Predicting Agricultural Productivity Through Machine Learning

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Abstract

As the economy is based on the agriculture highly, there should be a progress in this sector. To make a progress in the agriculture the productivity must be increased. The reason of low productivity is not finding suitable crop for a particular land. In this way, the crops are not produced at the maximum amount. productivity of agriculture depends on multiple parameters on the basis of location. The suitable crop for a particular location is necessary for agriculture to bring the most productivity. Here we have designed a system that predicts productivity of the crop with given parameter, also recommend the suitable crop. For the prediction we have used multiple machine learning algorithms and for recommendation we will use content-based filtering system..

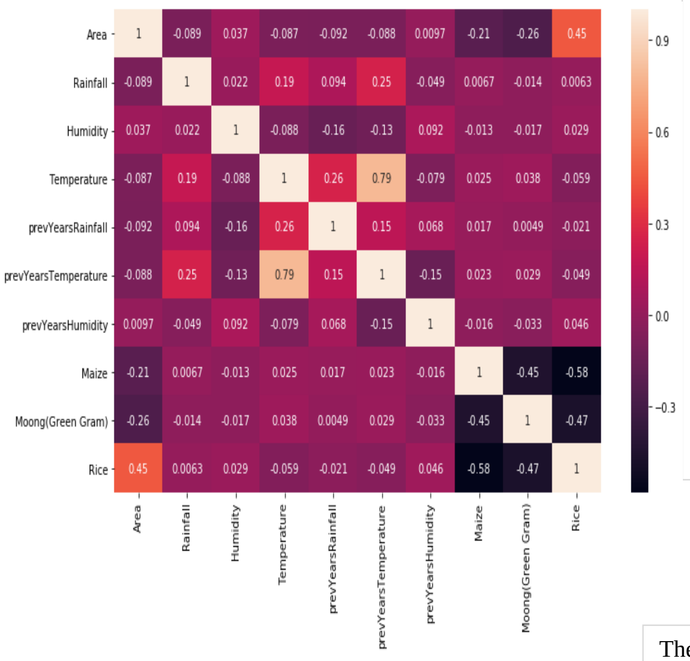

Fig. 1: Heat-map of the input data

Introduction

Agricultural Productivity is the efficiency of an agricultural system. To measure the output, productivity is dependent on different parameters. Hence, it varies in different parts of the world due to some variable conditions of the inputs. So, the better the condition of the inputs the greater the productivity of agriculture.

In Bangladesh, population is increasing drastically and the land is occupying by them and this is the reason the demand for our staple food of Bangladesh is increasing day by day in a greater amount and the land for growing our principle crop is declining. It is assumed that agricultural productivity will gradually starts to decline to a level where food will no longer available to the increasing population. It is also related to Economy of Bangladesh because Productivity and Efficiency are two fundamental strategy to the country's economy as we know that Bangladesh is a low income country. There is continuous transformation of Bangladesh's economy as measured by changes of the Gross Domestic Product (GDP). This structural change clearly indicates a rapid movement away from an agriculture-dominated economy where it shows that Agricultural GDP is declining. It should not be changed in poverty reduction rather it should be changed in process of agricultural productivity. So it is very important to increase the Productivity with efficiency and lower cost. For this purpose, apart from other things technology is the only option to have the miracle of bringing back the productivity to the people all over the world. Keeping that in mind we are thinking to look for the solution of increasing the agricultural productivity especially crop through Machine Learning process. We are using Algorithms to see the changes in agricultural productivity by the collection of huge amount of data from different organization or Farm. We are hoping that our system will use the correct method to bring the changes of increase in Productivity to the Agriculture.

Dataset Analysis

The dataset we have collected there are 11691 samples where a total of 12 columns and around 11691 rows. The columns were "State Name", "District Name", "Crop Year", "Season", "Area", "Rainfall", "Humidity", "Temperature", "Previous Year's Rainfall", "Previous Year's Humidity", "Previous Year's Temperature" and "Crop". Here the input dataset has been manipulated for the optimal accuracy, the columns "State Name", "District Name", "Crop Year" has been eliminated as they are object type that machine learning algorithm cannot work on this type of data. The column "Season" is also string type, we have turned it into integer value (0 and 1). Furthermore, we have selected the column "Crop" as target file and input parameter as rest.

Literature Review

In[1], researcher used various techniques like MLR, logistic regression, exponential smoothing models, Markov chain model for forecasting crops per count, forewarning low or high crop yields. They developed a system where they put the location, soil attributes, Weather attribute, pH level of the water and soil. They also take the previous year production value to predict which crops will be produced better in that area.. However, their System cannot predict the numerical amount of the production and the individual effect of the soil attributes, weather and water and sudden variation of attributes.

In[2], Authors, use techniques like K-Nearest Neighbor, Support Vector Machine, and Least Squared Support Vector Machine for providing comparative study of various algorithm. In this paper they apply these algorithm on datasets and it shows the accuracy of each algorithms to train the datasets and also mean squared error at the cross-validation phase which show the rate of production and this models can handle structural accident minimization. However, it requires a huge amount data for finding variance and providing a good result.

In [3], Authors have applied collaborative filtering that offers recommendation to the users by developing a system with the help of big data for the complexity. They have clustered the data by the characteristic similarities using an agglomerative hierarchical clustering algorithm, then applied Pearson correlation coefficient for the similarity (Collaborative filtering). With this system, farmers buy the essentials and sell the products through application.

In [4], S. S. Dahikar and S. V. Rode implemented the ANN algorithm to determine the suitable crop for the specific soil type. As the soil have a lot of parameters. They have predicted one particular crop to be yielded in one particular type of soil depending on the parameters. Furthermore, they have claimed that Artificial Neural Networks (ANNs) works better on this type problem than statistical models as complex neural systems with many inputs has shown better accuracy.

Accuracy

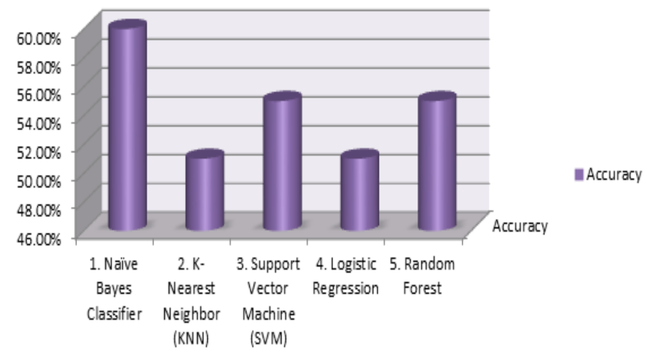

Figure : Accuracy for different algorithm

Future Work Plan

In future, we will develop a responsive web system that will take the input parameters based on location recommend the suitable crop and expected productivity. Moreover, the system will provide production ratio of different crops.

References

[1] D.S. Zingade et al., "Crop Prediction System using Machine Learning," International Journal of Advance Engineering and Research Development, vol. 4, 2017.

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[3] A. A. Chirde and U. K. Biradar, "A Survey on Collaborative Filtering in Accordance with the Agricultural Application," International Journal of Computer Applications (0975 – 8887), International Conference on Advances in Science and Technology, 2014

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