AISA Lab 6

AI System for Agriculture

Crop Prediction and Disease Detection

Introduction

- Agriculture faces challenges such as yield uncertainty and crop diseases
- AI can provide solutions for predicting yields and detecting diseases
- Goal: Assist farmers with timely insights and decision-making

System Overview

- Data Collection: Weather, soil, crop history, images
- Data Processing: Feature engineering and cleaning
- Model Training: Crop prediction (XGBoost/LSTM), Disease detection (CNN)
- Deployment: Mobile app / Web dashboard for farmers

Crop Prediction

- Inputs: Soil properties, weather data, NDVI indices, management data
- Models: Gradient Boosted Trees (XGBoost), LSTM/Transformers for time-series
- Outputs: Expected yield, uncertainty interval
- Benefits: Better planning, optimized resource allocation

Disease Detection

- Inputs: Leaf or field images, metadata (crop, stage)
- Models: CNN (EfficientNet/ResNet), U-Net for segmentation
- Outputs: Disease type, severity, location (bounding boxes/heatmaps)
- Benefits: Early intervention, reduced crop loss

System Workflow

1. Data Collection (sensors, satellites, images)
2. Preprocessing & Feature Engineering
3. Model Training & Evaluation
4. Deployment (API, mobile app, dashboard)
5. Monitoring & Retraining

Benefits

- Accurate yield forecasts
- Early detection of crop diseases
- Data-driven farm management
- Reduced losses and improved sustainability

Conclusion

AI-based systems can revolutionize agriculture

- Support farmers with predictive insights
- Enable sustainable and efficient farming
- Future scope: IoT integration, real-time monitoring, advanced analytics

Discussion Questions

1. How can AI improve crop yield prediction compared to traditional methods?
2. What types of data are essential for building an accurate crop prediction model?
3. How does computer vision help in detecting crop diseases?
4. What challenges may arise when deploying AI systems for smallholder farmers?
5. How can IoT and real-time monitoring further enhance this AI system?