README

# Crop Yield Forecasting Using CNN-ResNet with Meteorological and Pesticide Data

## Project Overview

This project integrates meteorological data, soil conditions, and pesticide usage to accurately forecast crop yields using machine learning and deep learning techniques. A hybrid approach is adopted, combining Gradient Boosting for structured data and a ResNet-based Convolutional Neural Network (CNN) for classifying soil images. The model supports data-driven, sustainable, and precision agriculture by offering predictive insights for farmers and policymakers.

## Features

- Soil image classification using ResNet

- Weather and environmental data integration

- Pesticide usage analysis

- Crop yield forecasting using Gradient Boosting

- Crop and fertilizer recommendation system

- Web interface for user and admin access

- Performance visualization (accuracy, loss, confusion matrix)

## Technologies Used

- Languages: Python, HTML, CSS, JavaScript

- Frameworks: Flask (Backend), Bootstrap (Frontend)

- Machine Learning: Scikit-learn (Gradient Boosting)

- Deep Learning: TensorFlow, Keras (ResNet)

- Database: MySQL

- Tools: OpenCV, Matplotlib, NumPy, Pandas

## Algorithms

- Gradient Boosting for regression-based yield prediction

- ResNet for soil image classification

- Random Forest for crop recommendation

## Dataset

- Soil images and environmental datasets from Kaggle

- Fertilizer and crop datasets customized for model training

## Installation

1. Clone the repository:

git clone https://github.com/your-repo/soil-crop-forecasting.git

2. Install dependencies:

pip install -r requirements.txt

3. Set up MySQL database and import `1leafdb`.

4. Run the app:

python app.py

## Usage

1. Upload soil images and environmental parameters via the web interface.

2. View predictions for suitable crops and fertilizer suggestions.

3. Admins can monitor users, training performance, and model results.

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## License

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## Future Enhancements

- Incorporate real-time satellite imagery

- Deploy as a mobile app for farmers

- Add federated learning for user privacy

- Expand crop coverage across more regions

## References

- Precision Agriculture ML Approaches: https://doi.org/10.1016/j.compag.2018.05.012

- Crop Yield Prediction Using ANN: https://doi.org/10.1109/XXX.2014.1234567

- Complete list available in the REFERENCES section of the project report