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MACHINE LEARNING BASED CROP YIELD PREDICTION ON GEOGRAPHICAL AND CLIMATIC DATA

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ABSTRACT:

Agriculture is essential to life on a fundamental level, and machine learning (ML) presents a noteworthy method for solving problems related to crop productivity. Results from current techniques, such as manual counting, climate-smart pest control, and satellite photography, are frequently erroneous. This research uses a variety of machine learning approaches to forecast agricultural productivity. Random Forest, Naïve Bayes, and Logistic Regression are the classifiers used; Random Forest has the best accuracy. By taking into account variables like temperature, rainfall, and area, these machine learning forecasts help farmers choose which crops to produce for the best yield, closing the gap between technology and the agricultural industry.

INTRODUCTION:

Throughout human history, agriculture has been the primary and most important activity in every society and civilization. It is vital to our existence as well as a major component of the expanding economy. With its considerable employment contribution, it is an important industry for both the Indian economy and the future of humankind. The need for production has grown enormously over time. People are abusing technology in order to create in enormous quantities. Every day, new hybrid kinds are created. These cultivars do not, however, contain the vital nutrients present in crops grown organically. These artificial methods deteriorate the soil, causing further harm to the ecosystem. The majority of these artificial techniques are employed to stop losses. The primary and most important endeavor for any.

LITERATURE SURVEY:

Using data from the Indian government, Aruvansh Nigam, Saksham Garg, and Archit Agrawal[1] found that the Random Forest machine learning method yields the best yield forecast accuracy. They discovered that temperature forecasting is best served by a Long Short-Term Memory (LSTM) network, whereas rainfall is best predicted by a Sequential model employing a Simple Recurrent Neural Network (RNN). Their research integrates a number of variables into the yield forecast method, including temperature, precipitation, season, and area. The results show that when all these factors are combined, Random Forest performs better than any other classifier.

PROBLEM STATEMENT:

The global economy and food security are both greatly impacted by the important industry of agriculture. For farmers, policymakers, and other stakeholders to make educated decisions on resource allocation, planning, and risk management, accurate crop yield forecasts are essential. Since climate and geography have a major role in crop performance, accurate yield prediction is crucial for sustainable agriculture.The difficulty is in developing a machine learning model that uses meteorological and geographic data to predict crop yields. To produce accurate forecasts for a range of crops in diverse areas, this model should make use of past data on crop yields, weather patterns, soil characteristics, and other relevant variables.

MOTIVATION:

This project aims to demonstrate how weather patterns have a significant impact on rural agriculture productivity. This is particularly relevant to agriculture, where the goal is to improve and use GPS technology more efficiently. Farmers may increase their profitability by cultivating crops that have the potential to provide better returns on the market by implementing a GPS module for crop yield prediction.

OBJECTIVES:

- Accuracy Enhancement: Create a machine learning model that forecasts crop yields with a higher degree of accuracy. When evaluating the performance of the model, try to keep the Mean Absolute Error (MAE), Mean Squared Error (MSE), or Root Mean Squared Error (RMSE) to a minimum.

- Accuracy in Space and Time: Boost the model's capacity to forecast crop yields with exact spatial and temporal precision. To provide more accurate predictions across different places and time frames, use algorithms that take into consideration temporal interdependence and spatial autocorrelation within the data.

- Analysis of Feature Significance: Identify and evaluate the essential characteristics that affect crop yields. Conduct a feature importance analysis to identify which geographical and climatic factors play the most significant roles in crop production.

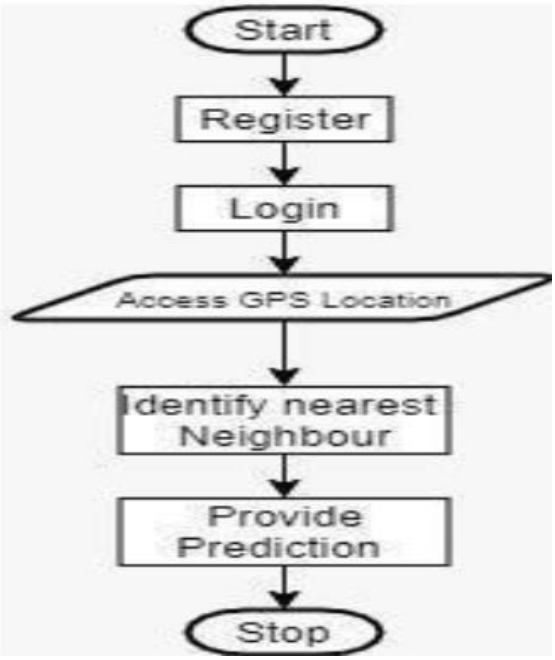
- Real-time Prediction Capability: Put into practice a model that can forecast crop yields in real time. Create a system that can handle incoming data streams and update forecasts on a regular basis.

- Easily navigable User Interface: Design a dashboard or application that makes forecasts easily accessible and understandable for farmers and stakeholders.

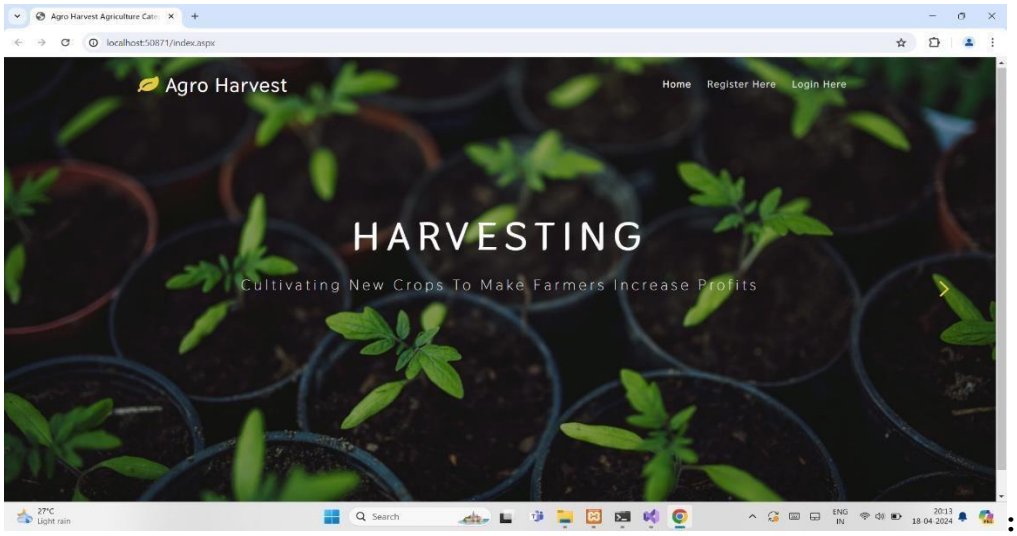
SCOPE OF THE PROJECT:

By using location data, the suggested system in this research seeks to deliver useful crop information. GPS technology is used to predict which crops will grow well so that farmers may maximize profits and harvests. This strategy aids farmers in making well-informed decisions, improving their capacity to produce revenue and make efficient use of location-specific information.

FLOW CHART:



CROP PREDICTION HOME PAGE:



SYSTEM REQUIREMENTS:

HARD WARE REQUIREMENTS:

Processor : Intel i3
Hard Disk : 40GB
RAM : 2GB or more

SOFTWARE REQUIREMENTS:

Operating System: Windows 7
Front End : ASP.NET(HTML5,CSS3, JavaScript)
Coding Language: C# ,Database MSSQL
IDE :Visual studio 2022

FUTURE ENHANCEMENTS:

A detailed understanding of the intricate agricultural ecosystems is more important than ever because of the growing challenges facing the agricultural manufacturing industry. Precision agriculture makes considerable use of machine learning techniques because they can extract useful insights from agricultural data. By increasing model accuracy and generalization capacity, the expanding data availability brought about by information and communication technology

(ICT) breakthroughs promises to foster innovation in strategic decision-making. If precision agriculture procedures do not leverage the data they create, it is hard to say if big data will make a meaningful difference. On the other hand, big data analytics is anticipated to present significant prospects and game-changing possibilities for precision farming.

CONCLUSION:

This initiative furnishes a convenient and effective framework for forecasting crop types and estimating yields based on specific regional conditions. Despite the persistent disconnect between rural farmers and contemporary technologies, this system adeptly bridges that gap. Machine learning algorithms have demonstrated remarkable efficacy in crop prediction and yield estimation. Through a thorough comparison analysis of K-nearest neighbors (KNN) and support vector machine (SVM), it has been established that SVM outperforms KNN for the selected dataset. Looking ahead, the integration of Internet of Things (IoT) to connect all farming devices to the internet holds the potential to elevate agriculture to unprecedented heights.

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