IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Survey Paper On Crop Prediction using Machine Learning

[1] Aryamol A U, [2] Raji P G, [3] Sam G Benjamin

[1]CSE Department, BMCE
APJ Abdul Kalam Technological University, Sasthamcotta, Kerala,India.

[2]CSE Department, BMCE
APJ Abdul Kalam Technological University, Sasthamcotta, Kerala,India.

[3]CSE Department, BMCE
APJ Abdul Kalam Technological University, Sasthamcotta, Kerala,India

ABSTRACT: Agriculture is the backbone of India. It also plays an important role in the Indian economy by providing a major percentage of domestic cultivation to ensure the security of food. Now a days all the farmers facing difficulties on cultivation due to natural calamities and wrong selection of crops. Machinelearning is one of the best possible ways to solve the farmers problem at an extend. However there occurs a problem regarding which algorithm suits the best as well as which is the best way to do so. This paper is a survey on the strategies as well as the algorithms used with pros and cons. With existing system issues and libraries used.

Keywords—Machine Learning, prediction, Classification Technique.

I. INTRODUCTION

Agriculture is the main industry in India. From ancient days, agriculture is considered as the main source of supply to satisfy the daily needs of human lives. Its very difficult for now a days. Natural calamites, wrong crop selection, rainfall, these will make difficulties in farmers life.

In recent years the advancement of Machine Learning plays a crucial role in every field including agriculture, Enhancing the crop prediction is one of the prime target to the farmers and reduce the loss on cultivation. Different algorithms and tools such as KNN,KNN with cross validation, Decision tree, Regression , SVM, LS-SVM, ANN, BPN, Deep Neural Network has been used previously for different use cases.

II. LITERATURE SURVEY

S. Veenadhari, Dr. Bharat Misra, Dr. CD Singh , are proposed datamining techniques. It is a user friendly web page which predict the crop with users choice by providing the climatic data of that place. Here they use decision tree for that. The parameters used here are rainfall, temperature, cloud cover, wet day frequency and also they collected the 20 years of information regarding the yield of crops from different secondary sources. Ranking of attribute obtained through information of each attributes. This ranking can help to the analysis of relevant attributes.They mainly focus on the Soybean, Maize, Paddy and Wheat crops at a particular district . They got 75% accuracy.

This paper is proposed by Shivnath Ghosh , Santanu Koley. Here it is used for soil property analysis such parameters are organic matter, essential plant nutrients, micronutrients. Here it also find the relationship percentage on the properties using Back Propagation Neural Network(BPN). BPN finds the correct correlation percentage in these parameters because BPN is trained with reference crops growth properties. Here machine learning system is divided into three steps, first sampling, second Back Propagation Algorithm and third Weight updating. Results will shown using artificial neural network with certain number of neurons in hidden layer.

Prof. D.S. Zingade, Omkar Buchade, Nilesh Mehta ,Shubham Ghodekar, Chandan Mehta, used Multiple Linear Regression. They find the best profitable crop which can be cultivated for the particular environment. Their parameters are data related to soil, weather and past year production. It helps the farmers for selecting the crops for cultivation. It also check the past production of data so that th farmers can identify which crop has demand in the market and cost of various crops. It develop a system by integrating data from different sources.

By, Konstantinos G. Liakos , Patrizia Busato , Dimitrios Moshou , Simon Pearson ID and Dionysis Bochtis proposed this paper. Here they show the various methods like crop management, including applications on yield prediction, disease detection, weed detection crop quality, and species recognition. On the presence of ML to sensor data, the management system are transferred to real time AI enabled programs. So that they provide high recommendations and support for farmers for decision making. Here the system was mainly concentrated into crop prediction with some sub categories. Here they use SVM(binary classifier) and ANN(pattern recoginition).

This paper is proposed by Arun Kumar, Naveen Kumar, Vishal Vats. They mainly concentrated on the crop sugarcane and it is comparative study for accuracy of training the propsed model. For that they use descriptive analytics in the agriculture production. . In this paper, here three various supervised techniques are used. They are K-Nearest Neighbor, Support Vector Machine, and Least Squared Support Vector Machine. They use 3 values for checking that is, LOW, MID and HIGH. Here they got complexity of SVM is O (n3), and least square support vector machine is O(n).

Rushika Ghadge, Juilee Kulkarni, Pooja More, Sachee Nene, Priya R Lpropsed this work. Here it is a paper based on the problems faced by the farmers in Maharastra. Used on the data mining approach. It helps the farmers to check the soil quality and predict the crop according to the soil and fertilizer. Comparision of two algorithms is used such as unsupervised and supervised learning algorithms, like Kohonen Self Organizing Map (Kohenon's SOM) and BPN (Back Propagation Network). The main functionality is that it take PH value as input and location. Result processing is done by two controllers. Controller 1 is used as the input of location and Controller 2 is used as the input of PH. The result of the controller 1 and controller 2 are compared and choose the best one.

This paper is proposed by Andrew Crane-Droesch. It is mainly depend the climatic changes. Here it concentrated on the crop corn for the place US Midwest. Here he use deep neural network which describes the yield modeling approach. Here it use a parametric structure that is the complex nonlinear relationships in high-dimensional datasets. Using these it takes under a climate models, in that it has large negative impacts but it is less impact than normal classical statistical methods.

Mohsen Shahhosseini, Rafael A Martinez-Feria, Guiping Hu and Sotirios V Archontoulis proposed this method. Pre-growing season prediction of crop production of outputs such as grain yields and nitrogen losses can provide best suggestion of crops to farmers to make decisions. It uses four machine learning (ML) algorithms are LASSO Regression, Ridge Regression, random forests, Extreme Gradient Boosting. Here it mainly discuss about (1) How the ML meta-models predict maize yield and N losses using pre-season information? (2) How many datas are needed to train ML algorithms to achieve acceptable predictions?(3) Which input data variables are used commonly for accurate prediction? And (4)is it do all ML meta-models improve prediction? Across all ML models, yield prediction error decreased by 10%–40% as the training dataset increased from 0.5 to 1.8 million data points, 37 whereas N loss prediction error showed no consistent pattern.

K.D.Yesugade, Hetanshi Chudasama, Aditi Kharde, Ketki Mirashi, Kajal Muley proposed this paper. Yield forecast is essential for agriculture stakeholders and it can be obtained with the machine learning models and data from multiple sources. Yield farm was mainly depends on the cultivation of selected crop and correct parameters selection before cultivation is vital in farming. Here uses K-Means clustering. This system will facilitate farmers in deciding the proper crop as per the given climatic conditions which will help to maximize yield rate.

This paper is proposed by S.R.Rajeswari , Parth Khunteta, Subham Kumar, Amrit Raj Singh, Vaibhav Pandey. Here it mainly focus on predict crop yield , crop cost prediction and algorithms used for this. Smart farming can be achieved through these features. The Feature Extraction process has been done through, take that data or columns in which they want to apply algorithms and find out the accuracy and plot the graph related to that data. Classification process has been applied to find out the accuracy of the particular algorithm. Then after the Bayesian network is used to form the Statistical analysis of the attribute in the given dataset. Then after the ANN is used to compares the patterns which has the nonlinear effect and underline concept.

Ramesh A. Medar, Vijay S. Rajpurohit and Anand M. Ambekar proposed this work. In this paper sugarcane yield forecasting in Karnataka(India) region using LongTerm-Time-Series (LTTS), Weather-and-soil attributes, Normalized Vegetation Index(NDVI) and Supervised machine learning(SML) algorithms have been proposed. They divides yield forecasting into three stages, i)soil-and-climate ascribes are anticipated for the span of SCLC, ii)NDVI is anticipated utilizing Support Vector Machine Regression (SVR) calculation by thinking about soil-and-climate credits as info, iii)sugarcane crop is anticipated utilizing SVR by thinking about NDVI as information. The parameters used here are Soil Temperature, Temperature, Soil Moisture, and Precipitation. These algorithms runs multiple times for different data set.

Pavan Patil, Virendra Panpatil, Prof. Shrikant Kokate proposed this system. Here it discuss about improve the yields and recognition of patterns by improving the result through adding more attributes to the system. In other survey papers they give a brief idea about ML with one attribute. Combination of Naïve bayes and decision tree algorithms are used. Decision tree shows poor performance with the given dataset and have more variations but naïve bayes provides better result than decision tree for such datasets. The combination classification algorithm of naïve bayes and decision tree classifier are better performing than use of single classifier model. The parameters are Soil Type, Soil Ph value, Humidity, Temperature, Wind, Rainfall.

M. Kalimuthu , P. Vaishnavi , M.Kishore, proposed this paper. They helps the farmer for sowing the reasonable crops by deploying machine learning. Naive Bayes, a supervised learning algorithm are used here. The seed data of the crops are collected here, and used the parameters like temperature, humidity and moisture content, which helps to successful growth of the crops. The proposed system consist of four major process includes, collection of preceding data , collecting present data, data consolidation and seed data collection. The Bayes Theorem predict the probabilityof an occurring event when the probability of already occurs event. In Naïve Bayes methodthe accuracy of the model is 97%.

Merin Mary Saji , Kevin Tom Thomas, Varsha S, Lisha Varghese, Er. Jinu Thomas, proposed this paper. They will solve the agricultural problems by observing the agricultural area on the basis of soil properties. It recommends the most suitable crop to farmers, thereby helping them to increase productivity and reduce loss. Here it is a paper of comparing the algorithms. Here mainly using the algorithms are KNN,decision tree, Naïve Bayes, KNN with cross validation SVM. And it result which algorithm is best for this crop prediction. The algorithms that will used for testing are kNN, kNN with Cross Validation, Decision Tree, Naive Bayes and SVM. The accuracies obtained were 85%, 88%, 81%, 82% and 78% respectively. kNNwith cross validation has the highest accuracy and thus can be used for implementation inthe final system.

Alexandre Barbosaa, Naira Hovakimyana, Nicolas F. Martinb, proposed this paper. Here it also uses the CNN architecture under the Deep Ensemble framework for increasing productivity by redesigning. Instead of a single value it predicts a probability distribution of outputs. Here it use a gradient-based optimization algorithm for find the maps of crop inputs. It will maximize the net value with the risk constraints. The proposed model not only give importance to uncertainty quantification but also increases the predicted performance of its former version. Optimization algorithm show an increase up to 6.4% from the expected net. This work uses five input variables: nitrogen and seed rate prescription maps, elevation map, soil's shallow electro conductivity. This descriptions shown in the given table Table 1.

Table 1: COMPARATIVE STUDY OF VARIOUS ALGORITHMS IN LITERATURE REVIEW

YEAR	AUTHOR	PURPOSE	METHODS MENTIONED	INFERENCE
2014	S.Veenadari, Dr. Bharat Misra, Dr. CD Singh.	ML approach for forecasting crop yield based on climatic parameters.	Decision tree.	Decision tree can perform both the classification and regression problems.
2014	Shivnath Ghosh, Santanu Koley.	ML for Soil Fertility and Plant Nutrient Management using Back Propagation Neural Networks.	Back Propagation Neural Network(BPN) and Artificial Neural Network(ANN)	BPN finds the correct correlation percentage So for result it uses ANN.
2017	Prof. D.S. Zingade ,Omkar Buchade ,Nilesh Mehta,Shubham Ghodekar ,Chandan Mehta.	Crop Prediction System using Machine Learning.	Multiple Linear Regression	The difference is that multiple linear regression has more than one independent variables and simple linear regression has only 1 independent variable.
2018	Konstantinos G. Liakos , Patrizia Busato , Dimitrios Moshou , Simon Pearson ID and Dionysis Bochtis.	Machine Learning in Agriculture"Institute for Bio-Economy and Agri-Technology.	SVMand ANN	SVM is used here for binary classifier and ANN is used for pattern recoginition
2018	Arun Kumar, Naveen Kumar, Vishal Vats.	Efficient Crop Yield Prediction Using Machine Learning Algorithms.	Support Vector Machine, and Least Squared Support Vector Machine.	It shows that SVM is better here compared to the complexity.
2018	Rushika Ghadge, Juilee Kulkarni, Pooja More, Sachee Nene, Priya R L.	Prediction of crop yield using machine learning.	Kohonen Self Organizing Map (Kohenon's SOM) and BPN (Back Propagation Network)	BPN is better than Kohenon's SOM. Because it has prior knowledge of the network.
2018	Andrew Crane Droesch.	Machine learning methods for crop yield prediction and climate change impact assessment in agriculture.	Deep Neural Network.	It has the ability to learn by its own technique and produce the output that is not limited to the input. It doesnot use any data base instead of that it use the large network. So retrieve is easy .
2019	Mohsen Shahhosseini , Rafael A Martinez-Feria , Guiping HU and Sotirios V Archontoulis.	Maize yield and nitrate loss prediction with machine learning algorithms.	LASSO Regression, Extreme Gradient Boosting, Ridge Regression, random forests.	Pre-growing season prediction of crop production of outputs such as grain yields and nitrogen losses can provide best suggestion of crops to farmers.
2019	K.D.Yesugade , Hetanshi Chudasama , Aditi Kharde, Ketki Mirashi, Kajal Muley.	Crop Suggesting System Using Unsupervised Machine Learning Algorithm .	K-Means clustering	K-Means algorithm is to group the data, which is represented by K. Based on the features provided the algorithm iteratively assigns each data point with a particular cluster.
2019	S.R.Rajeswari , Parth Khunteta, Subham Kumar,Amrit Raj Singh,Vaibhav Pandey.	Smart Farming Prediction Using Machine Learning.	Bayesian network and ANN.	Bayesian network is used to form the Statistical analysis of the given dataset. ANN is used to compares the patterns which has the nonlinear effect and underline concept.

2019	Ramesh Medar & Anand M.Ambekar.	Sugarcane Crop prediction Using Supervised Machine Learning.	SVR, Lasso, Navïe-Bayes, and Decision Tree	NaiveBayes algorithm is performing better than compared with other three algorithms. Accuracies of Soil Temperature, Soil Moisture, and Temperature prediction are more than 80% whereas, for Precipitation, accuracy is low.
2020	Pavan Patil, Virendra Panpatil, Prof. Shrikant Kokate.	Crop Prediction System using Machine Learning Algorithms.	Decision tree and Naïve Bayes.	The combination classification algorithm of naïve bayes and decision tree classifier are better performing than use of single classifier model.
2020	M.Kalimuthu ,P .Vaishnavi, M.Kishore.	Crop Prediction using Machine Learning.	Naïve Bayes.	In the Naïve Bayes method the accuracy of the model is 97%.
2020	Kevin Tom Thomas , Varsha S , Merin Mary Saji, Lisha Varghese, Er. Jinu Thomas.	Crop Prediction Using Machine Learning.	kNN, Decision Tree, Naive Bayes , kNN with Cross Validation, and SVM.	Theaccuracies obtained here are 85%, 88%, 81%, 82% and 78% respectively. kNNwith cross validation has the highest accuracy for this paper.
2020	Alexandre Barbosa, Naira Hovakimyan, Nicolas F. Martin	Risk averse optimization of crop inputs using a deep ensemble of convolutional neural networks	Convolutional Neural Network (CNN).	Optimization algorithm show an increase up to 6.4% from the expected net.

III. CONCLUSION AND FUTURE WORKS

Here it discussed about different types of machine learning algorithms of Crop Prediction.Here we use various machine learning algorithms and find the best algorithm by analysing their features. Each algorithm has given different result in different situations. Further marginal accuracy is achieved by Naïve Bayesed system. In future it may also extend to suggest the fertilizer, suitable guidelines for cropland and crops for the given input. Iot systems can be implemented building a hardware unit which contain microprocessors DTH11 sensor, soil sensor and cloud platform.

REFERENCES

[1] S.Veenadhari Dr. Bharat Misra Dr. CD Singh "MLapproach for forecasting crop yield based on climatic parameters"2014 International Conference on Computer Communication and Informatics (ICCCI -2014), Jan. 03 – 05, 2014, Coimbatore, INDIA.

[2] Shivnath Ghosh,Santanu Koley, "ML for Soil Fertility and Plant Nutrient Management using Back Propagation Neural Networks" IJRITCC, vol. 2, Issue 2,292-297,2014.

[3] Prof. D.S. Zingade ,Omkar Buchade ,Nilesh Mehta,Shubham Ghodekar ,Chandan Mehta "Crop Prediction System using Machine Learning"International Journal of Advance Engineering and Research Development Special Issue on Recent Trends in Data Engineering Volume 4, Special Issue 5, Dec.-2017.

[4] Konstantinos G. Liakos , Patrizia Busato , Dimitrios Moshou , Simon Pearson ID and Dionysis Bochtis "Machine Learning in Agriculture"Institute for Bio-Economy and Agri-Technology (IBO), CERTH Received: 27 June 2018; Accepted: 7 August 2018; Published: 14 August 2018.

[5] Arun Kumar, Naveen Kumar, Vishal Vats, "Efficient Crop Yield Prediction Using Machine Learning Algorithms", International Research Journal of Engineering and Technology (IRJET)- e-ISSN: 2395-0056, pISSN:2395-0072, Volume: 05 Issue: 06 | June2018 .

[6] Rushika Ghadge, Juilee Kulkarni, Pooja More, Sachee Nene, Priya R L, "Prediction of crop yield using machine learning", 2018 - International Research Journal of Engineering and Technology.

[7] Andrew Crane Droesch, "Machine learning methods for crop yield prediction and climate change impact assessment in agriculture", Published by IOP Publishing Ltd Volume: 05 | OCT-2018.

[8] Mohsen Shahhosseini , Rafael A Martinez-Feria , Guiping HU and Sotirios V Archontoulis" Maize yield and nitrate loss prediction with machine learning algorithms.RECEIVED 29 April 2019 REVISED 29 October 2019 PUBLISHED 4 December 2019.

[9] K.D.Yesugade , Hetanshi Chudasama , Aditi Kharde, Ketki Mirashi, Kajal Muley" Crop Suggesting System Using Unsupervised Machine Learning Algorithm" International Journal of Computer Sciences and Engineering Open Access Research Paper Vol.-7, Issue3, March 2019 E-ISSN: 2347-2693.

[10] S.R.Rajeswari , Parth Khunteta, Subham Kumar,Amrit Raj Singh,Vaibhav Pandey "Smart Farming Prediction Using Machine Learning" - International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-7 May, 2019.

[11] Ramesh Medar & Anand M. Ambekar, "Sugarcane Crop prediction Using Supervised Machine Learning" published in International Journal of ntelligent Systems and Applications Volume: 3 | August 2019.

[12] Pavan Patil, Virendra Panpatil, Prof. Shrikant Kokate" Crop Prediction System using Machine Learning Algorithms"- International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 07 Issue: 02 | Feb 2020 www.irjet.net.

[13] M Kalimuthu ,P.Vaishnavi, M.Kishore "Crop Prediction using Machine Learning" Proceedings of the Third International Conference on Smart Systems and Inventive Technology (ICSSIT2020) IEEE Xplore Part Number: CFP20P17-ART; ISBN: 978-1- 7281-5821-1.

[14] Kevin Tom Thomas , Varsha S , Merin Mary Saji, Lisha Varghese, Er. Jinu Thomas" Crop Prediction Using Machine Learning" International Journal of Future Generation Communication and Networking Vol. 13, No. 3, (2020), pp. 1896–1901.

[15] Alexandre Barbosa, Naira Hovakimyan, Nicolas F. Martin" Risk_averse optimization of crop inputs using a deep ensemble of convolutional neural networks" Received 12 June 2020, Revised 26 August 2020, Accepted 7 September 2020, Available online 1 October 2020. https://doi.org/10.1016/j.compag.2020.105785.