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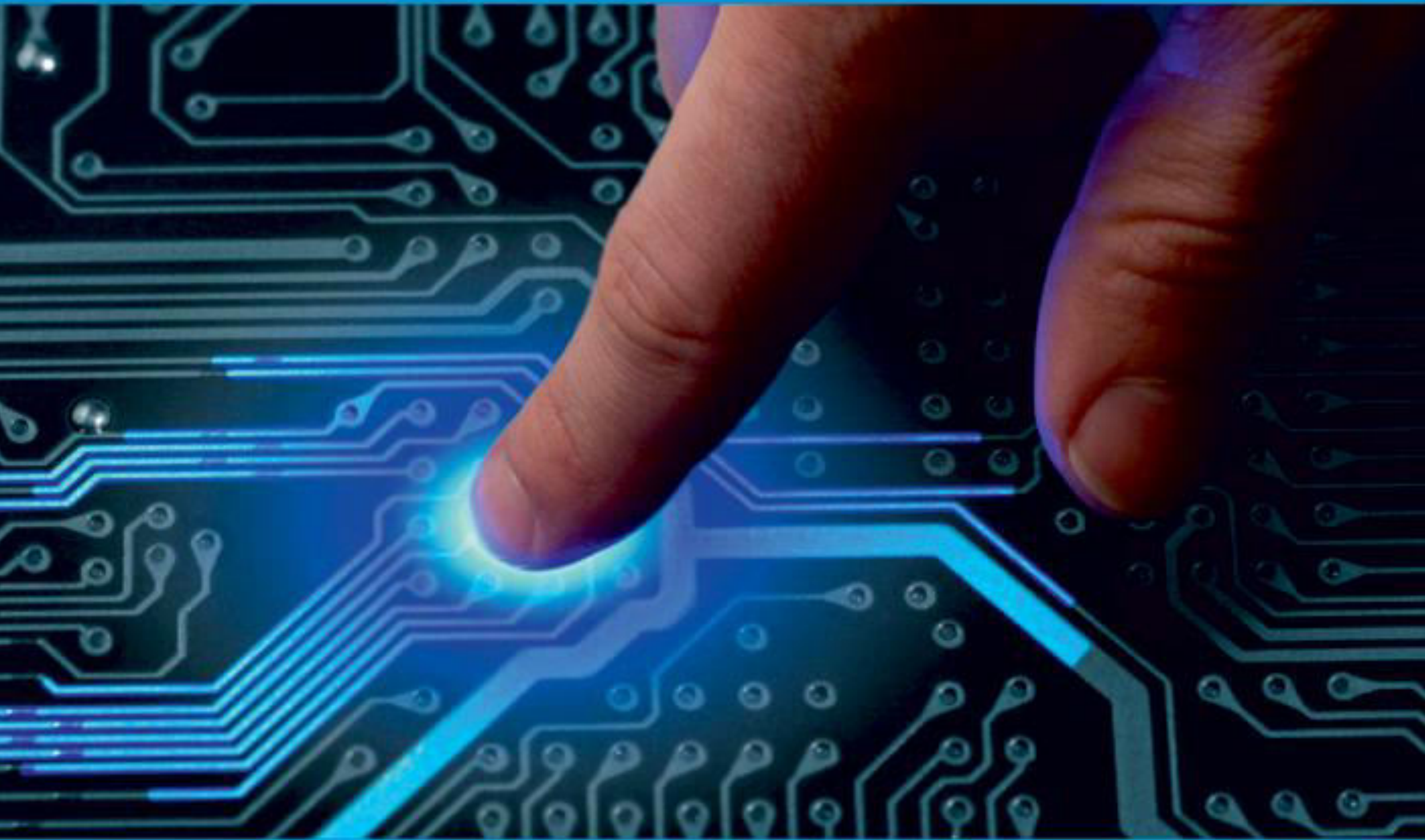

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GrowPro Using Machine Learning

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ABSTRACT: Some of the biggest problems facing our farmers today include crop failure, lack of knowledge, crop damage due to ignorance and carelessness, lack of professional support, and inaccessibility to agricultural technical solutions. GrowPro helps farmers address these issues by providing plant recommendation system, fertilizer recommendation system and plant disease detection system tools. Soil surveys are important as they determine soil fertility and allow for crop forecasting. Soil pH is a measure of soil acidity and alkalinity. Crop yields are being massively impacted by uncontrolled disease spread. Machine learning is an emerging research area in crop yield analysis. In agriculture, various machine learning techniques are used and evaluated to recommend harvests. We use machine learning classification algorithms to predict the right crop based on the values we get from the device and also provide the right fertilizer this land needs. We believe this will allow farmers to achieve higher crop yields and significantly prevent crop damage. It does this by applying machine learning algorithms such as support vector machines and random forests to agricultural data to recommend appropriate fertilizers for individual crops.

KEYWORDS: Crop Recommendation, Fertilizer Recommendation, Disease Detection.

I. INTRODUCTION

The viability of any agricultural venture is directly proportional to the quality of the underlying soil. Recent advances in technology have been effective in the process of increasing harvests. Many farmers and ranchers continue to cultivate their land on the basis of urban tales rather than acquiring the fundamental facts or doing an in-depth assessment of which manures would be most advantageous for their particular soil and crop. This is because they believe that urban tales are more reliable than getting the essential facts or conducting an in-depth examination. It is possible to increase agricultural output by enhancing the nutrient density of the soil by testing and identifying which types of compost make the most sense to use. If the incorrect manures are employed, it is possible that both the amount and quality of the crop will be affected negatively. The burgeoning discipline of informatics known as machine learning (ML) holds great potential for use in agricultural settings in the near and far future. In order to accomplish this. The predictions that were created utilizing machine learning algorithms for composting have assisted ranchers in increasing the yields of their harvests.

II. RELATED WORK

Here we have selected few key literatures after exhaustive literature survey and listed as below:

Singh A et al [1] The authors provide details of the DNN architectures used for both crop recommendation and disease detection tasks. They also discuss the preprocessing steps involved in handling the input data and training the models. Additionally, they evaluate the performance of their approach using appropriate metrics and compare it with existing methods in the field.

Barman A et al [2] The authors address the importance of appropriate fertilizer management in achieving optimal crop yields and sustainable agricultural practices. They aim to determine the appropriate fertilizer doses for each crop in the specified cropping pattern based on field experiments and scientific analysis.

Khaswneh N [3] The authors address the significant economic losses caused by tomato diseases and the need for early detection to prevent their spread. They propose a solution that utilizes deep transfer learning, a powerful machine learning approach that leverages pre-trained models and adapts them to new tasks. Niranjan S. Second International Conference on Green Computing and Internet of Things (ICGCIoT 2018).

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S Shariff S et al [4] The authors address the importance of accurate crop recommendation to optimize agricultural productivity and ensure sustainable farming practices. They propose a solution that leverages machine learning algorithms to provide personalized crop recommendations based on various factors such as soil characteristics, climate data, and historical crop performance.

Mohanty SP et al [5] The authors address the challenges posed by plant diseases in agriculture and the potential of image analysis techniques, particularly deep learning, in facilitating early and accurate disease detection. They propose a solution that utilizes deep convolutional neural networks (CNNs) to classify images of plants as healthy or diseased based on visual cues.

Palaniraj A et al [6] The authors address the significance of precise crop and fertilizer recommendations to enhance agricultural productivity and sustainability. They propose a solution that utilizes machine learning algorithms to provide personalized recommendations based on various factors such as soil properties, climate conditions, and crop requirements.

Jaware TH et al [7] The authors address the importance of early detection and accurate identification of crop diseases to minimize yield losses and enable timely interventions. They propose a solution that utilizes image segmentation algorithms to separate diseased regions from healthy ones in images of crops, facilitating disease detection.

Van Klompenburg T et al [8] The authors address the significance of crop yield prediction in agriculture for effective resource management, decision-making, and maximizing productivity. They conduct a comprehensive literature review to identify and analyze existing studies that utilize machine learning algorithms for crop yield prediction.

III. PROBLEM STATEMENT

The purpose of this project is to design and develop an efficient and user-friendly crop recommendation and fertilizer with disease prediction System using machine learning, aimed at simplifying the process of finding suitable fertilizer for the soil and predicting the crop disease if any. The current process of checking for soil contents and other factors requires lengthy processing times. This system aims to overcome these challenges and streamline the entire process, ensuring quick and hassle-free access to the recommender to the users.

IV. DESIGN AND IMPLEMENTATION

Flowchart of crop and fertilizer recommender and disease prediction can be a complex task as it involves multiple steps and processes. However, I can provide you with a simplified flowchart that represents the key steps involved in such a system.

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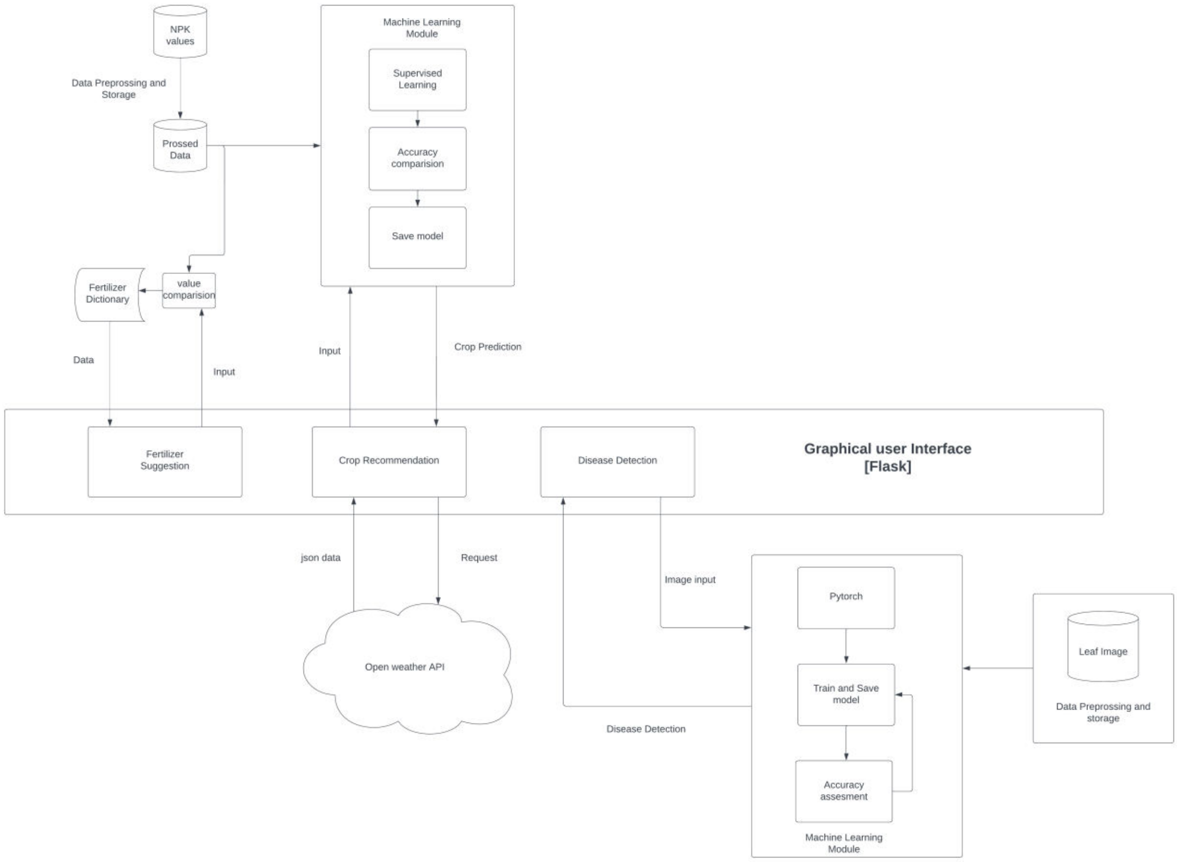

Fig 1: System Architecture of GrowPro

The above Figure 1 shows the following steps of the system flow:

1. Start
2. User accesses the GrowPro
3. System displays the homepage with options for the services
4. If the user choses for crop recommendation service, then the page is accessed
5. Here the user has to enter the values
6. The values along with the api fetched data is sent to the model
7. The model then recommends a crop based to the data suitable to that place
8. Then the user can access the second service that is fertilizer recommender service
9. If the user choses for fertilizer recommendation service, then the page is opened
10. The NPK values along with ph value is taken as input by the user and processed
11. A suitable fertilizer is recommended based on the soil contents of the place
12. Then the user can go to homepage
13. The third service is disease prediction of crop leaf image
14. The image of a crop leaf is uploaded by the user
15. The is image is then processed and the result is displayed
16. If there is disease then the name along with its cure suggestions are displayed in the page
17. If there is no disease then it displays as healthy leaf

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V. RESULT ANALYSIS

Snapshot:

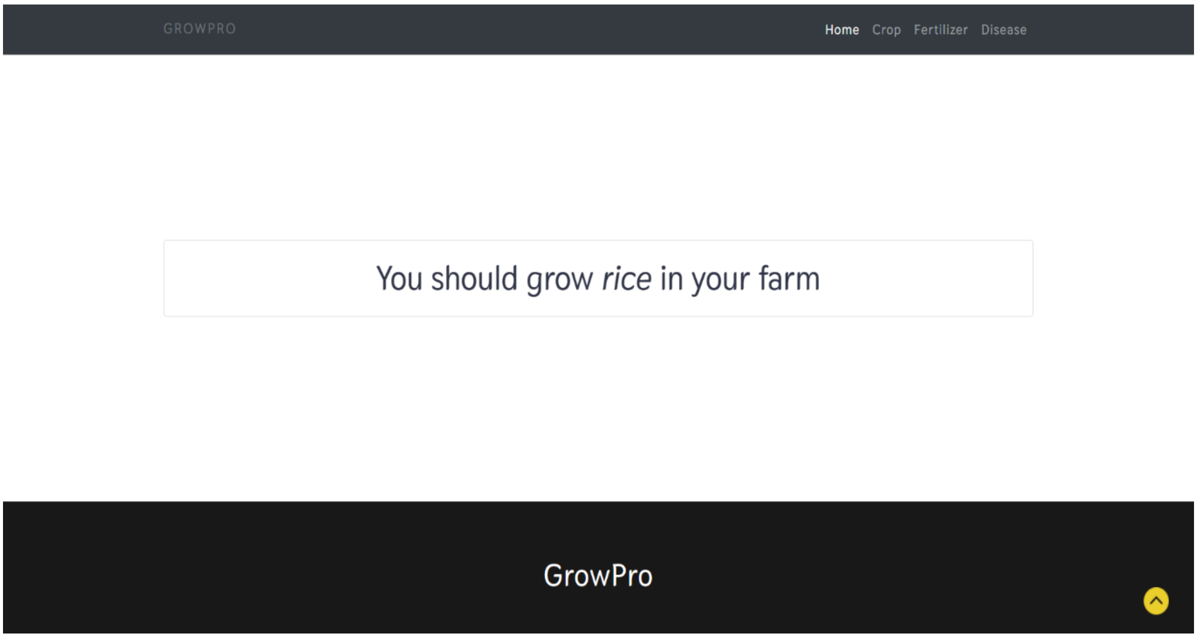

Fig 1: Crop recommendation

The above figure 1 shows the recommendation of crop based on the input of from the user such as NPK values, soil acidic content and weather conditions that are entered

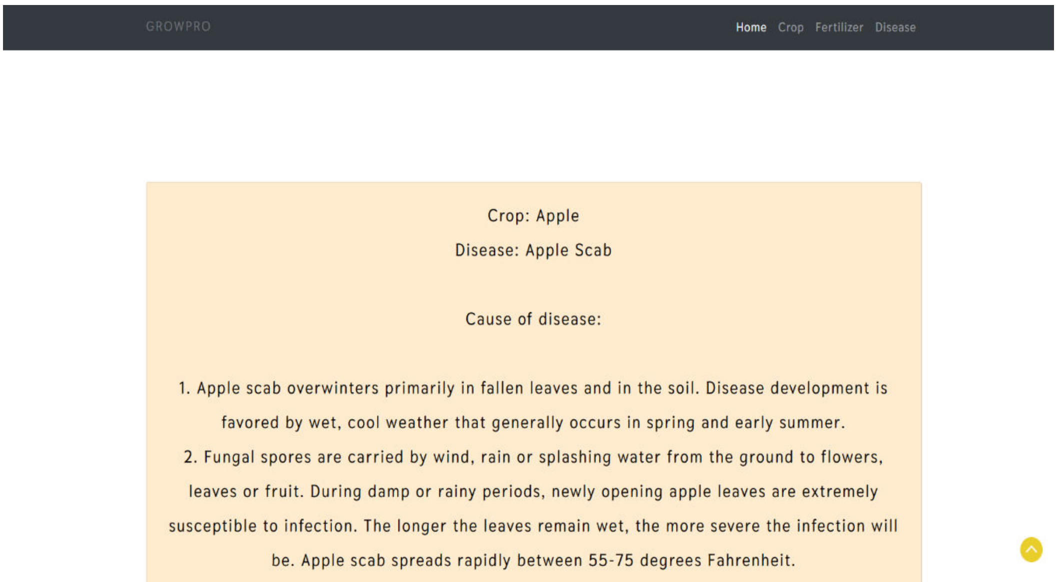

Fig 2: Disease detection

The above figure 2 shows the disease of the leaf that is uploaded by the user if there is any disease then it shows if not then it shows that the crop is healthy.

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To perform outcome analysis, such as crop and fertilizer recommendations, disease prediction, etc., it is usually necessary to consider various aspects of system functionality, usability, and performance. Key areas to assess are:

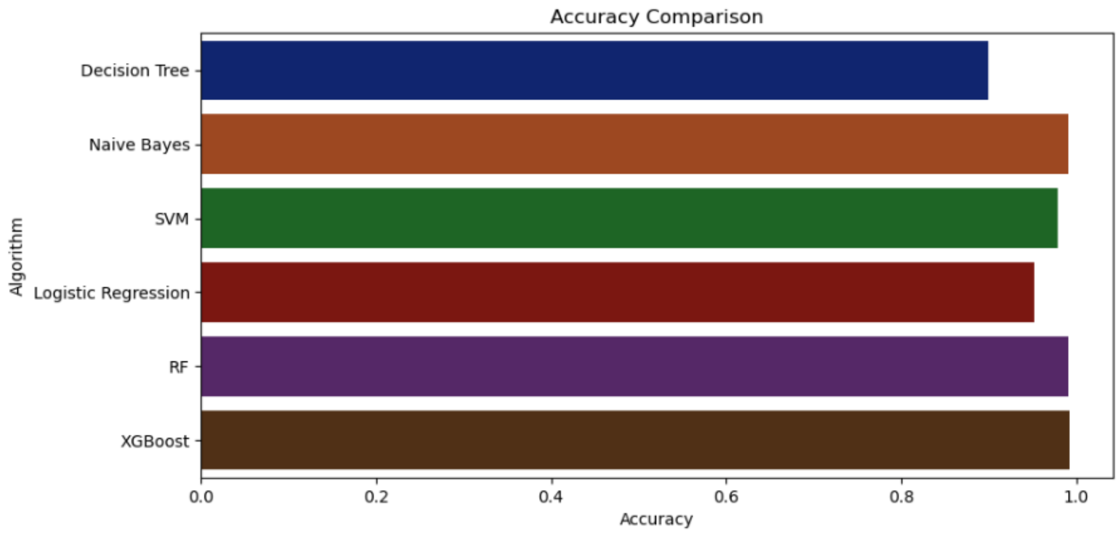
1. User Experience: Evaluate the overall user experience of the system. Consider factors such as ease of use, intuitive interface design, and clarity of explanation.

2. System Reliability: Check system reliability in terms of uptime and availability. Check if the system experienced any significant downtime or technical issues during the analysis period.

3. Performance: Assess system performance in terms of speed and responsiveness. Check the load times of various pages and forms and assess whether the system can handle a reasonable number of concurrent users without significantly slowing down or crashing.

4. Feedback and User Satisfaction: Collect feedback from users who have used our crop and fertilizer recommendations and disease prediction system. Conduct surveys and interviews to understand their experiences, pain points, and suggestions for improvement.

Based on our analysis of these areas, we can identify the strengths and weaknesses of our crop and fertilizer recommendation systems and disease prediction systems, and make recommendations for improvements and bug fixes to improve overall functionality and user experience. can.
The figure below shows the accuracy of different models used in the system.



VI. CONCLUSION

This plan was designed to address all three issues simultaneously. The first step is to suggest crops to grow based on the given inputs. The second step is to use user data to recommend appropriate fertilizers to users. And the third step is to take a user-uploaded photo and recognize if it is disease. Whether the photo is sick or not, and if so, suggest a cure. The technology has been a success in all three perspectives, and promises future results such as increased yields and the discovery of new locations.

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