IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

CROPIFY

(Ai-based crop yield prediction for precision agriculture)

Sakshi Khade
Department of Information Technology,
Terna Engineering College,
Navi Mumbai, Maharashtra, India

Akanksha Khot
Department of Information Technology,
Terna Engineering College,
Navi Mumbai, Maharashtra, India

Chetan Bhandari
Department of Information Technology,
Terna Engineering College,
Navi Mumbai, Maharashtra, India

Guide: Prof. Namrata Singh
Department of Information Technology,
Terna Engineering College,
Navi Mumbai, Maharashtra, India

Rutikesh Pawar
Department of Information Technology,
Terna Engineering College,
Navi Mumbai, Maharashtra, India

***Abstract*—** This research paper introduces "Cropify," an innovative agricultural technology that combines artificial intelligence (AI) and advanced image analysis for accurate crop yield prediction. The system analyzes crop health, identifies diseases, and offers personalized recommendations to optimize agricultural yield. This paper presents the development, methodology, and real-world application of Cropify, showcasing its potential to revolutionize traditional farming practices.

I. INTRODUCTION

Welcome to Cropify, the revolutionary agricultural ally poised to transform farming practices worldwide! In an era where the health of crops determines our food security, Cropify emerges as a groundbreaking solution leveraging advanced technology to safeguard plants against diseases and viruses. Imagine a world where a simple photo of a sick plant becomes the key to unlocking precise diagnoses and tailored solutions. Cropify stands at this intersection of innovation and necessity, utilizing sophisticated image recognition technology powered by Artificial Intelligence. We also talk about possible future lines of inquiry in this field.

Through the lens of a smartphone or any camera, Cropify analyzes plant images with astonishing accuracy, swiftly identifying diseases and viral infections. This streamlined approach eradicates the need for extensive lab tests or manual diagnosis, providing farmers with immediate insights into the health of their crops. But Cropify isn't just about diagnosis; it's a comprehensive guardian for agricultural well-being. Beyond pinpointing diseases, it acts as a knowledgeable advisor, suggesting personalized prevention strategies to curb the spread of ailments and recommending the most suitable fertilizers for afflicted plants. The agriculture is one of the most important sectors in the Indian economy. Changing rain patterns, droughts, flooding, and geographical dispersion are just a few of the direct and indirect effects of climate change on agricultural output.

AI-based crop yield prediction, a powerful tool that harnesses Artificial Intelligence to provide accurate forecasts of crop yields. By analyzing diverse data sources and employing sophisticated algorithms, this approach not only boosts productivity and sustainability but also ushers in a new era of precision and efficiency in agriculture.

II. REVIEW OF LITERATURE

[1] Crop yield predictions are carried out to estimate higher crop yield through the use of machine learning algorithms which are one of the challenging issues in the agricultural sector. Due to this developing significance of crop yield prediction, this article provides an exhaustive review on the use of machine learning algorithms to predict crop yield with special emphasis on palm oil yield prediction. Initially, the current status of palm oil yield around the world is presented,

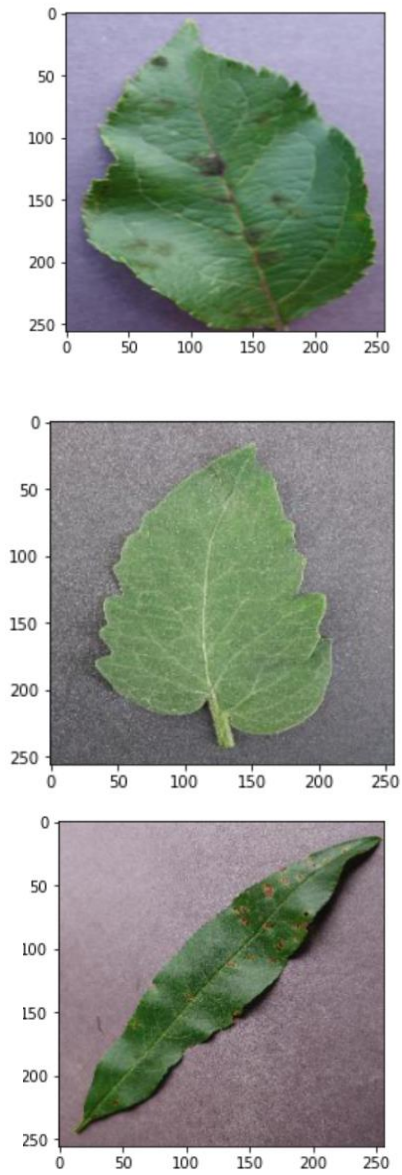
along with a brief discussion on the overview of widely used features and prediction algorithms.

[2] Crop growth is a complex and risky process and difficult for producers to analyze in isolation. The emergence of information technology has developed a large amount of data, i.e., big data, that can be analyzed utilizing AI to provide valuable decision support to producers, particularly large-scale operations. AI can provide predictive analytics for growers to better manage risks through improved preparation and response for unexpected events such as severe flooding and drought. Robotics and visual machine learning platforms. enable automation of critical labor activities such as field scouting and harvesting.

[3] different techniques and applications of Artificial Intelligence for yield prediction and smart irrigation. Timely prediction of irrigation requirements and crop yields is necessary for farmer's welfare and satisfaction. The beforehand prediction significantly contributes to minimizing production cost and maximizing crop yields. acknowledges the past breakthroughs and emerging Artificial Intelligence-based techniques in precision farming specifically for yield prediction and smart irrigation. Artificial Intelligence-based system provides sufficient information about crop yields at an early stage and its associated smart irrigation management system is effective in the judicious use of essential resources such as water and energy for agriculture.

[4] AI's promise in the field of researching and implementing intelligence in agricultural automation using WDN data is becoming increasingly important for developing intelligent solutions. Based on the projected rainfall, the resilience of the soil, and the history of the crop planted, a MEA is utilized in the proposed study to predict the type of crops that can be cultivated to acquire the maximum yield. Farmers will be provided with a user-friendly AGILE FARM web application to aid them in determining the sort of crop that can be cultivated depending on the specified parameters. Farmers will be given ideas on alternate sorts of crops that can be grown as a substitute to prevent the anticipated problems. Farmers can make their option depending on the available seeds, fertilizer, and cultivation history because the advice is not with one alternate crop.

[5] The choice of crop will depend on the various factors like, value of the crop, price given by the government, weather conditions and the price given by the private market buyers. Numerous progressions are needed in the field of agriculture to improve the benefit to Indian economy. We can improve agriculture by implementing AI mechanisms which can be same are deficiently on various cultivating areas. With all the advancements in the areas of machines and their improvements we can use them in cultivating the valuable and detailed data concerning various issues in addition to assuming the critical part in it. This paper helps use to getting an idea towards executing all the harvest-based strategy with the ambitious techniques that helps in enchanting the maintenance of numerous agriculture and agriculture field issues.



Following are Few Images that where consider for training the dataset for prediction of crop diseases like Apple___Apple_scab, Tomato___healthy, Peach___Bacterial_spot and many more.

III. PROPOSED SYSTEM

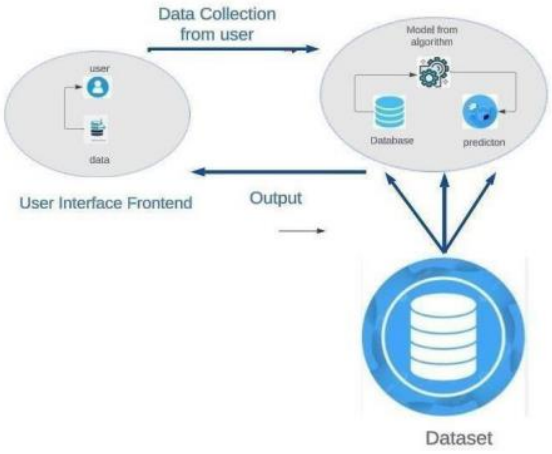


Figure 1: System Architecture

The front-end is crafted using, HTML, CSS, and JS, creating an intuitive user interface. This interface allows users to input crucial data, such as soil information, climate information according to state and city to initiating a dynamic interaction with the backend. The backend, empowered by AI and ML algorithms like and Random Forest Classifier, leverages these sophisticated models to predict the crop.

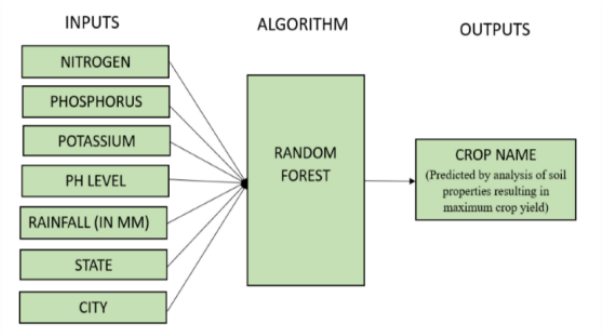


Figure 2: Block Diagram

Data Loading and Preprocessing
• Load dataset: 'fertilizerDataSet.csv'
• Select relevant columns: 'crop', 'N', 'P', 'K', 'PH', 'Rainfall', 'State', 'City'
• Remove missing values.
Feature Engineering
• Use Random Forest Algorithm to train dataset
Model Training:
• Split the data for training and testing

IV. Result and Implementation

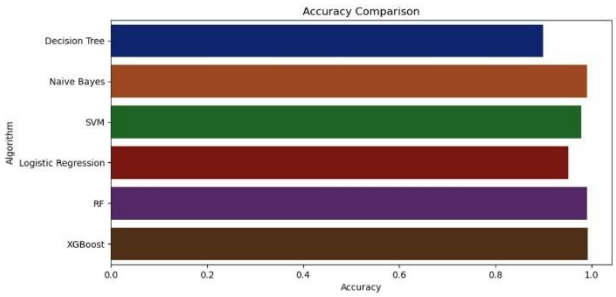


Figure 3: Comparison of Algorithms

Accuracy Comparison between various Algorithms Such as Decision Tree, Naïve Bayes, Support vector Machine, Logistic regression, Random forest, XGBoost in which the accuracy of Random forest and XGBoost was maximum. In which Random Forest algorithm was most precise for this project.

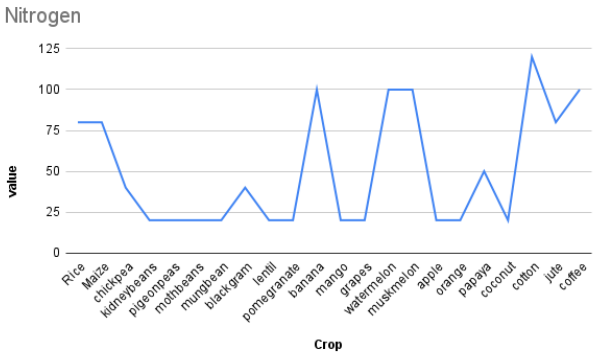


Figure 4: Nitrogen Content in Soil

Above is the Graphical Representation of Nitrogen. Crops like Banana, Watermelon, Muskmelon, cotton and coffee require higher amount of nitrogen content in the soil.

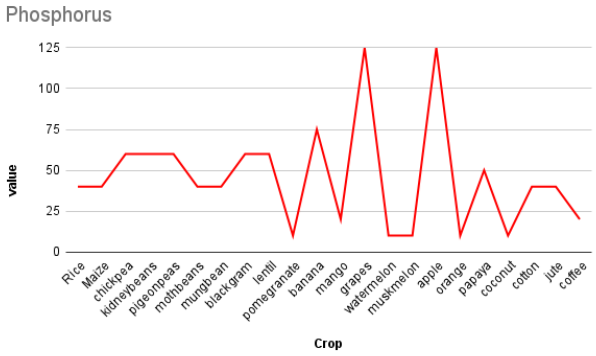


Figure 5: Phosphorus Content in Soil

Above is the Graphical Representation of Phosphorous. Crops like Grapes, Apple require higher amount of Phosphorus content in the soil.

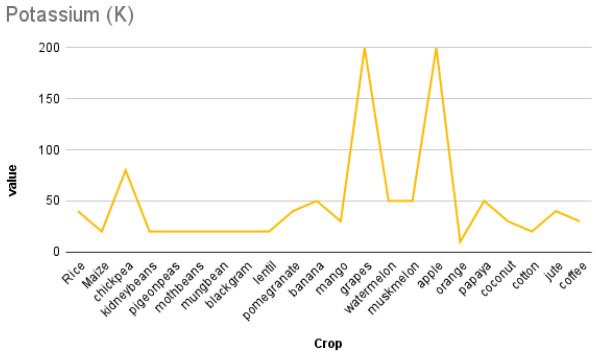


Figure 6: Potassium Content in Soil

Above is the Graphical Representation of potassium. Crops like Grapes, Apple require higher amount of Potassium content in the soil.

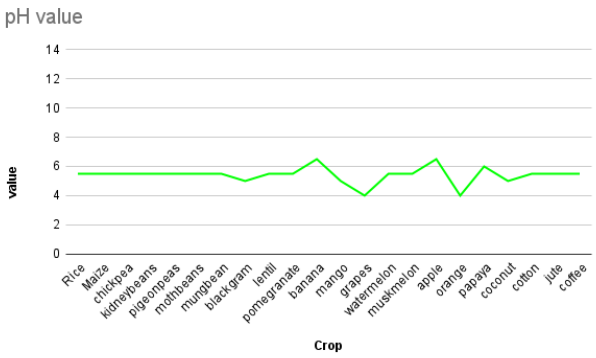


Figure 7: PH Value of the Soil

Above is the Graphical Representation of PH Value. The Average PH Value required is around 5.5 to 6.5 for majority of crop growth.

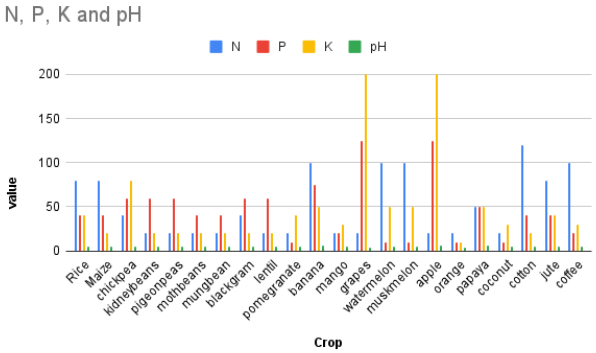


Figure 8: Combined Content in Soil

On the Basis of various Soil contains like Nitrogen, Phosphorous, Potassium and PH Value the above is the combine Graphical Representation for each crop.

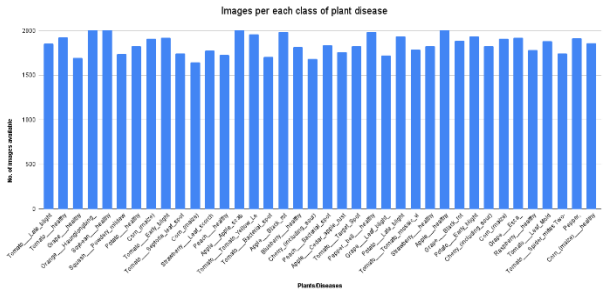


Figure 9: Images per each class of plant disease

Above is the distribution of the no. of images that were used for the particular diseases of the crop for the prediction of crop diseases

V. Conclusion

In conclusion, the Cropify project represents a groundbreaking leap forward in agricultural technology, leveraging the capabilities of AI to empower farmers and revolutionize crop management. By harnessing the potential of image analysis to swiftly diagnose diseases, provide tailored recommendations, and optimize farming practices, Cropify stands as a beacon of hope for agricultural communities globally.

This innovation not only promises increased yields and improved crop quality but also plays a vital role in minimizing crop waste by swiftly addressing diseases and issues that could otherwise devastate entire harvests. Beyond its immediate impact on productivity, Cropify fosters a sustainable approach by reducing the excessive use of pesticides and fertilizers, thereby promoting environmental conservation. Moreover, by offering accessible and actionable insights derived from sophisticated AI algorithms, Cropify extends a helping hand to farmers, especially those in remote or underserved areas, enabling them to make informed decisions and achieve greater crop yields. In doing so, it contributes significantly to food security and economic stability while elevating farming practices to new levels of efficiency and resilience

Acknowledgment

First and foremost, we would like to thank our guide Prof. Namrata Singh for her invaluable expertise, guidance, and support throughout our project. A debt of gratitude is also owed to our HOD Dr. Vaishali Khairnar and the Department of Information Technology for providing us with the opportunity as well as the support required to pursue this project. We would like to extend our appreciation to our colleagues for their assistance and discussions during the research.

References

[1] Rashid, Mamunur, et al. "A comprehensive review of crop yield prediction using machine learning approaches with special emphasis on palm oil yield prediction." IEEE access 9 (2021): 63406-63439.

[2] Liu, Simon Y. "Artificial intelligence (AI) iagriculture." IT Professional 22.3 (2020): 14- 15

[3] Sinwar, Deepak, et al. "AI-based yield prediction and smart irrigation." Internet of Thingsand Analytics for Agriculture, Volume 2 (2020): 155-180

[4] Cema, G., and E. Kaliappan. "AI Based Crop Recommendations for Intensive Farming using WSN." 2022 Third International Conference on Intelligent Computing Instrumentation and Control Technologies (ICICICT). IEEE, 2022.

[5] Shaik, Mohammed Ali, et al. "Prediction of crop yield using machine learning." AIP Conference Proceedings. Vol. 2418. No. 1. AIP Publishing, 2