

Literature Review on A Machine Learning Model to Predict Crop, Fertilizers and Diseases

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Abstract

Machine Learning is a part of Computer Science that follows various learning methodology and performs many changes within the set of performance and its task to create it higher than the sooner learning. Agriculture domain is leading supply of states growth. New farmers area unit doesn't awake to systematic farming technique and their methodology to induce good yielding of crops and if they are available recognize the technique, they're unable to use at their regional condition. taking correct answer or information this specific drawback information exploitation machine learning may be a exhausting and sophisticated task. the assorted system mentioned below is extremely useful to user to induce agricultural connected queries with its economical answer in straightforward method, prediction of crop in keeping with their regional conditions, identification of diseases and therefore the fertilizers needed to treat these diseases.

Keywords: - Review, machine learning, prediction, agriculture, NLP.

1. INTRODUCTION

Agriculture is the art and science of cultivating land and raising animals for future use, it is key to the development of the country as it provides primary sector employment to half of the country's population and also contributes 19.9% to the country's GDP. Modern methods of plant breeding, agrochemicals such as pesticides, fertilizers and due to increased technological development, our farmers are falling behind to be one step ahead.

Selection of crops is the basic and fundamental steps in the field of agriculture get better crops products but farmers of the different regions are somehow unable to predict the suitable crops

[4][6] from which they can earn more profit and which reduces their human mechanical force so they can also enjoy some precious time with their family and friends with the peaceful mind.

As we know that according to different forecast condition and climate changes diseases occurs in the crop which damage the nutrition value exist in the crops that also result in the selling price of the crop as the quality of crop is directly proportional to the quality of the crop. So, if we can able to predict the diseases [9] before it causes any harm to crop yield it is far extended be beneficial to farmer to gain more profit.

To increase the involvement of the primary sector (agriculture) consumer of the economy, both central as well as the state government launches different-different types of schemes help for raisings of source of income of farmers. But somehow the schemes are only known to the upper and literate sector of the society which have been the cause of the poverty in the primary sector of the society to reduce this government to tries to advertise the schemes with different ways like in poster, TV ads and in social media platform and now days this platform has also been chat bot embedded and used for transfer of fund and other services [9].

Farmers sometimes manually able to predict the diseases but due to the presence of many varieties of product with different manufacturers and amount of chemical contained it causes confusion to the farmers in selecting the fertilizers the fertilizers prediction [6] system help them to choose better treatment to the crops that give better yielding to the crops. Fertilizers requirement is also based on the type of soil in which the crops is sown so a system with soil-based fertilizer prediction[5] gives better nourishment.

2.LITERATURE REVIEW

Literature review has been mentioned during this section to spotlight the work applied until currently in chatbot system for agriculture domain in recent years.

Ref. No.	System	Author	Technique Used	Year
[1]	Yield Forecasting Using Machine Learning: An Academic Review of the Literature	Thomas van Klompenburga, AyalewKassahuna, CagatayCatalb	Artificial Neural Networks, and CNNs are the most commonly used deep learning formulas.	2020
[2]	Predicting Crop Yield and Chemical Recommendations with Machine Learning Algorithms	Devdatta A. Bondre, Mr. Santosh Mahagaonkar	Support Vector Machines and Random Forests	2019
[3]	A Comparative Study on the Performance of Classification Algorithms in Crop Yield Prediction Systems	T Halbast Rashid Ismael, d Adnan Mohsin Abdulazeez, Dathar A. Hasan Shekhan	Random Forests, k-Nearest Neighbors, Coal Trees, Naive Bayes, Support Vectors	2021

[4]	Crop Prediction mistreatment Machine Learning Approaches	Mahendra N,Dhanush Vishwakarma, Ashwini , Manjuraju M.	SVM formula and crop prediction through call tree formula.	2020
[5]	Soil check based mostly chemical Uttar Pradesh Japan Flat Mustard (Brassica juncea L.) Recommended	P. Dey, Y.V. Singh, M. Verma and A. Babu	Fertilizer demand equation for target yield through chemical solely Fertilizer demand equation for target yield through chemical and FYM	2017
[6]	Crop Recommendation and Chemical Purchasing System	Sonali Ghorpade, Shubhada Mone, Mansi Shinde, KimayaEkbote, , Sanket Pawar	This system is mainly used by farmers based on robotic mobile devices. The application is used to increase crop yields. Fertilizer recommendations are also taken from positioning. This method uses the A priori and Random Forest formulas.	2018
[7]	Intelligent pesticide and chemical recommendation System-supported TPF-CNN for Good Farming	Sunil Kumar Kashyap , B.K. Patle, Tanmay Thorat	In this article, we use the twin operators of Transition Likelihood Perform (TPF) and Convolutional Neural Networks (CNN) to extract images of pests discretely and process continuously. Soil nutrient analysis is performed using the soil NPK device, which contains fertilizer recommendations according to the nutrient values obtained. We also use the Google Docile Machine.	2022
[8]	Plant Disease Detection, Image Processing and Machine	Pranesh Kulkarni, Atharva Karwande, Tejas Kolhe, Soham Kamble, Akshay Jo	Digital image process techniques and back propagation neural network (BPNN).	2019

	Learning	shi, MedhaWyawah are	Random Forest Classifier.	
[9]	Mishandling in Disease Detection Machine Learning	Shashank N, Niveditha M, P V Vinod, Shima Ramesh, Ramachandra Hebbar, Pooja R, Prasad Bhat N,	Teaching dataset creation, feature extraction, classifiers a nd classification. Random Forest for Classifying Pathology and Health Images	2018
[10]	Automatic and Reliable Detection of Plant Disease Abuse Deep Learning Technolo gy	Sawal Hamid Md Ali	The deep learning design supported the recently named EfficientNet convolutio nal neural network with 18,161 simple segmented tomato leaf images. , classified tomato diseases. His two segmentation mode ls, U-net and modified U-net, are rumored to be powerful for leaf segmentation.	2021
[11]	Maize plant disease Detection and Classification mistreatment Machine Learning Algorithms.	Abhaya Kumar Sahoo, Himansu Das, Kshyanaprava Panda Panigrahiand Suresh Chandra Moharana	Naive Bayes (NB), call Tree (DT), K-Nearest Neighbor (KNN), Support Vector Machine (SVM), and Random Forest (RF)	2020
[12]	Solving Current Limitations of Deep Learning based mostly Approaches for disease Detection	Marko Arsenovic , Andras Anderla, SrdjanSladojevic, Mirjana Karanovicand Darko Stefanovic	Disease detection and also the reduction of losses through optimum choices supported the results of decilitre ways.	2019
[13]	Diseases in rice Abuse detection Machine l earning techniques	Kawcher Ahmed, Syed Md. Irfanul Alam,Tasmi a Rahman Shahidi,	Necessary pretreatment , the dataset is based on a variety of different machine learning algorithms and KNN (K-Nearest Neighbor), J48 (Decision Trees), Naive Bayes,	2019

			Deploying Regression.	
[14]	Plant Disease Detection and Classification by Deep Learning	Bin Wang, Lili Li, Shujuan Zhang	Image and Video Process, Language Process, Natural Language Process	2021
[15]	Harvest Recommendation System	Rikin Nayak, Dhruvi Gosai, Hardik Jayswal, Axat Patel, Chintal Raval	An IOT and metric capacity unit based mostly system that uses sensors for soil testing . they need used soil temperature ,soil wetness ,pH and NPK sensors for watching soil wetness ,temperature ,pH and humidness .	2021

Table 1. Literature Review on machine learning model for crop, disease and fertilizer prediction.

Thomas van Klompenburga et al [1] They conducted a systematic literature review to analyze the algorithms and functions that have been used in crop recommendation system studies. They analyze that The most commonly used functions are precipitation, temperature, and soil type, the most commonly used algorithms are artificial neural networks, and CNN is the most widely used deep learning algorithm.

Devdatta A. Bondre Student, NICT Solutions & Research et al [2] In this paper, they used Support Vector Machine and Random Forest algorithms to predict crop yield from previous data and recommend fertilizer suitable for each crop. They divided the system into three steps, first soil classification, second crop yield prediction and third fertilizer recommendation. They concluded that random forest is good for soil prediction with 86.35% accuracy and support vector machine is good for crop prediction with 99.47% accuracy.

T Halbast Rashid Ismael et al [3] In this paper , The classification algorithms Random Forest ,K-Nearest Neighbour , Decision Tree ,Naive bayes , and Support Vector Machine are measured and compared to all other . They concluded that support vector machine has highest accuracy and KNN has lowest accuracy and highest error value .

Dhanush Vishwakarma et al [4] A system that predicts suitable crops for a particular region Based on soil content and meteorological parameters such as pH, precipitation, temperature and humidity. They used an SVM algorithm to predict precipitation and a decision tree algorithm to predict crop forecasts.

M. Verma, Y.V. Singh et al [5] this system recommends the fertilizers according to the required data. Information on the expected response of crop yields to nutrient application is required to determine the use of plant foods. this method uses 2 ways to predict best suited fertilizers, that area unit -

1. plant food demand equation for target yield through plant food solely

$$FD = \frac{NR}{\%CF} \times 100 T - \frac{\%CS}{\%CF} \times STV \quad (1)$$

2. Plant Food Demand Target yield formula from plant foods and FYM

$$FD = \frac{NR}{\%CF} \times 100 T - \frac{\%CS}{\%CF} \times STV - \frac{\%CFYM}{\%CF} \times M \quad (2)$$

where FD = phytonutrient dosage of gas, phosphorus and elemental metals in kilogram ha-1, NR = nutrient requirements of gas, phosphorus and elemental metals (kg), cesium = nutrient requirement from soil nutrients. Contribution (%), CF = Contribution from nutrients from applied vegetable feed soil nutrients (%), CFYM = Nutrient contribution from applied organic fertilizer (%), T = Yield in kilogram ha-1 units Target, M = amount of nutrient applied by FYM (kg ha-1), STV = soil reference value (kg ha-1).

Mansi Shinde, KimayaEkbote et al [6] Applications Provides farmers with recommendations for identifying suitable plant foods and crops. This method can be used mainly in agricultural automata based on mobile devices. Applications can be used to increase crop yields. You can also purchase recommended fertilizers when positioning. The user is given suggestions for frequently purchased fertilizers during trials. Soil gas, elemental metals and phosphorus (NPK) values confirm soil standards. This method uses these values to suggest the correct fertilizer. This method could try to close the gap between agriculture and technology, especially vending technology. An online search platform helps you select products displayed from a website (EC site) and buy products online.

Tanmay Thorat et al [7] The planned system will consist of a combination of pesticide and plant nutrition recommendation systems to help farmers achieve the maximum possible agricultural yields. Also, soil nutrients are managed quickly, resulting in a nutrient-rich soil. It is a method of recommending pesticides and fertilizers depending on the situation (weather, humidity, temperature, etc.). The planned system combines two of his main aspects in agriculture. Brighter Identification and Pesticide Recommendations, Mishandling, Computer Vision, CNN. In this article, a twin-operator Transition Likelihood Operate (TPF) and a Convolutional Neural Network (CNN) are used to discretely and continuously process pest images for proposed pesticide application. Soil nutrient analysis uses the soil NPK device to recommend fertilizers that match the nutrient levels obtained. The proposed method uses a 28-layer agglomeration neural network. Compared to alternative approaches such as ANNs, SVMs, and ANNs, we get almost a 200x performance improvement. This method is self-contained and doesn't require a web association, so it can be used anywhere. This method can be recommended to farmers, soil testing laboratories and seed production companies.

Pranesh Kulkarni et al [8] able to discover twenty totally different diseases of five common plants with ninety-three accuracies. disease detection mistreatment digital image process techniques and back propagation neural network (BPNN). They used dataset and performed knowledge preprocessing and have extraction. Random forest classifier (combination of multiple call trees) has been used for classification or detection task. it's the a part of ensemble learning, wherever the output is foreseen from multiple base estimators.

Shima Ramesh et al [9] The implementation stages are different, namely data set generation, feature extraction, classifier training, and classifier. The generated datasets of healthy and pathological leaf regions were collectively trained in a random forest to classify pathological and healthy images. To extract options from an image, we typically use a bar chart with a degree-oriented gradient (HOG).

Muhammad E et al [10] A deep learning design that supports a complex neural network, recently known as EfficientNet, on 18,161 simple segmented Picture of tomato leaves to classify tomato diseases. Performance of two segment models, i. U-grids and modified U-grids for the H. Lobe segments has been reported.

3. MACHINE LEARNING MODELS

1. K-NEAREST NEIGHBORS

The K-NEAREST NEIGHBORS algorithm is effective and very simple. The model presentation of ANN is the total training data set. Prediction of new data points is done by finding the K number of neighborhoods across the training set and summing up the output variables for those K number of neighbors. For classification, it could be the common class value and for regression, it could be the mean output variable.

The idea is to determine the similarity between data instances.

KNN may require a large amount of space or storage to collect all the data, but it only computes just in time when there is a need for prediction. You can also organize and update your training instances over a period of time to keep your predictions accurate.

2. Random Forest

Random Forest is a powerful and popular machine-learning algorithm that belongs to the supervised learning technique. It is based on ensemble learning.

Ensemble learning is a process of solving complex problem by combining the multiple processes and to improve the performance.

3. Naive Bayes

The naive Bayes algorithm is a simple and effective algorithm for making quick predictive models. It is used in text classification.

It is a probabilistic classifier, which means it predicts on the basis of the probability of an object.

It converts the given dataset into a frequency table then generates a likelihood table by finding the probabilities of given features then uses bayes theorem to calculate the probability.

4. Linear Regression

Linear regression is perhaps one of the best-known and best-understood algorithms in the fields of statistics and machine learning.

Predictive modeling is primarily aimed at minimizing model error or making as accurate a prediction as possible at the expense of explainability. We borrow, use, and plagiarize algorithms from various fields, including statistics, and use them for these purposes.

5 Support Vector Machines

Support vector machines are probably one of the most popular and discussed machine learning algorithms.

A hyperplane is a spatial division of the input variables. In SVM, the hyperplane is chosen to better separate the points in the space turning the input into layer 0 or layer 1. In 2D you can think of this as a line. All entry points can be completely separated by this line. The SVM learning algorithm finds the coefficients that best separate the hyperplane classes.

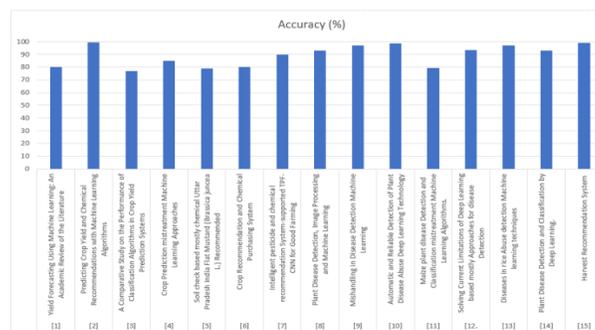
4. RESULT

Following are the accuracies of model, used in this paper -

Ref. No.	System	Accuracy (%)
[1]	Yield Forecasting Using Machine Learning: An Academic Review of the Literature	80
[2]	Predicting Crop Yield and Chemical Recommendations with Machine Learning Algorithms	99.47
[3]	A Comparative Study on the Performance of Classification Algorithms in Crop Yield Prediction Systems	76.82
[4]	Crop Prediction mistreatment Machine Learning Approaches	85
[5]	Soil check based mostly chemical Uttar Pradesh India Flat Mustard (<i>Brassica juncea</i> L.) Recommended	79
[6]	Crop Recommendation and Chemical Purchasing System	80
[7]	Intelligent pesticide and chemical recommendation System-	90

	supported TPF-CNN for Good Farming	
[8]	Plant Disease Detection, Image Processing and Machine Learning	93
[9]	Mishandling in Disease Detection Machine Learning	97.30
[10]	Automatic and Reliable Detection of Plant Disease Abuse Deep Learning Technology.	98.66
[11]	Maize plant disease detection and classification mistreatment Machine Learning Algorithms.	79.23
[12]	Solving current limitations of Deep Learning based mostly approaches for disease Detection	93.67
[13]	Diseases in rice Abuse detection Machine learning techniques	97
[14]	Plant disease detection and classification by Deep Learning	93
[15]	Harvest Recommendation System	99.31

Table 2. Accuracy of the model used



Graph 1. Accuracy of the model used

With the research through above mentioned paper we found that the system with minimum and maximum accuracy are as follows :-

SN	Category	Minimum Accuracy	Maximum Accuracy
1.	Chemical Prediction	Maize plant disease Detection and Classification mistreatment Machine Learning Algorithms. (79.23%)	Automatic and Reliable Detection of Plant Disease Abuse Deep Learning Technology. (98.66%)
2.	Crop Prediction	A Comparative Study on the Performance of Classification Algorithms in Crop Yield Prediction Systems.(76.82)	Predicting Crop Yield and Chemical Recommendations with Machine Learning Algorithms.(99.47)
3.	Diseases Prediction	Soil check based mostly chemical Uttar Pradesh India Flat Mustard (Brassica juncea L.) Recommended. (79%)	Intelligent pesticide and chemical recommendation System-supported TPF-CNN for Good Farming. (90%)

Table 3. Minimum Accuracy and Maximum Accuracy of the model used, in different category

5.CONCLUSION

Modern technology and large amounts of data make it difficult for farmers to get accurate information online in the time they need. there are a unit varied crop, diseases and fertilizers system developed however only a few provides correct and economical answers and conjointly per their regional condition. A well-designed system should capture user questions through a variety of techniques, including verbal communication, mishandling, stop word removal, POS tagging, stemming, and mishandling. A sparse classifier is all about classifying a user's query to give a precise and accurate answer. during this paper we are come upon varied system that

amendment method of accessing economical knowledge per the farmers needs like crop predictor, weather prediction, diseases prediction and per that the chemical required thereto.

With the research through above mentioned paper, we found that for Chemical prediction system “Automatic and Reliable Detection of Plant Disease Abuse Deep Learning Technology (98.66%)”, Crop prediction “Predicting Crop Yield and Chemical Recommendations with Machine Learning Algorithms (99.47%)”, and for Diseases Prediction “Intelligent pesticide and chemical recommendation System-supported TPF-CNN for Good Farming. (90%).” System has maximum accuracy.

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