

Crop Yield Prediction And Efficient Use Of Fertilizers Using Machine Learning

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ABSTRACT: India being an agriculture country, predominantly its economy depends on agriculture yield growth and agro-industry products. In crop yield analysis Data Mining is an emerging research field. Yield prediction is a vital issue in agriculture. Any farmer is curious about knowing how much yield he can expect. We analyze various related attributes like location, etc. With the help of third-party applications like APIs for weather and temperature, nutrient value of the soil there in region, amount of rainfall within the region can be determined. All of these attributes are going to be analyzed, train various machine learning algorithms for creating a model. The system comes with a model to be accurate in predicting crop yield and deliver the user with proper recommendations about which crop to sow to expect better yield and increase farmer's revenue.

Keywords: Data Mining, Prediction, Machine Learning Algorithms.

1.NEED OF THE PROJECT:

Achieving maximum crop yield is one of the goals of agricultural production. Early detection and managing of problems associated with crop yield indicators can help increase yield and subsequent profit. Predictions can help crop managers to minimize the occurrence of losses when unfavorable conditions may occur.

Many factors like soil type, precipitation, seed quality, lack of technical facilities etc. directly influence the crop yield. Therefore, Usage of new technologies are necessary for satisfying the growing need and farmers must work smartly by opting new technologies rather than going for trivial methods. Early detection of problems and management of those problems can help the farmers for better crop yield.

For the better predicting of the crop yield, we need to study of the huge data with the help of a machine learning algorithm so that it can give the accurate yield for that crop and suggest the farmer a better crop. fertilizer is also one of the major factors to grow crops accordingly. If fertilizer is used more or less than required in the field the soil may lose its fertility and crop may not give the expected yield. So, predicting the amount of fertilizer to be used for a crop is also essential to get good yield. Generally, machine learning algorithms have the capability to predict the most efficient output of the yield.

2.INTRODUCTION:

The history of Indian agriculture dates back to the Indus Valley Civilization Era. India ranks second in this sector. Agriculture and allied sectors like forestry and fisheries account for 15.4 percent of the GDP (gross domestic product) with about 31 percent of the workforce. India globally has the highest net cropped area followed by US and China. Agriculture is statistically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India. Due to the revolution in industrialization, the economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. The problem that the Indian Agriculture sector is facing is the integration of technology to bring the desired outputs. With the advent of new technologies and overuse of non-renewable energy resources patterns of rainfall and temperature are disturbed. The inconsistent trends developed from the side effects of global warming make it cumbersome for the farmers to clearly predict the temperature and rainfall patterns thus affecting their crop yield productivity. In order to perform accurate prediction and handle inconsistent trends in temperature and rainfall various machine learning algorithms like RNN, LSTM, etc can be applied to get a pattern. It will complement the agricultural growth in India and all together augment the ease of living for farmers. In past, many researchers have applied machine learning techniques to enhance agricultural growth of the country. This paper completely focuses on predicting the yield of the crop by applying various machine learning algorithms. The outcome of these algorithms is compared on the basis of mean absolute error. The prediction made by the accurate machine learning algorithm will help farmers to decide which crop to grow to get the maximum yield by considering factors like temperature, rainfall, area, etc.

3. EXISTING WORK :

Due to the revolution in industrialization, the economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. The problem that the Indian Agriculture sector is facing is the integration of technology to bring the desired outputs. With the advent of new technologies and overuse of non-renewable energy resources patterns of rainfall and temperature are disturbed. The inconsistent trends developed from the side effects of global warming make it cumbersome for the farmers to clearly predict the temperature and rainfall patterns thus affecting their crop yield productivity. In order to perform accurate prediction and handle inconsistent trends in temperature and rainfall various machine learning algorithms like RNN, LSTM, etc can be applied to get a pattern. It will complement the agricultural growth in India and all together augment the ease of living for farmers. In past, many researchers have applied machine learning techniques to enhance agricultural growth of the country.

4. PROPOSED WORK :

The yield of the crop depends on the seasonal climate, nitrogen level in the soil and based on this a decision on which crop to be sowed should be taken. In our System we use the dataset with attributes of the crop season, Area and production in hectares data from the previous years to estimate future data and analyzed with various algorithms. Crop yield prediction can be done using crop yield data ,nutrients and location data. Fertilizer Recommendation can be done using fertilizer data, crop, location. Third party applications are used to know weather and temperature information. In our proposed system, we develop the functionality of Predicting the crop yield using the most accurate algorithm.

Crop yield expectation is a significant agrarian issue. The Agricultural yield principally relies upon climate conditions. Exact data about history of harvest yield is significant for settling on choices identified with farming danger the board and future expectations.

There are four phases in this prediction. They are – Overview of Data, Data Preprocessing, Model Selection, Crop Prediction.

A) Overview Of Data:

In this project, India crop data set was used for prediction. This is the collection of sample data used in this project. . The data used to estimate yields of crops based on variables. We can construct a machine learning model and train the model using these factors and we predict the output and we can predict from the data set how much fertilizer will be used to achieve the correct yield.

B) Data Pre-processing:

As Information Pre-preparing is a strategy that is utilized to change over the crude information into a spotless informational collection. At the end of the day, at whatever point the information is accumulated from various sources it is gathered in crude configuration which isn't doable for the investigation. Right now, information in the yield information is cleaned and the metadata is annexing to it by evacuating the things which are changed over to the whole number. Along these lines, the information is anything but difficult to prepare. Hear all the information. Right now, we first burden the metadata into this and afterward this metadata will be connected to the information and supplant the changed over information with metadata. At that point this information will be moved further and evacuate the undesirable information in the rundown and it will partition the information into the train and the test information For this parting of the information into train and test we have to import train_test_split which in the scikit-gain proficiency with this will help the pre-prepared information to part the information into train and test as indicated by the given weight given in the code. The division of the test and train is done as 20 and 80 percent individually.

C) Exploratory Data Analysis:

In this, we used different machine learning algorithms for prediction purpose we use recurrent neural network , Long Short Term Memory and Feed Forward Neural Network algorithms. RNN is a powerful and robust type of neural network, and belong to the most efficient algorithms in use because it is the only one with an internal memory. Because of presence of internal memory, RNN's can remember important things about the input they received, which allows them to be very precise in predicting what's coming next. That is why they are preferred algorithm for sequential data like time series, speech, text, financial data, audio, video, weather and much more. Long short-term memory networks are an like an update for recurrent neural networks, which basically extends the memory. LSTMs help RNNs to remember inputs for a long period of time. And LSTMs can help RNN because they can store information in a memory, much like the memory of a computer. The LSTM have the capability to read, write and

delete information from its memory. In a feed-forward neural network, the information only moves in one direction i.e.; from the input layer, through the hidden layers, to the output layer. The information moves straight through the network from input to output layer without touching a node twice.

D)Crop Prediction:

Toward the start, the program gets to the information of the yield of that crop in that specific state over the previous years and trains that information to anticipate what the yield would be founded on the past yields. The program at that point predicts the estimations of the variables influencing the yield of the harvest in that specific year by getting to and preparing the information of elements in the state during the previous hardly any years.

5. DETAILS ABOUT ACCURACY OF THE MODEL:

This model is used to predict the better crop when given the details of location and crop name. This model is used to assist the farmers in deciding which crop to be sowed to get maximum yield and the amount the fertilizers to be used to achieve that. The algorithm analyses the previous year crop and fertilizer datasets for the prediction. The main attributes of the crop dataset are location, crop name, yield. The accuracy of this software will be very high when compared to previous way of predicting crop on farmer's prior experience. And the accuracy of algorithm used is 78%.

6. PROPOSED ARCHITECTURE:

In our proposed system we are going to collect Crop dataset .Now we are going to pre process the dataset initially and then send each dataset individually first into RNN , LSTM and then into Feed Forward neural network algorithm. Based on the accuracy i.e.; the number of wrong predictions we select the best algorithm. In our project it is LSTM Algorithm is the most efficient algorithm. And then we apply this algorithm to test dataset.



Fig-1 Architecture Diagram.

Dataset Explanation:

Here we use crop dataset . The climatic data gathered in India at each square meter territory in various pieces of the zone arranged by Indian Meteorological Department. Additionally, the yield of each harvest in each state is gathered and distributed by the branch of agribusiness and collaboration consistently. we download this dataset from the internet and use this in our project. The crop dataset contains the attributes state ,city ,crop name ,season ,yield . The dataset contains data collected over decades.

7. RESULT ANALYSIS:

In this paper, execution is made so as to predict crop yield and is prepared by executing RNN , LSTM and Feed Forward Neural Network techniques. These models were explored different avenues regarding various sorts of yields in different districts across India to foresee the yield.

Among these algorithms Long Short Term Memory gives more accuracy than others and is used for prediction in the software.

The possibility of Wrong predictions is less in LSTM algorithm because in this we have more memory for storing output than RNN and it is cyclic to make changes in the hidden layer based on the output of previous input and takes less time than Feed Forward Neural Network algorithm

Graphical Representation Results

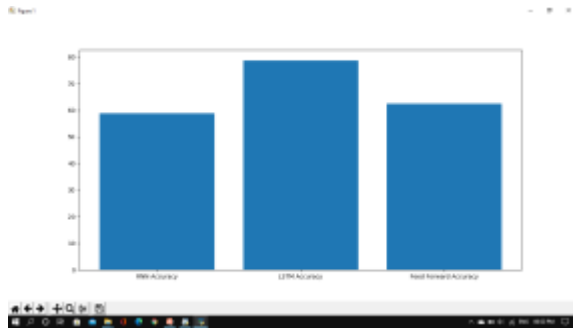


Fig-2 Graphical Representation

8. CONCLUSION:

Crop yield forecast and proficient utilization of the compost is effectively anticipated and furthermore found the productive calculation from both the calculation and acquired the most effective yield of the yield. In this project we compared two machine learning algorithms and Used the most efficient algorithm to predict the crop yield and fertilizer amount to be used . By using this the farmers can get help on deciding which crop to sow to get maximum yield and this project also says how much amount of fertilizers to be used based on previous statistics rather than depending on farmers prior experience.

9. FUTURE SCOPE:

The work can be extended further to add following functionality. Mobile application can be build to help farmers by uploading image of farms. Crop diseases detection using image processing in which user get pesticides based on disease images. Implement Smart Irrigation System for farms to get higher yield. In future all farming devices connected to IOT will be installed in the soil to get the current values of the soil and current season, current location. These Values can be mForest. R news, 2(3), 18-22

directly fed to software to get the prediction. And all these things combined can make a good application.

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