

## **ABSTRACT**

### **AI-DRIVEN SMART FARMING: MULTIMODAL DATA FUSION FOR CROP HEALTH MONITORING AND YIELD ENHANCEMENT**

This seminar explores AI-driven smart farming, leveraging machine learning (ML) to integrate multimodal data - satellite imagery, drone visuals, sensor readings (soil moisture, temperature), and weather data—for crop disease detection and yield optimization. Advanced ML models, including convolutional neural networks(CNNs) for image analysis and LSTMs for time-series forecasting, enable early disease identification and precise yield predictions.

By fusing diverse data, these models achieve higher accuracy than single-modality approaches, addressing challenges like climate variability and food security. The study demonstrates practical implementations using public datasets (e.g., PlantVillage) and frameworks like PyTorch, alongside visualizations of disease-yield correlations. Ethical considerations, such as data privacy for farmers and model biases across crop types, are discussed. This approach aligns with 2025's sustainable agriculture trends, offering scalable solutions for precision farming, with potential extensions to mobile advisory apps and drone-based monitoring.

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