Soil Prediction, Crop Suggestion, Leaf Disesase Detection Using ML Based Methods

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Abstract-*India is the land of agriculture and is among the top three global producers of many crops. The Indian farmer lies at the heart of the agricultural sector yet most Indian farmers remain at the bottom of the social strata. In addition, farmers find it difficult to decide which crop is best suitable and profitable for their soil, in spite of the few technological solutions that exist today, due to the variation in soil types across geographical regions. This paper proposes a crop recommendation system that uses a ML Model to predict the optimal crop to be grown by analyzing various parameters including the region, soil type, yield, selling price, etc. In general, agriculture is the backbone of India and also plays an important role in Indian economy by providing a certain percentage of domestic product to ensure the food security. But now-a-days, food production and prediction is getting depleted due to unnatural climatic changes, which will adversely affect the economy of farmers by getting a poor yield and also help the farmers to remain less familiar in forecasting the future crops. Economy contributes the most for the productivity of the agriculture. In agricultural field, the disease in plants is more common and the detection of disease in plants has become more feasible due to the above reason. These day's plant disease detection has acquired enlarging scrutiny in shriveling crops of large and various fields. Farmers undergo significant hassles in chop and changing from one disease administer principle to a different one. We can identify or spotting the tomato leaf diseases for detection for surveillance and monitoring experts is the standard approach for detection. The plants get seriously affected if the proper control hasn't been taken and this represents the quality of the pants the production of the plants will be affected.*

Keywords: *– Random Forest Classifier, Decision Tree Classifier, SVC, Logistic Regression, Gaussian NB and MLP Classifier. Crop – Random Forest Classifier, Decision Tree Classifier, SVC, AdaBoost, XG Boost.*

I.INTRODUCTION

Agriculture has long been a cornerstone of the Indian economy, supporting two-thirds of the population and contributing significantly to the country's Global Domestic Product (GDP) at 20%. In this scenario, Machine Learning and Artificial Intelligence offer promising solutions. Precision agriculture and crop recommender systems can enhance harvest quality, predict yields, and detect plant pests and nutrient deficiencies. These technological advancements can be a lifeline for the struggling agricultural sector, which currently employs a majority of the workforce while contributing significantly to the GDP. The integration of AI systems presents an opportunity to revitalize and secure the future of India's vital agricultural industry.

II.FUNCTIONAL OVERVIEW

Requirement's analysis is very critical process that enables the success of a system or software project to be assessed. Requirements are generally split into two types: Functional and non-functional requirements.

- Functional requirements:

  These are the requirements that the end user specifically demands as basic facilities that the system should offer. All these functionalities need to be necessarily incorporated into the system as a part of the contract. These are represented or stated in the form of input to be given to the system, the operation performed and the output expected. They are basically the requirements stated by the user which one can see directly in the final product, unlike the non-functional requirements. Examples of functional requirements:

  1) Authentication of user whenever he/she logs into the system.
  2) System shutdown in case of a cyber-attack.
  3) A verification email is sent to user whenever he/she register for the first time on some software system.

- Non-functional requirements:

  These are basically the quality constraints that the system must satisfy according to the project contract. The priority or extent to which these factors are implemented varies from one project to other. They are also called non-behavioral requirements. They basically deal with issues like:

  - Security
  - Maintainability
  - Reliability
  - Scalability
  - Performance
  - Reusability
  - Flexibility
  - Portability

HARDWARE REUIREMENTS:

Processor - I3/Intel Processor

Hard Disk - 160GB

Key Board - Standard Windows Keyboard

Mouse - Two or Three Button Mouse

Monitor - SVGA

RAM - 8GB

SOFTWARE REQUIREMENTS:

Operating System : Windows 7/8/10

Server side Script : HTML, CSS, Bootstrap & JS

Programming Language : Python

Libraries : Flask, Pandas, Mysql.connector, Os, Smtplib, Numpy

IDE/Workbench : PyCharm

Technology : Python 3.6+

Server Deployment : Xampp Serve

III. DESIGN

In Proposed System various machine learning models have been proposed to address the misdiagnosis problem, including those integrating machine learning and deep learning for soil prediction and fertility suggestion, crop prediction, and plant disease detection. However, these models often fall short in adequately handling the complexities of the data, such as heterogeneity and size. To address this, we propose a novel approach that combines advanced preprocessing techniques for feature transformation with both traditional machine learning and deep learning algorithms. By leveraging the strengths of both types of algorithms, we aim to achieve the highest accuracy possible while mitigating bias, instability, and deviations in the classification process. Our approach involves thorough testing of classifiers and image classifiers to ensure robustness and effectiveness in addressing the misdiagnosis problem in agricultural and medical domains.

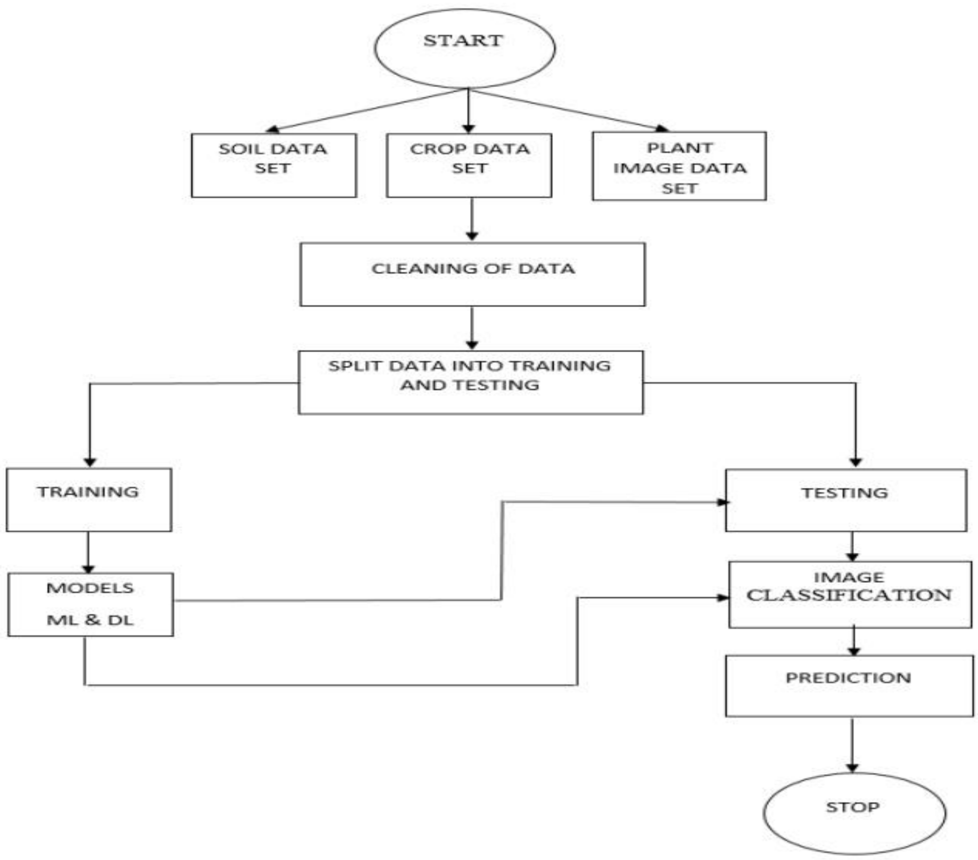


Fig: Work flow of Proposed system

Workflow of the proposed system:

1.The process begins with three primary datasets: soil data, crop data and plant image data.

2.Data cleaning is performed to eliminate null values and convert categorical values into numerical representations.

3.The cleaned data is then divided into training and testing.

4.Next, image classification techniques are applied to the plant image dataset.

5.Predictions are made based on the trained model.

6.Finally, the desired output is obtained from the predictions.

IV. IMPLEMENTATION

MODULES:

USER:

View Home Page:

Upon login or access, the user is directed to the home page of the application, which serves as the central hub for all functionalities.

View About Page:

Users can navigate to an "About" page to access detailed information about the platform, its objectives, and the team behind its development.

Input Model:

Users are required to input specific values and data for the model to generate accurate predictions. This may include data related to soil conditions, crop types, planting dates, or images of plant diseases for disease detection.

View Results:

After inputting the necessary data, users can access the generated results from the model, which could include soil health recommendations, crop yield predictions, or plant disease diagnosis.

Create Dataset:

In the context of plant disease detection, the user can create a dataset by uploading images of plants with disease symptoms and classifying them as healthy or infected. The dataset is then divided into training and testing subsets.

Pre- Processing:

As part of the image dataset preparation, users can apply preprocessing techniques, such as resizing and reshaping, to ensure the images are in a suitable format for model training.

Training:

The training module involves the use of deep learning algorithms, machine learning models, and possibly transfer learning methods (e.g., Resnet50) to train the model on the pre-processed dataset. This step is crucial for building accurate predictive models.

Classification:

The classification results are presented to the user, indicating the labels assigned to plant disease classification. Users can see if the plants are healthy or identify the specific disease affecting them.

Working on Data set:

The classification results are presented to the user, indicating the labels assigned to plant disease classification images. Users can see if the plants are healthy or identify the specific disease affecting them.

Pre-processing:

The classification results are presented to the user, indicating the labels assigned to plant disease classification images. Users can see if the plants are healthy or identify the specific disease affecting them.

Training the data:

The system splits the data into training and testing sets, a crucial step before training the machine learning algorithms or deep learning models. This ensures model performance can be accurately evaluated.

Model Building:

The system splits the data into training and testing sets, a crucial step before training the machine learning algorithms or deep learning models. This ensures model performance can be accurately evaluated.

Generate Results:

The system splits the data into training and testing sets, a crucial step before training the machine learning algorithms or deep learning models. This ensures model performance can be accurately evaluated.

Upload Image:

The system splits the data into training and testing sets, a crucial step before training the machine learning algorithms or deep learning models. This ensures model performance can be accurately evaluated.

View Results:

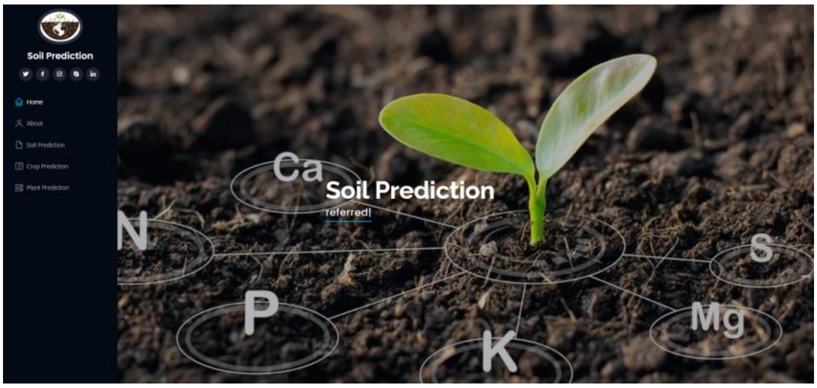
After image classification, the results are displayed to users. They can view the classified images and the corresponding disease labels.

Table: Test Cases

Input	Tested for different model given by user on the different model.	Success
Random Forest Classifier	Tested for different input given by the user on different models are created using the different algorithms and data.	Success
Prediction	Prediction will be performed using the different models build from the algorithms.	Success

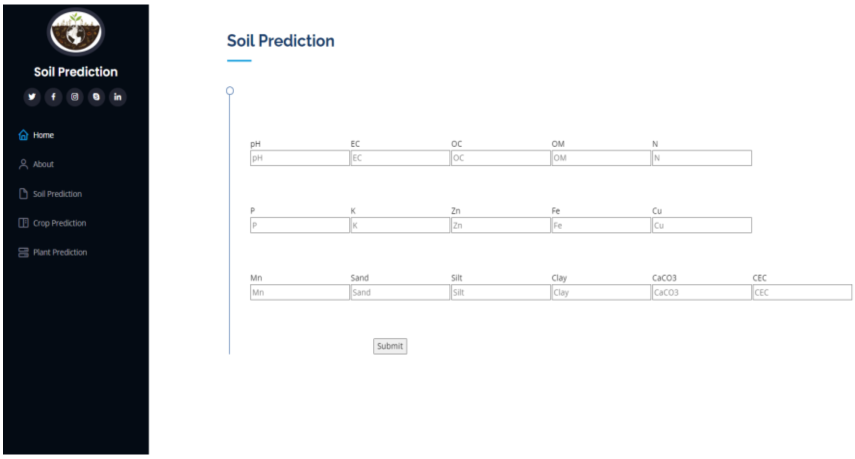
IV.RESULTS

HOME PAGE: This is a Soil Prediction home page.

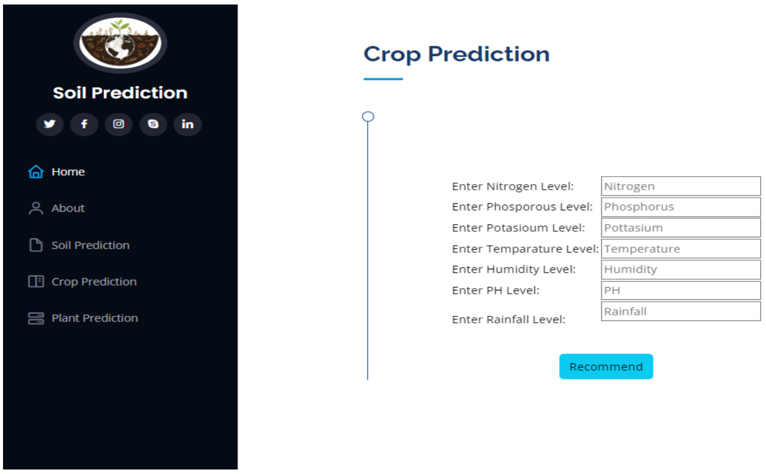


ABOUT: Here we can read about our project.

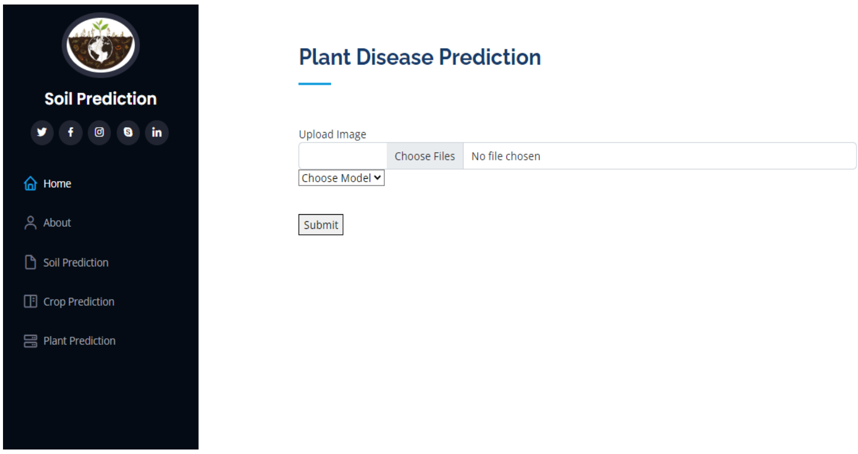
SOIL PREDICTION:



CROP PREDICTION:



PLANT DISEASE DETECTION:



V. CONCLUSION

In conclusion, the implementation of machine learning based methods for crop suggestion and soil prediction, as well as plant disease prediction, holds great potential for revolutionizing modern agriculture. By harnessing the power of data analytics and artificial intelligence, farmers can optimize resource utilization, mitigate risks, and contribute to sustainable food production practices. However, further research and development are needed to address challenges such as data scarcity, model interpretability, and scalability, ensuring the widespread adoption and long-term success of these innovative technologies in agriculture.

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