Smart Farming Using Machine Learning Algorithms

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Abstract –

The majority of India's agricultural products have been negatively impacted by climate change in terms of performance over the past 20 years. Prior to harvest, crop output predictions would aid farmers and policymakers in deciding on the best course of action for marketing and storage. Before cultivating on the agricultural field, this project will assist the farmers in learning the yield of their crop, enabling them to make the best choices. By creating a working prototype of an interactive prediction system, it tries to find a solution. It will be put into practice to implement such a system with a user-friendly web-based graphic user interface and the machine learning algorithm. The results will be made available to the farmers of the prediction. Therefore, there are various ways or algorithms for this type of data analytics in crop prediction, and we can anticipate crop production with the aid of those algorithms. It employs the random forest algorithm. There are no suitable solutions or technologies to deal with the scenario we are in, despite the analysis of all these concerns and problems, including weather, temperature, humidity, rainfall, and moisture. In India, there are numerous approaches to boost agricultural economic growth. Machine Learning is the technique most widely used in today's world. ANN is the most widely used algorithm for prediction. It is based on a collection of nodes. These nodes are called neurons. Neurons work in a way similar to the human brain. Hence, it gives more appropriate results.

***Key Words:** ANN, Machine Learning, Crop Prediction*

1. INTRODUCTION

About 70% of Indians work in the agricultural sector, which is why it was important to include it in our analysis of the economy of the nation. Crop yield prediction is a huge problem in the agricultural sector. Crop prediction is the process of figuring out what the farmer can grow. Building a system that would operate with maximum accuracy and take into account all significant variables that can affect the outcome of the crop prediction is imperative. Numerous studies have been conducted to forecast the crop that a farmer can grow. Most of the farmers try to know crop yield and whether it meets their expectations. They evaluate the previous experience of the farmer on a specific crop

yield. The decision of a farmer on which crop to cultivate is typically influenced by his intuition and other unimportant variables, such as the desire to make quick money, ignorance of market demand, exaggeration of a soil's ability to support a particular crop, and so forth. The farmer's family's financial situation could be severely strained by a choice he made. Maybe this is one of the numerous factors contributing to the innumerable farmer suicide cases that the media reports on every day. we suggest a system, an intelligent system, which, before advising the user on the best crop to plant, will take into account environmental factors (such as temperature and rainfall) and soil characteristics such as pH value, soil type, and nutrient concentration.

A website created as part of the "Smart Farming using Machine Learning" project helps farmers by predicting the crop that will be grown. This calls for specific conditions including temperature, precipitation, and soil moisture. The suggested system specifies the kind of crops a farmer may raise on his property. A suitable dataset that describes the best crop is required for the crop prediction process in order to reduce the likelihood of crop failure. Another thing to keep in mind is that it uses technology for prediction more and does not require a lot of human resources.

1.1 Introduction to ANN

Artificial Neural Networks, also known as ANN is the machine learning algorithm which works similar to human brain. The human nervous system contains neurons. Similar to neurons, ANN algorithm works. Just like the working of these neurons from the past data, ANN learns from data.

It provides the output in the form of classifications or predictions. ANN is feed-forward approach that sends data in straight forward way. ANN contains three layers input layer, hidden layer and output layer. In input layer it takes data and send to the hidden layer. Hidden layer applies various activation function, preprocess that data and send to the output layer. Output layer gives desired output.

1.2 Introduction to IOT

IOT stands for Internet Of Things. It is collection of various embedded devices such as sensors, soft ware and other different technologies. IOT is basically used for the purpose of connecting and exchanging the information or data through the devices over the internet. IOT applications use the machine learning algorithms to analyze large amount of data. Machine learning technology is used to predict the possible output on the basis of past and future data. IOT sensors collect the data through the sensors and send to the server. The model is trained using this data and predicts the output using ANN machine learning algorithm.

2. Related Work

[1] The limits of current technologies and their usefulness in yield prediction are highlighted in this research. This method assists a user in exploring potential crops and their yield in order to make more informed judgements. On the provided datasets from the states of Maharashtra and Karnataka, many machine learning algorithms, including Random Forest, ANN, SVM, MLR, and KNN, were deployed and assessed for yield to accuracy. The results show that Random Forest Regression, which has 95% accuracy, is the best standard algorithm when applied to the given datasets.[2] In this paper, the author has discussed the effect of weather conditions on crop yield. The paper focuses on artificial neural network technology. The parameters used are sensor parameters such as type of soil, Ph value, N, P, K values, etc. The multilayer perceptron model is developed by using a neural network. The accuracy of the model is validated using cross-validation. The weka tool is used for execution. The accuracy obtained is 97.5% . The paper focuses on the description of different numbers of agronomic-based models. Models have used artificial neural network algorithm. Crop yield prediction using aerial pictures have been utilized for taking decision-related harvesting. This paper reports on the use of Artificial Neural Networks to predict the rice crop yield for Maharashtra state, India.[3] The authors of this article suggested a model that uses meteorological data records from the past as the training set. The selection of a crop based on the predicted production rate, which is affected by a number of criteria, is demonstrated by the use of numerous methods, including Artificial Neural Networks, K-Nearest Neighbours, and Regularized Greedy Forest. Another clever approach, shown in, enables the prediction of soil characteristics like phosphorus concentration. To obtain high prediction accuracy, the authors apply a variety of classification algorithms, including Naive Bayes, C4.5, Linear Regression, and Least Median Square.[4] The project's goal is to forecast the crop. In this research, an intelligent farming strategy based on two emerging technologies: machine learning and the Internet of Things is provided. This method aims to

support farmers in making well-informed crop forecasting decisions.

3. Role of IOT

Proper placement of sensors is necessary. This point includes the proper location of sensors. For prediction of crop different parameters like temperature, humidity, soil moisture, rainfall of that particular region are responsible.

For more accuracy soil moisture sensor are placed at multiple points in the soil in the farm. Through temperature and soil moisture sensor live data is collected. Rainfall and moisture level are taken manually.

In this paper raspberry-pi model 4B+ is used as a computing unit. The temperature and soil moisture sensors send data to raspberry-pi unit. Here all data is collected and ANN algorithm is applied to produce output.

Python 3.5 version is used to do coding so that sensor data is processed and result is produced.

All data from sensors is collected into computing unit.

Sensor data and the result that is produced is stored as a primary storage.
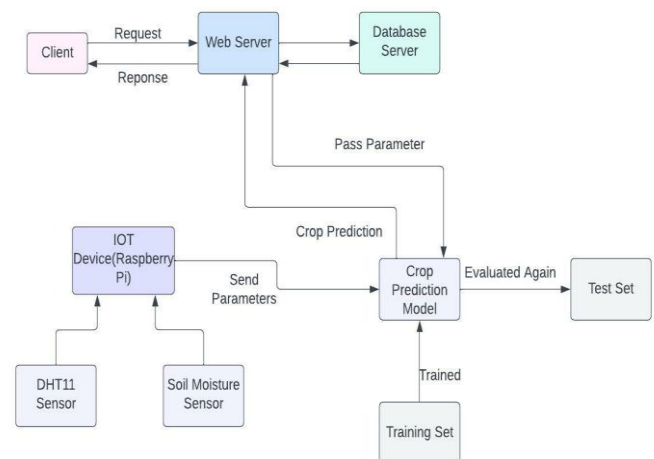
4. System Architecture

Fig -1: System Architecture

Soil-moisture sensor and temperature sensor collect the live data and will send to the Raspberry pi. Raspberry pi store and preprocess that data and then send data to the model. This data is sent by the model to the server for visualization. Model is trained using this data for prediction of crop. ANN algorithm is used to train the model. This trained ANN model will give the crop to be grown.
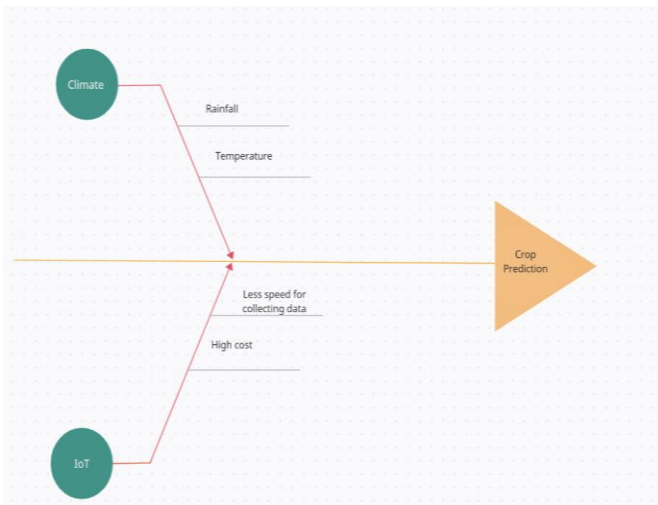
5. Cause and error diagram

Fig -2: Fishbone Diagram

The climate and IOT are the factors that are considered for the predicton of crop. The factors affecting climate are rainfall and temperature. The factors that are affecting IoT are it can have less speed for the transfer of data. Using IoT can lead to high cost. These are the factors affecting the prediction.

6. Proposed System

We proposed a smart farming crop recommendations system which takes into consideration all the appropriate parameters including temperature, rainfall, and soil moisture to predict crop suitability. The proposed model provides crop selection based on economic and environmental conditions and benefit to maximize the crop yield that will be subsequently help to meet the increasing demand for the country's food supplies. We also provide real time data collections by sensors Raspberry pi and IOT technology. This system is fundamental concern with performing the primary function Agro consultant, which is providing crop recommendations to farmers.

7. Results

The training data that is used contains information about ph, soil-moisture, rainfall, humidity.

Farmers use agroconsultant website for the prediction of crop.

Fig -3: Home page

After clicking on register user can see registration page. User can register to website by filling the details in the registration form and then click on submit. Then click on the return to login button which redirect you to login page.
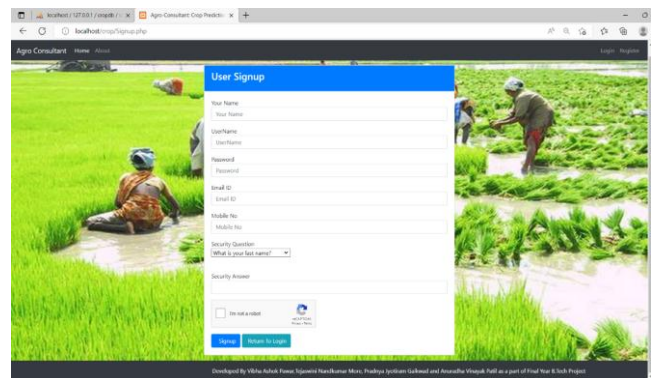

Fig -4: Registration page

After clicking register option the user will redirect to the login page. By verifying register credentials admin will activate the user account. User can login with the verified credentials.
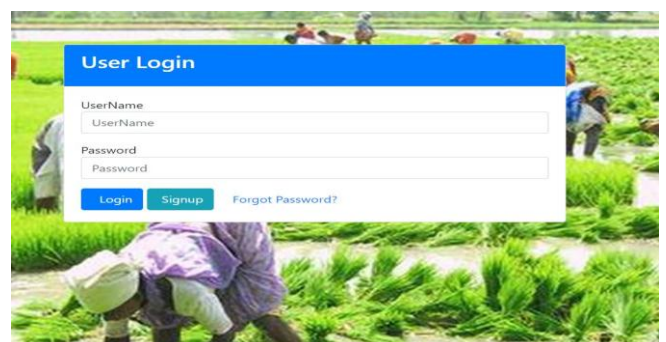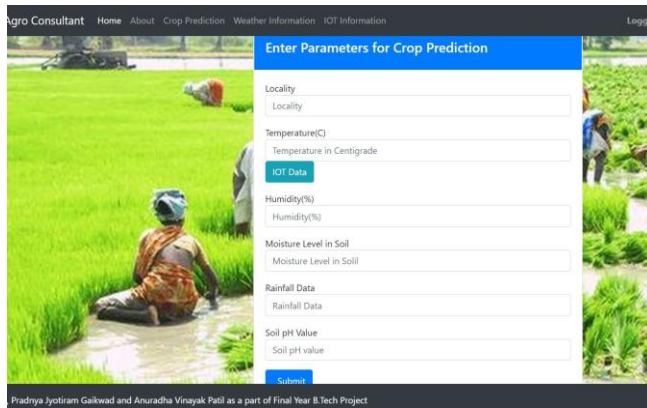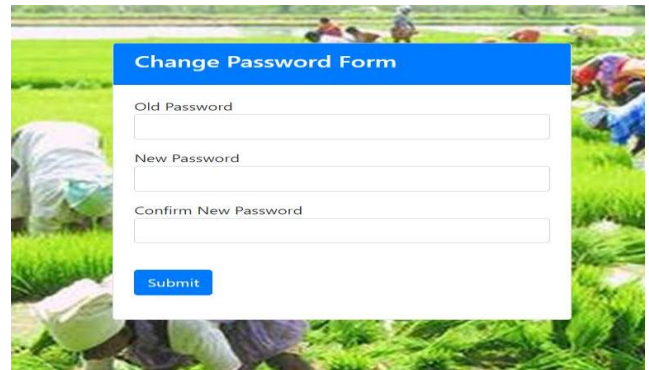

Fig -5: Login page

Select the crop prediction option from the home page menu. Fill all the required information and click on submit button.
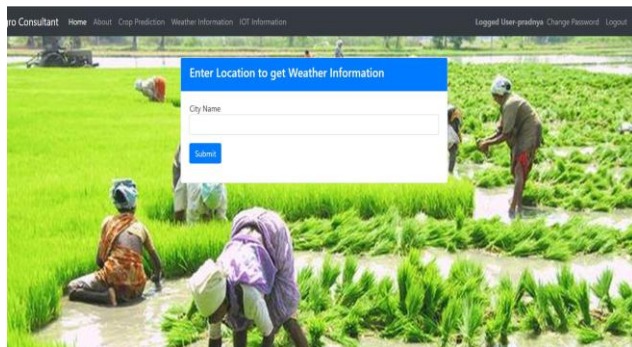
Fig -6: Crop prediction

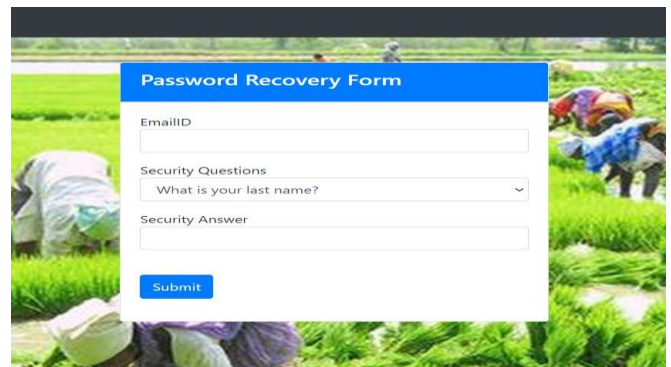Weather information gives the data about the temperature along with date and time from using public API.

Fig -7: Weather Information

This shows the live data which is gathered by the IoT device.

Fig -8: IoT Information

This module is used for changing the password with old password.

Fig -9: Password Change

The password recovery is a special thing in which we use email id to get our new password using forget password button.
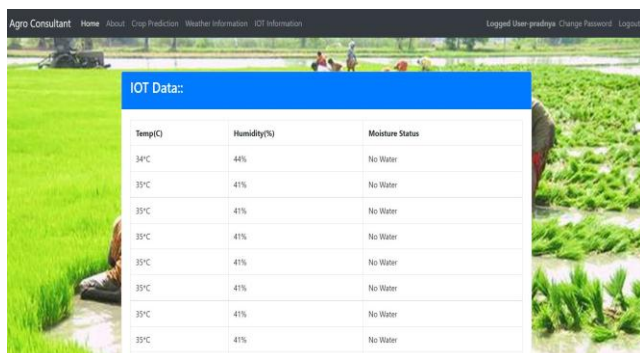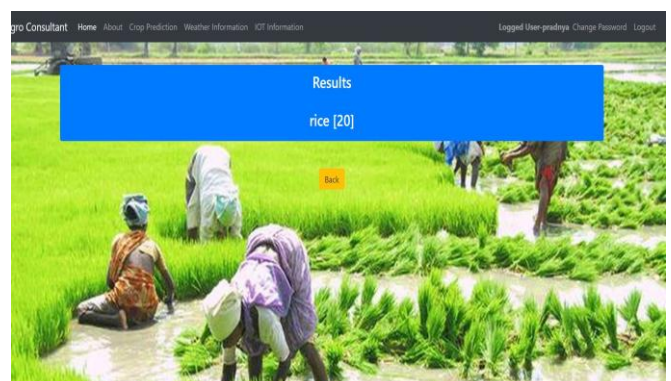

Fig -10: Password Recovery

The result tab shows whatever prediction of the crop for the given data values.

Fig -11: Results

8. CONCLUSION

We get the crop prediction for the specific environment using different parameters. The ANN model gives the accuracy of 95% approximately. This is useful for farmers to increase the profit and productivity of the crop.

9. Future Work

Building this particular application in the regional languages, so that it would be more comfortable for farmers. Crop disease detection and prevention. A generalized prediction model for various crops by considering other parameters like humidity and solar radiation can be developed. Also giving information about micronutrients.

10. REFERENCES

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