

Prediction of the Crop Cultivating using Resembling and IoT Techniques in Agricultural Fields for Increasing Productivity

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Introduction

The science and craft of development on the dirt, raising outputs and raising domesticated animals is called Agriculture. It is likewise called as cultivating. It assumes a prevailing job in the growth of the nation's economy. Indian agribusiness incorporates numerous new organic products like banana, mango, guava, papaya, lemon and vegetables like chickpea, okra and significant flavours like stew pepper, ginger, sinewy harvests, for example, jute, staples, for example, millets and castor oil seed. India is the second biggest maker of wheat and rice, the world's significant nourishment staples. Atmosphere and other natural changes has become a significant danger in the farming field. AI is a fundamental methodology for accomplishing viable and successful answers for this issue. Predicting the best crop is one of the most important aspects for increasing productivity in order to satisfy the increasing food demand. Through our project we can predict the best crop that suites to the agricultural land and the whole process of prediction is automated by machine learning technique and IoT.

The prime objective in agriculture is to increase the productivity to satisfy the food needs of the country. Improper crop selection forms the major source of low productivity. Today many farmers select the crop for their agricultural land based on their knowledge, but this kind of crop selection doesn't have significant advantage.

Predicting the best crop is one of the most important aspects for increasing productivity in order to satisfy the increasing food demand. Through our project we can predict the best crop that suites to the agricultural land and the whole process of prediction is automated by machine learning technique and IoT.

ABSTRACT

The agriculture plays a prevailing job in the development of the nation's economy. Atmosphere and other natural changes has become a significant danger in the agribusiness field. AI is a fundamental methodology for accomplishing viable and viable answers for this issue. Harvest Prediction includes anticipating the best output from accessible authentic information like climate parameters and soil parameters. This recommender system uses real time data as input to the machine learning. The sensors collect data from the soil and send that data to the cloud (firebase). Then the machine learning model retrieves that data and predicts the best crop and sends that crop to the cloud. We develop an android application which retrieves the sensor values from the cloud and displays them. This forecasting facilitates the farmer to forecast the best crop earlier than cultivating onto the agriculture field, which in turn increases the productivity.

Keywords Machine learning, IoT, Sensors, Prediction, Best crop.

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Crop Recommendation involves predicting the best crop from existing past data like climatic parameters and soil parameters. This recommender system uses real time data as input to the machine learning. The sensors collect data from the soil and send that data to the cloud (firebase). Then the machine learning model retrieves that data and predicts the best crop and sends that crop to the cloud. We develop an android application which retrieves the sensor values from the cloud and displays them. This forecasting helps the farmer to forecast the best crop before cultivating onto the agriculture field, which in turn increases the productivity.

Related Work

India is generally an agricultural country. Farming harvest creation relies upon the season, natural, and money related reason. These days, Farmers are threatening to create the output as a result of whimsical climatic changes and shortage of water asset. To foresee the harvest output with the assistance of information mining strategy, propelled strategies can be acquainted with anticipate crop output and it likewise encourages the rancher to pick the most appropriate harvest, consequently improving the worth and addition of the cultivating zone. [1].

This paper [2] center around foreseeing the output of the harvest dependent on the current information by utilizing Random Forest calculation. Genuine information of Tamilnadu were utilized for building the models and the models were tried with tests. The expectation will serves to the rancher to foresee the output of the harvest before developing onto the horticulture field. To anticipate the harvest output in

future precisely Random Forest, a generally ground-breaking and well known administered AI calculation is utilized.

Harvest output forecast is a significant farming issue. Any rancher is keen on knowing how much output he is going to anticipate. Previously, output forecast was performed by thinking about rancher's understanding on specific field and harvest. We analyzed result of multiple linear Regression, Regression Tree, K-nearest Neighbor and Artificial Neural Network We has done prediction based on Soil, Environmental and A biotic attributes. KNN algorithm gives better result evaluates to other algorithms for Groundnut crop output forecasting [3].

The crop output is the major factor to decide the farmers earning. Crop output prediction will assist the farmers and other stakeholders for better crop planning i.e. selling, warehousing, market prices etc. Mainly data mining techniques for DSS is based on artificial neural networks, Bayesian networks, vector support system etc. The decision support system will help the farmers to cut the losses, farmer suicides and also will improve the crop output due to proactive planning. This paper discusses and compares the various data mining techniques available for the decision support systems i.e. crop output prediction [4].

Data Mining is developing examination field in crop output investigation. Output forecast is a significant issue in farming. Information mining procedures are the better decision for this reason. Various Data Mining strategies are utilized and assessed in farming for evaluating the coming year output creation. This is accomplished by applying affiliation rule mining on agribusiness information. This exploration centres on formation of a forecast model. This paper presents a short investigation of harvest output expectation utilizing information mining procedure dependent on affiliation rules for the chose locale. The test results shows that the proposed work effectively anticipate the harvest output creation [5].

In Indian history, horticulture has been the foundation of the economy. The point of this investigation is to take a gander at the forecast of harvests which will offer high return inside the given area considering the atmosphere and soil boundaries. A neural system is utilized for demonstrating propelled connections among data sources and outputs. The goal of this postulation is to get a handle on the AI algorithmic principle abuse neural systems and building model that predicts seed classifications bolstered AI strategy. The model is tested abuse seed dataset thus seed classes zone unit anticipated abuse the created model [6].

The impact of environmental change and its flightiness has made lion's share of the agrarian outputs be influenced regarding their creation and upkeep. Anticipating or foreseeing the output well in front of its collect time would help the tacticians and ranchers for taking reasonable measures for selling and capacity. Precise expectation of harvest improvement stages assumes a significant job in crop creation the executives. The neural system calculation is less inclined to mistake than other AI and information mining procedures, making it a successful AI instrument for anticipating crop outputs [7-11].

Methodology

In our work we are going to use Ensemble technique. Collection strategies are methods that make different models and afterward join them to create improved outcomes. Outfit techniques typically produce more exact arrangements than a solitary model would be Decision Tree and Linear Regression algorithms are used in our project. The results from these algorithms are then combined to produce improved results.

Decision tree technique regulates the utilized for taking care of relapse and arrangement issues as well. The overall intention of utilizing Decision Tree is to make a preparation model which can use to anticipate class or estimation of target factors by taking in decision guidelines induced from earlier information (preparing information).

The decision tree technique effort to take care of the issue, by utilizing tree portrayal[12]. Each inward node of the tree relates to a characteristic, and each leaf node compares to a class label.

Decision Tree Algorithm Pseudo code:

1. Positioned the greatest characteristic of the dataset.
2. Divide the training set into subsets.
3. Replicate stage 1 and stage 2 on every subset until you discover leaf nodes in all the parts of the tree.

In decision trees, for foreseeing a class mark for a record we start from the foundation of the tree. We think about the estimations of the root quality with records characteristic. Based on correlation, we follow the branch relating to that worth and bounce to the following node.

Assuming a creating Decision Tree:

1. At the start, the entire preparing set is considered as the root.
2. Feature qualities are wanted to be all out. On the off chance that the qualities are consistent, at that point they are discredited preceding structure the model.
3. Records are dispersed recursively based on trait esteems.

- Order to putting qualities as root or interior hub of the tree is finished by utilizing some measurable methodology.

A Random Forest is a group process equipped for executing both relapse and order undertakings with operation of abundant decision trees and a method known as Bootstrap Aggregation, usually identified as stowing.

- Choose at irregular K information focuses from the training set.
- Build the decision tree associated with those K information focuses.
- Decide the number N tree of trees you need to manufacture and rehash stage 1 and 2.
- Now prepare the matrix

The following is the bit by bit Python execution.

- Introduce the necessary libraries.
- Import the dataset
- Pre-process the data
- Fit arbitrary forest regress or to the dataset
- Calculating a fresh result

We create models from these two algorithms.

The real time data from sensors are retrieved from firebase (Google Cloud) and sent to our models. Then we will combine the results of all the models to get accurate prediction. For this purpose, we need to create a project in firebase and create corresponding labels to store real time sensor data.

Experimental Results

Based on the data read by the sensors, we can finally predict the best crop that will give high productivity. The data read by the sensors include soil pH, soil moisture, and temperature. After prediction, we can observe the recommended crop in user interface. Below are the figures of App User Interface of our project



Figure.1. Splash Screen

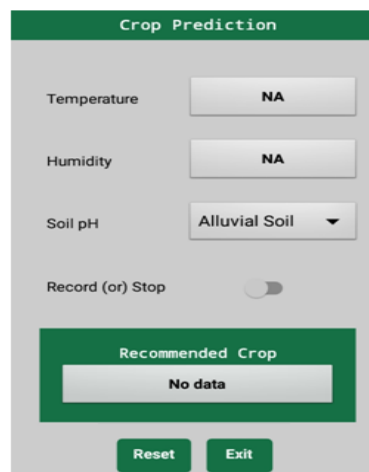


Figure.2. User Interface



Figure.3. App predicting the best crop

Conclusion

It can be concluded that we can accurately predict the best crop there by increasing the productivity. By doing so, we reduce the wrong decision on choosing crop and increase productivity to full fill growing food demands of the country. Compared to other papers, our algorithm can efficiently predict best crop for a particular agricultural land.

Future Scope

We can improve the prediction by integrating different sensors like soil nutrition sensors. By taking more attributes like rainfall, soil nutrients, year, crop area and other variables we can improve the best crop prediction.

References

- B. Devika and B. Ananthi "Analysis Of Crop Output Prediction Using Data Mining Technique To Predict Annual Output Of Major Crops", International Research Journal of Engineering and

- Technology (IRJET), Volume: 05, Issue: 12, Dec 2018.
2. P. Priya, U. Muthaiah and M. Balamurugan, "Predicting Output Of The Crop Using Machine Learning Algorithm", International Journal Of Engineering Sciences & Research Technology (IJESRT), April 2018.
 3. Vinita Shah and Prachi Shah, "Groundnut Crop Output Prediction Using Machine Learning Techniques", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (JSRCSEIT), Volume 3, Issue 5 May-June 2018.
 4. Kusum Lata and Bhushan Chaudhari, "Crop Output Prediction Using Data Mining Techniques And Machine Learning Models For Decision Support System", Journal of Emerging Technologies and Innovative Research (JETIR), Volume 6, Issue 4, April 2019.
 5. E. Manjula and S. Djodiltachoumy, "A Model for Prediction of Crop Output", International Journal of Computational Intelligence and Informatics, Vol. 6: No. 4, March 2017.
 6. N.L. Chourasiya, P. Modi, N. Shaikh, D. Khandagale and S. Pawar, "Crop Prediction using Machine Learning", IOSR Journal of Engineering (IOSR JEN), PP 06-10, 2019.
 7. Teresa Priyanka, Pratishtha Soni and C. Malathy, "Agricultural Crop Output Prediction Using Artificial Intelligence and Satellite Imagery", Eurasian Journal of Analytical Chemistry, (SP): 6-12, 2018
 8. Kumar, R., Bhardwaj, D., Mishra, M.K. 2020. Enhance the Lifespan of Underwater Sensor Network through Energy Efficient Hybrid Data Communication Scheme 2020 International Conference on Power Electronics and IoT Applications in Renewable Energy and its Control, PARC 2020 9087026, pp. 355-359
 9. Kumar, R., Bhardwaj, D. 2020. An improved moth-flame optimization algorithm based clustering algorithm for VANETs Test Engineering and Management 82(1-2), pp. 27-35.
 10. Bhardwaj, D., Chaturvedi, A. 2020. A Hybrid Resource Optimization Technique using Improved Fuzzy Logic Guided Genetic Algorithm for 5G VANETs Test Engineering and Management 82(1-2), pp. 36-44
 11. Kumar, M., Bhardwaj, D. 2019 Optimized cluster head and secret key comparison based secure routing in WSN Journal of Advanced Research in Dynamical and Control Systems 11(11 Special Issue), pp. 183-188.
 12. Varun K L Srivastava, N. Chandra Sekhar Reddy, Dr. Anubha Shrivastava, "An efficient Software Source Code Metrics for Implementing for Software quality analysis", International Journal of Emerging Trends in Engineering Research, Volume 7, No. 9 September 2019.