International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 04 | April - 2022 Impact Factor: 7.185 ISSN: 2582-3930

A SURVEY ON THE PREDICTION OF CROP YIELD USING MACHINE LEARNING AND CLOUD COMPUTING

MANOJ R

School of Computer Science and IT, Jain (Deemed-to-be University), Bangalore, Karnataka, INDIA

Manojstar205@gmail.com

MURUGAN R

School of Computer Science and IT, Jain (Deemed-to-be University), Bangalore, Karnataka, INDIA

muruganraam75@gmail.com

Abstract:- Agriculture is the first major source of livelihood for our country. For now challenges of water scarcity, uncontrolled costs due to service delivery, and climate change uncertainty enables farmers to equip farmers with smart farming. Mostly, low crop yields are due to unpredictable climate change, poor irrigation systems, and depletion**.** AI Platform Prediction can capture your models to get you guessed at them inthe cloud. The process of capturing a saved model is called deployment. The forecasting service controls the infrastructure required to use your model on the scale and makes it availablefor online guessing applications and collections. This section describes the use of models.Prediction is forecasting the future based on the available data set, Prediction is what someone thinks will happen, Prediction using machine Learning gives us more accurate results based on data that is used for training the model. You can easily host scaleand deploy the machine learning models in the cloud and use AI Platform Prediction to infer target values for new data.

Keywords- Machine learning, Cloud Computing, AWS sage maker, python IDE'S, Prediction

1. INTRODUCTION

Agriculture proves to be a major component of the Indian economy and involves the production of plants. Crops can be food crops or vegetable crops. Food crops include paddy, wheat, corn, grams, sorghum, etc., and the crops for sale are cotton, sugarcane, nuts, cashews, etc. Crop production is strongly influenced by climate.

[1]. Therefore, accurate harvest forecasting is a major problem that needs to be solved. Previously Harvest forecasting will help farmers to take safety measures to improve production. Early prediction is possible with a

collection of previous experiences of farmers, climates, and other influential factors as well; keep it on a large website. Normal input parameters are rainfall, temperature, humidity, sunlight, yield overcrowding, fertilization, irrigation, farming, soil type, depth, farm capacity, and organic soil. By using data mining techniques such as prediction, classification, and sum it up, early decisions are possible**.**

1.1. Need for prediction

Measuring agricultural yields before harvesting Estimating agricultural yields beforehand harvesting is an important issue for agriculture, as changes in crop yields year after year has an impact on global businesses, food supply, and global market prices. Also, the prediction is early crop crop provides useful information for policy planners. Proper crop prediction productivity is needed to better plan land use and economic policy. The latest times, the prediction of crop production at the level within the field has increased. Many a factor that contributes to crop production and climatic conditions. If the weather forecast is based it is done more accurately, then farmers can be warned in advance so that greater losses can occur reduced and can be instrumental in economic growth. The forecast will help too farmers make decisions such as choosing other crops or dumping a crop in the area

The first stage when there are critical situations. In addition, predicting crop yields can be helpful farmers have a better idea of the annual crop planting and planning. So, that's right it is necessary to mimic and predict crop yields before planting in order to plant successfully management and expected outcome. As there is a non-linear relationship between the plant yield and yield factors, machine learning methods may work well show predictions.

2. MACHINE LEARNING TECHNIQUES

Machine learning involves problems where input and output relationships are unknown. Reading clarifies the automatic acquisition of structural meanings. Contrary to conventional mathematical methods, machine learning is not aware of the exact construction of a data model, which explains the data. This feature is very useful in describing complex indirect behaviors such as predicting crop yields. Machine learning is part of the artificial intelligence used to build intelligent systems By using training samples, test samples can be identified. System

accuracy can be measured using metrics such as square measure error, root square root error, accuracy, recall, sensitivity specification etc. Further, machine learning can be used to address a variety of applications that include yield prediction using supervised, unsupervised and reinforcing learning methods. Planning, integrating, reversing, predicting other strategies involved to achieve a smart plan. In this study, prediction is considered and the methods used to predict are described in the next paragraph.

2.1. Linear Regression

Prediction based on linear regression is discussed in many works, It is a mathematical method used in linear regression By using this, the relationship between dependent and independent variables can be measured. If a standalone variant has more than one input attribute, multiple reversals may be used. Depression-based models are used in prediction as this procedure shows consistent results during standardized tests. Although retrofit models work well online data, they are not suitable for complex and indirect data. Also, these models may not be able to perform better due to their limitations with the assumption of declining multiple interactions between dependent and independent objects. Decline models used for Tea Harvest Prediction. The results revealed that most of the events observed were accurate predictions. A climate-predictable crop yield prediction equation is presented. crop yield analysis using the Multiple Linear Regression (MLR) method and compaction method based on congestion in the East Godavari region of Andhra Pradesh was introduced

2.2. Artificial neural Networks

Artificial Neural Network (ANN) is another technique attempted by many researchers to address prediction. Back Propagation Neural Network (BPNN) is widely used among available neural networks. The back propagation algorithm involves three layers namely input, output and hidden layers. The weights are adjusted depending upon error. Multiple Linear Regression (MLR) and neural networks utilizing data from various tests conducted for three years were considered as predictive models for potato yield

ANN solves complex and indirect relationships between crop production and various forecast parameters. They contain more precise mathematical functions than precise rules and can be easily automated. Also, they produce output with acceptable accuracy in unspecified input cases. In addition, it does not include pre-established

relationships and can be accessed using available data. ANN is considered an effective means of obtaining results from indirect, indirect, and indirect data. ANN has been an important tool for many applications that include crop production estimates. Proposed ANN-based maize crop forecast system and soil and weather data as input parameters The output can be further tuned by using Convolutional Neural Networks (CNN) and Deep Neural Network (DNN) or deep learning.

3. Cloud computing

Cloud computing is the delivery of on-demand computer services - from applications to storage and processing power - usually online and on a pay basis as you go. Storing and protecting large amounts of data is only accessible to authorized users, who have the ability to use online applications that store and protect data while providing the service. Used in Web applications. To combine photos, maps, and GPS information to create integration in Customer Web browsers. Cloud computing is used in intellectual agricultural development by assisting farmers with specific tasks such as Crop Related, Information, Soil Information, Growth Monitoring, Farmer Data, E-commerce, consultation with experts, etc. The role of the cloud computing Store is all agricultural-related information in the central cloud, which will be available to all users anytime, anywhere, Management of all land, location, and location-related data. There are three major players in the field of community cloud platforms Amazon Web Services (AWS), Microsoft's Azure, and Google Cloud Platform. Top cloud computing companies are talking about a large and growing market. Significant growth in cloud infrastructure is leading to the use of several machine learning as a service (MLaaS) development of machine learning models.

eventually made in place of cloud providers. Farmers can use the cloud to access information from forecasting analysis, where they can have accurate predictions about the products most needed in different markets and adjust production accordingly. They are also able to have an understanding of the weather and other parameters that affect production.

4. METRICS

From the above section, it is understandable that different machine learning algorithms are used to predict crop yields. Although different machine learning algorithms are available for use, the choice of a specific algorithm is based on the type of application and the accuracy of the prediction algorithm. The prediction accuracy of classifiers is validated by different metrics such as Mean Absolute Error (MAE), Root Mean Squared Error(RMSE), and Mean Absolute Error(MAE) as discussed below.

Mean Squared Error

Mean Squared Error(MSE) measures the average of squared error of predictions. That is, it calculates the square of the difference between the predicted value and the real value and measures those values Computation of MSE is shown in

$$MSE = \frac{1}{N}\sum_{i=1}^{N}(y_i - \overline{y_i})^2$$

Root Mean Squared Error (RMSE)

Root Mean Squared Error(RMSE) is the square root of MSE. RMSE is expressed as in

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(y_i - \overline{y_i})^2}$$

5. PROPOSED APPROACH

To provide an understanding of how different research activities utilized the various machine learning algorithms, tools, and data sets for various crop yields included in the table in table 1.1

S.No	Research reference	Crop	Factors	Method	Tool	Data sets
1	[11]	Maize	Precipitation, Maximum temperature, Minimum temperature, potential evapotranspiration, soil moisture, land cultivated	ANN	Neural net package in R software	CRU TS 3.24.01
2	[5]	Pepper, common bean, corn, potato, tomato	Irrigation water depth, Solar radiation, rainfall, temperature, relative humidity	ANN, MLR, SLR, regression tree	SPSS, WEKA	Agricultural production data from spriter-GIS system and weather information data from SMN
3	[12]	Rice	Precipitation, Minimum, average and maximum temperature, Evapotranspiration, Area,	ANN	WEKA	1998-2002 Maharashtra government records
4	[20]	Rice	precipitation, minimum temperature, average temperature, maximum temperature and reference crop evapotranspiration, area, production and yield	SVM	WEKA	publicly available Indian Government records
5	[21]	Rice	Soil code, section thickness, soil composition entropy,	SVM	v2.1 software in the	weather observation stations in China (i.e., daily published
			organic matter, pH, nitrogen, phosphorus, potassium, air pressure, average temperature, average relative humidity, precipitation, wind speed		MATLAB	meteorological data and the 1:1000000 soil database published by the Chinese Academy of Sciences [CAS]
6	[22]	Maize, Soyabean, Sugar beet	maximal (Tmax), minimal (Tmin) and average (Tavg) monthly air temperatures, precipitation and evapotranspiration	SVM	R package e1071	(from 1999 to 2008) in Serbian province of Vojvodina, from the internal database of the Department of field and vegetable crops at the Faculty of Agriculture in Novi Sad
7	**[23]**	Prediction of suitable crop according to the factors	Temperature, rainfall, soil parameters	Multiple Linear Regression	----	Indian Meteorological Department
8	[24]	Rice paddy, cotton, sugarcane, groundnut, black gram	Climate variables	SVM, AdaSVM, NaiveBayes, AdaNaive		Indianwaterportl.org
9	[25]	Prediction of suitable crop according to soil quality, soil nutrients and soil composition	Nutrients present in the soil	Kohonen Self Organizing Map and Back Propagation Network		Not mentioned

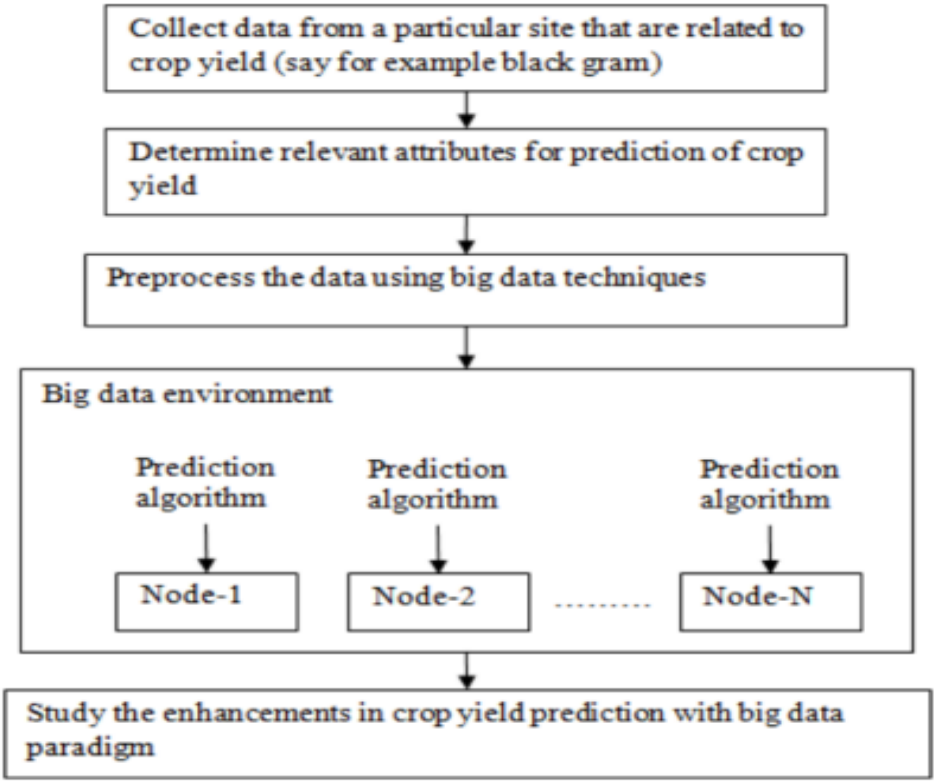

Figure 1 Approach to predict the yield of black gram yield with big data tools and techniques

6. CONCLUSION

Extensive research on crop prediction is being done. The literature outlines various machine learning techniques that are used to predict crop yields. In addition, the performance metrics of machine learning algorithms such as root mean square error are studied. In line with predictive machine learning algorithms, it is planned to study the impact of big data strategies on crop yield predictions. The conceptual approach is proposed the same. The proposed method is being implemented

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