DPU	**DR.D. Y. PATIL INSTITUTE OF TECHNOLOGY, PIMPRI PUNE**	
Academic Year: 2024 - 25	**Synopsis**	**Term:** I/II

1 Group Id - 1

2 Project Title –

Kisan Mitra: Transforming Agriculture with Next-Gen Disease Detection and Prediction.

3 Project Option – Internal Project.

4 Internal Guide – Dr. Vinod V. Kimbahune, Mrs. Aarju Jain.

5 Sponsorship and External Guide –

No sponsorship, this is an internally guided project.

6 Technical Keywords (As per ACM Keywords) –

a) AI (Artificial Intelligence)

b) Image Recognition

c) MERN Stack

d) Material Design

e) ML (Machine Learning)

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7 Problem Statement –

The agricultural sector faces challenges related to inefficient soil management, inaccurate crop selection, and undetected diseases, which can lead to reduced yields and unsustainable farming practices. To address these issues, there is a need for a solution that leverages advanced machine learning techniques to provide precise soil analysis, recommend optimal crops and fertilizers, detect diseases early, and promote sustainable soil management practices. This would enable farmers to make data-driven decisions, increasing productivity and ensuring environmental sustainability.

8 Abstract –

The agricultural sector is currently confronted with significant challenges, including inefficient soil management, suboptimal crop selection, and undetected plant diseases. These issues often lead to reduced crop yields and unsustainable farming practices, threatening food security and environmental health. To address these pressing concerns, this study proposes a solution that integrates advanced machine learning techniques to enhance agricultural decision-making. By providing precise soil analysis, the system can recommend optimal crops and fertilizers tailored to specific conditions. Additionally, early detection of diseases through predictive modeling will allow farmers to implement timely interventions, minimizing losses and promoting healthier crops. This data-driven approach empowers farmers to make informed choices, ultimately increasing productivity and fostering sustainable soil management practices. By leveraging technology, the solution aims to create a more resilient agricultural framework that balances economic viability with environmental sustainability. Through improved practices and insights, we can support the agricultural community in overcoming current challenges while ensuring a sustainable future for farming. This research underscores the potential of machine learning in transforming agriculture into a more efficient and sustainable industry.

9 Goals and Objectives –

1. Enhance Soil Management: Implement advanced machine learning techniques for precise soil analysis to improve soil health and fertility.

2. Optimize Crop Selection: Develop algorithms to recommend the most suitable crops based on soil conditions, climate, and market demand.

3. Early Disease Detection: Create predictive models to identify plant diseases early, allowing for timely intervention and reducing crop losses.

4. Fertilizer Recommendations: Provide tailored fertilizer suggestions that maximize yield while minimizing environmental impact.

5. Promote Sustainable Practices: Encourage sustainable soil management techniques that support long-term agricultural productivity and environmental health.

6. Empower Farmers: Equip farmers with data-driven insights and tools that enable informed decision-making to enhance productivity.

7. Increase Agricultural Resilience: Foster a resilient agricultural framework that adapts to changing environmental conditions and market needs, ensuring food security.

10 Relevant mathematics associated with the Project

System Description:

- Input: Chemical components and suggestions for crops according to fertility and quality of soil.
- Output: Crop Prediction, Crop Disease Prediction, Crop Fertilizer Prediction according to chemical components present in the soil.
- Data Structures: Circular Linked List, Decision Trees, Random Forest.
- Functions: Prediction and Suggestion of crops according to fertility and quality of soil.
- Mathematical formulation if possible –
    a) Sigmoid Function
    b) Decision Trees
    c) Naive Bayes
    d) Random Forest

- Success Conditions:
  a) High accuracy in detecting plant diseases.
  b) Correct and actionable fertilizer recommendations.
  c) The model performs well across various plant species and environmental conditions.
  d) User-friendly interface with fast and reliable predictions.
  e) Positive feedback from users (farmers or agricultural experts).

- Failure Conditions:
  a) Low accuracy in disease detection or incorrect fertilizer suggestions.
  b) High false positives or negatives in disease diagnosis.
  c) Poor performance in real-world tests (e.g., different climates or soil types).
  d) Difficulties in user interaction or data integration.
  e) Model overfitting or underfitting.

11 Names of Conferences / Journals where papers can be published –

- IEEE/ACM Conference/Journal 1
- IEEE/ACM Conference/Journal 2
- Scopus Magazines
- International Research Journal of Engineering and Technology (IRJET)

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12 Review of Conference/Journal Papers supporting Project idea –

The literature survey will cover at least 10 key papers on the use of ML, Python Libraries and MERN Stack in agricultural analysis, crop disease detection, soil management, and the application of AI and ML in optimizing farming practices and enhancing yield sustainability.

13 Plan of Project Execution

Phase 1: Literature review and problem definition.
Phase 2: Data collection and algorithm development.
Phase 3: Implementation of the generated model.
Phase 4: Testing and validation with real-world data.
Phase 5: Final refinement and documentation.

Project Guide	**Project Coordinator**	**HOD**
Name and Sign	Mr. Jameer Kotwal	Dr. Vinod Kimbahune

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