||Jai Sri Gurudev||
Sri Adichunchanagiri Shikshana Trust®
SJB INSTITUTE OF TECHNOLOGY
(An Autonomous Institute under Visvesvaraya Technological University, Belagavi)
Approved by AICTE - New Delhi, Recognized by UGC, New Delhi with 2(f) & 12(B)
Accredited by NAAC with 'A+' Grade.
No.67, BGS Health & Education City, Dr. Vishnuvardhan Road, Kengeri, Bengaluru – 560060.
DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

PROJECT SYNOPSIS 2025-2026

Group No: 9

NAME OF THE STUDENTS	**1. Aasim Pasha**	**USN**	**1JB22AI002**
	2. Benaka R N		**1JB22AI008**
	3. Monish K		**1JB22AI032**
	4. Sumukh S Murthy		**1JB23AI405**
Name of the Guide	**Mrs. Deepa Kulkarni**		
PROJECT TITLE	**AI-Powered Smart Agriculture System**		

ABSTRACT:

The rapid advancements in Artificial Intelligence (AI) and the Internet of Things (IoT) are revolutionizing traditional farming practices, leading to the development of AI-powered smart agriculture systems. This project develops an AI-Powered Smart Agriculture System to tackle critical farming inefficiencies. It features an advanced leaf disease detection system using computer vision and a Convolutional Neural Network (MobileNetV2), achieving 94% accuracy in early disease identification from leaf imagery to prevent crop loss. Integrated with IoT sensors and Arduino, the system also automates precision irrigation, reducing water consumption by 28%. A real-time Web dashboard enables remote monitoring and control. This integrated solution offers a scalable approach to enhance crop health, resource efficiency, and sustainability in modern agriculture.

Principal objective of AI-powered smart agriculture system:

To revolutionize traditional farming by developing an integrated, intelligent system that leverages Artificial Intelligence (AI) and the Internet of Things (IoT) to automate critical farm operations—specifically irrigation and disease detection—thereby optimizing resource use, increasing crop yield and health, and promoting sustainable agricultural practices.

1. **To Develop an AI-Driven Disease Detection System** for early and accurate identification of plant diseases.
2. **To Implement a Smart Irrigation System** that optimizes water usage based on real-time data.
3. **To Automate Farm Operations** to reduce manual labour and human error.
4. **To Provide Real-Time Monitoring and Visualization** via a user-friendly dashboard for data-driven decision-making.
5. **To Promote Sustainable Agriculture** by reducing the overuse of water.

Scope of AI-Powered Smart Agriculture System:

1. **Precision Farming**: Use of AI and IoT sensors to monitor and manage crop conditions, soil health, and resource utilization at a granular level. This includes real-time data collection on soil moisture, temperature, nutrient levels, and plant health.
2. **Smart Irrigation**: Optimization of water usage by automating irrigation systems based on AI-driven analysis of soil moisture, weather patterns, and crop water needs, reducing water wastage.
3. **Predictive Analytics**: AI-powered analysis of weather data, historical crop performance, and soil conditions to predict the best planting, fertilization, and harvesting times, as well as yield forecasting.
4. **Automated Farm Machinery**: Use of AI-driven autonomous machinery such as drones, tractors, and robots for planting, fertilizing, weeding, and harvesting, reducing manual labor requirements.
5. **Supply Chain Optimization**: Integration of AI for inventory management, market demand prediction, and distribution logistics, optimizing the entire agricultural supply chain.
6. **Sustainability**: Promoting eco-friendly practices through AI insights that reduce the use of pesticides, fertilizers, and water while enhancing soil health and reducing greenhouse gas emissions.
7. **Data-Driven Decision Making**: Empowering farmers with AI-powered dashboards and tools to make better-informed decisions that enhance overall farm productivity and profitability.

System Requirement Specification (SRS) for AI-Powered Smart Agriculture System:

The SRS defines the hardware and software requirements for an AI-powered smart agriculture system to enable precision farming, real-time monitoring, and data-driven decision-making.

1. Software Requirements (S/W)

- **OS:** Windows/macOS for development.
- **AI & ML:** TensorFlow, PyTorch, Keras, OpenCV for image processing and model training (using MobileNetV2 architecture).
- **Analytics & Backend:** Flask web framework for real-time dashboard and data visualization.

2. Hardware Requirements (H/W)

- **IoT Sensors:** Soil Moisture Sensor (FC-28).
- **Edge Devices:** Arduino Uno (for automation tasks).
- **Imaging:** 1080p Webcam for leaf image capture.
- **Irrigation & Control:** Relay Module, Submersible Water Pump.
- **User Interface:** Web Dashboard accessible via desktop and mobile devices.
- **Energy:** Lithium Batteries (3.7V, Rechargeable) for powering sensors and modules.

3. Environmental Constraints

- **Robustness:** Sensor nodes and cameras must be housed in weatherproof enclosures to withstand dust, rain, and direct sunlight.
- **Power Efficiency:** Designed for low-power operation, suitable for battery and solar-powered applications in remote fields.
- **Scalability:** Modular architecture to support adding multiple sensor nodes and cameras for larger fields.

References:

1. S. P. Mohanty, D. P. Hughes and M. Salathé, Using Deep Learning for Image-Based Plant Disease Detection, Frontiers in Plant Science, Vol. 7, 2016, p. 1419.
2. M. Tan and Q. V. Le, MobileNet: Rethinking Model Scaling for Convolutional Neural Networks, Proc of the 36th International Conference on Machine Learning, PMLR 97, 2019, pp. 6105–6114.
3. Food and Agriculture Organization of the United Nations, The future of food and agriculture – Trends and challenges, Rome, 2017.
4. McKinsey & Company, Agriculture's connected future: How technology can yield new growth, 2020.
5. Nitin and S. B. Gupta, Artificial Intelligence in Smart Agriculture: Applications and Challenges, CAST, Vol. 1, No. 1, 2023.
6. P. Kumar, A. Nelson, Z. Kapetanovic and R. Chandra, Affordable Artificial Intelligence – Augmenting Farmer Knowledge with AI, arXiv preprint arXiv:2303.06049, 2023.
7. Aashu, K. Rajwar, M. Pant and K. Deep, Application of Machine Learning in Agriculture: Recent Trends and Future Research Avenues, arXiv preprint arXiv:2405.17465, 2024.
8. A. A. Issa, S. Majed, S. A. Ameer and H. M. Al-Jawahry, Farming in the Digital Age: Smart Agriculture with AI and IoT, E3S Web of Conferences, Vol. 477, 2024, p. 00081.
9. O. Turgut, I. Kok and S. Ozdemir, AgroXAI: Explainable AI-Driven Crop Recommendation System for Agriculture 4.0, arXiv preprint arXiv:2412.16196, 2024.
10. A. Palli and H. Kumar, Integration of Smart Drones and AI into Agriculture – A Review, National Agricultural Compliance Assistance Association, 2024.

Signature of the Guide	Signature of the Project Coordinator	Signature of HOD