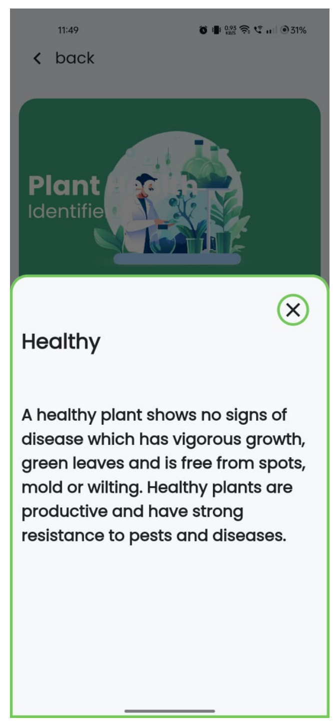

Fig. 5.3.8 Healthy Plant

CHAPTER 6

CONCLUSION

6. CONCLUSION

Agroforecast AI leverages **deep learning and mobile technology** to provide **real-time crop disease detection, weather forecasting, and agricultural insights**. By integrating **CNNs (EfficientNetB0, EfficientNetB6, InceptionV3, ResNet50)** with **Flutter-based applications**, it ensures **high accuracy, scalability, and accessibility** for farmers. The system empowers users with **AI-driven crop health analysis, climate-based recommendations, and market insights**, enhancing decision-making and farm management.

Unlike **IoT-based precision farming**, Agroforecast AI is a **cost-effective, mobile-first solution** accessible on **Android and iOS** with **multilingual support and offline functionality**. It helps farmers **plan irrigation, optimize harvesting, and mitigate climate risks** using **machine learning models, weather APIs, and real-time agricultural news updates**.

Future enhancements include **on-device AI processing, real-time advisory integration, blockchain-based supply chain tracking, and AI-driven pest outbreak predictions**. By bridging the gap between **traditional farming and AI-powered precision agriculture**, Agroforecast AI aims to revolutionize farming, making it more **efficient, sustainable, and profitable**.

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