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A Survey on Crop Prediction Based on Artificial Intelligence and Machine Learning

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Abstract: -

Agriculture is one of the major revenues producing sectors of India and a source of survival. The kind of yield desire is the hardest task for the cultivating space. Artificial Intelligence (AI) and Machine Learning (ML) are the recent technologies from the last few years. In this paper, we have surveyed techniques/methods used for crop prediction.

Keywords: **-** *Agriculture, Artificial Intelligence, Machine Learning, Crop prediction, Deep Neural Network.*

1.Introduction: -

Agribusiness is the most significant area in the Indian Economy. The farmers play in India a major role to feed the growing population of the country. This makes crop removal the redundancy examination and expectation as significant as harvest creation. Food crops in India are mostly seasonal and require monitory of soil parameters, rainfalls and temperature are to ecological variables that affect the harvest yield.

Estimating agriculture yield before harvest is an important issue in agriculture, as the changes in crop yield from year to year influence international business, food supply, and global market prices. Also, the early prediction of crop yield provides useful information to policy planners. Appropriate prediction of crop productivity is required efficient planning of land usage at economic. In recent times, the forecasted of productivity at the within-field level has increased. The most influencing factor for crop productivity is weather conditions. If weather based on predictions is more precise, then farmers can be alerted well in advance so that the major loss can be mitigated and would be helpful for economic growth. The prediction will also aid the farmers to make the decision such as the choice of alternative crops or to discard a crop at an early stage in case of a critical situation. Further, anticipating crop yield can encourage the ranchers to have a superior vision of the development of occasional harvests and their booking. In this manner, it is important to mimic and foresee the harvest yield before development for proficient harvest the board and expected results as there exists a non-direct connection between crop yield at the factors influencing crop, machine learning techniques might be efficient for yield production.

1.1Artificial Intelligence: -

Artificial intelligence is a technology that connected physical objects in the world that are accessible through the internet. Applications are developed based on Artificial Intelligence devices for monitoring and controlling in various domains including home appliances, smart cities, smart homes, and so on. In the agriculture domain, few kinds of research have proposed architectures based on AI with machine learning to predict the type of crops and small plants. AI with machine learning is mature technology and a lot of work has been done for the agriculture domain. AI with machine learning architecture was proposed for predicting the types of crops in the agriculture domain [1].

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1.2Machine Learning: -
Machine learning is a new technology and has been used for analysing the soil moisture, temperature, and humidity of the environment, pH value to classify them. It is useful for the type of crops and small plant predictions based on certain parameters like environmental conditions, the moisture of soil, pH level in farmland. Artificial Intelligence fundamentally utilized in farming space for kinds of harvests forecast utilizing altered help vector machine calculation [2].

1.3 Deep Neural Network: -
A Deep Neural Network (DNN) is an Artificial Neural Network (ANN) with numerous layers between the information and yield layers. The DNN finds the right numerical control to transform the contribution to the yield, regardless of whether it be a straight relationship or a non-direct relationship. The system travels through the layers ascertaining the likelihood of each yield. For instance, a DNN that is prepared to perceive hound breeds will go over the given picture and ascertain the likelihood that the pooch in the picture is a sure breed. The client can audit the outcomes and select which probabilities the system should show (over a specific limit, and so on.) and return the proposed mark. Each scientific control in that capacity is viewed as a layer, andcomplex DNN has numerouslayers, thus the name "profound" networks [3].

2. Literature Survey: -
Machine Learning (ML) deals with problems where the relationship between input and output variables is not known or hard to obtain. The "learning" term here signifies the programmed procurement of auxiliary portrayals from instances of what is being depicted. Unlike traditional statistical methods, ML doesn't make presumptions about the right structure of the information model, which portrays the information [4]. This trademark is extremely valuable to demonstrate complex non-direct practices, for example, a capacity for crop yield forecast. ML strategies most effectively applied to Crop Yield Prediction (CYP). Administered Learning calculation comprises an objective/result variable (or ward variable) which is to be anticipated from a given arrangement of indicators (autonomous factors). Utilizing these arrangements of factors, we produce a capacity that guides contributions to wanted yields. The training process continues until the model achieves a desired level of accuracy on the training data[5].

2.1. Method Used: -

K-MEANS:
K-means is a measurable, unsupervised, non-deterministic, iterative technique for gathering diverse articles into clusters. The k-means estimation has wound up being to an incredible degree extreme in making groups in different convenient applications in making districts, for example, in Bioinformatics, advertising division, PC vision, geostatistics, stargazing, and cultivation. It is the least complex unsupervised learning calculations known for its speed, ease, and convenience [6].

KNN:
K-Nearest Neighbours (KNN) calculation is one of the easiest, straightforward, flexible and one of the highest AI calculations. KNN is a non-parametric regulated learning calculation. Also, it is an occasion-based learning or a sluggish calculation. At the point when a question to the database is made, the calculation utilizes the preparation examples to let out an answer. That is the reason for KNN the preparation stage is quickly contrasted with other classifier calculations. Nonetheless, the testing stage turns out to be increasingly slow, which is as far as time and memory. KNN's motivation is to utilize a database where the information focuses are isolated into a few classes to anticipate the grouping of another example point. Informally, this means that for a labelled dataset consisting of training observations (x, y) and the algorithm is used to capture the relationship between x and y. KNN Algorithm is based on feature similarity: How closely out-of-sample features resemble our training set determines how we classify a given data point [7].

APPRIORI ALGORITHM:

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Defines the parameter K Appriori is a calculation for incessant thing set mining and affiliation guideline learning over value-based databases. It continues by recognizing the continuous individual things in the database and extending them to bigger and bigger things sets as long as those thing sets show up adequately regularly in the database [8]. The continuous thing sets dictated by Appriori can be utilized to decide affiliation rules which feature general patterns in the database: this has applications in area s, for example, showcase bushel examination.

LINEAR REGESSION:
Linear Regression model for crop yield prediction is to develop the Linear Regression models for crop yield prediction, Linear Regression analysis is majorly used for prediction functions because it provides predicted entity as a function of depended entities [9].

SVM:
SVM makes a hyperplane or set of hyperplanes in a high-or vast dimensional space, which is used for relapse, grouping or different assignments. SVM uses linear functions for learning. In the case of nonlinear cases, SVM uses a kernel technique to plot the data into a higher dimensional feature space, in which linear functions can be applied. This strategy finds wide applications in signal preparation, time series analysis, weather prediction, crop productivity prediction, etc. SVM is less vulnerable to the overfitting problem as it is capable of mapping the functions to a hyperplane. A study on the impact of climate factors such as temperature, rainfall, relative humidity, sunshine hours, daily temperature range, and rainy days are considered to predict paddy yield is proposed. Further SVM Classifier is used to recognize the plant as either harvest or weed. The strategy is executed to identify maize and weed plants. SVM-based Open Crop Model (SBOCM) for rice development stage and yield prediction is attempted Soil classification to identify suitable crop for the soil using SVM is proposed in the key issue in SVM modelling is the determination of the kernel functions, hyperparameters, and penalty coefficient. In[10], the application ofSVM in analysing aerial hyperspectral observations taken over a cornfield to predict crop yield, biomass, plant height, and leaf greenness is proposed. The outcomes were contrasted and a stepwise relapse strategy and saw as better.

PSO:
Particle Swarm Optimization (PSO) is an enhancement strategy that is remembered for the group of Swarm Intelligence. Particle Swarm Optimization was a technique introduced by Eberhart and Kennedy that flocking birds. The PSO algorithm 28 groups each particle (point) with a certain speed of flight but without quality and size in the multidimensional search space. It is assumed that there is a group (swarm) consisting of m particles flying with a certain speed in a Dimensional search space, and each particle changes its location (i.e., state or solution) based on both its own best search point in the history of the search process and that of other particles in the swarm (or neighbourhood).

4. Discussion :-

In the previous work algorithm like KNN (k-Nearest Neighbour), SVM (Support Vector Machine), PSO (Particle Swarm Optimization), etc. have been used for prediction. But these algorithms have low accuracy and due to improper farming and greenhouse effects, there is a lot of misprediction in crop yield. The accuracy of crop estimation for the diverse crops involved in strategizing and planning is deliberated to be one of the utmost significant issues for agronomic production purposes. Nowadays prediction is still considered to be a major issue that remains to be explained based on available data for some agricultural areas. While profound learning has prompted significant leaps forward in prescient applications and man-made brainpower, classical statistical methods will remain central to scientific applications that seek to elucidate mechanisms governing cause and effect. This approach is suitable for any prediction problem in which there is some potentially imperfect prior knowledge about the functions mapping inputs to outcomes and longitudinal or other structure in the data.

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To remove this drawback, Deep nets will be use in this project to improve accuracy. In these farmers learns by experience as to how can the yield be improved. But extreme unexpected cases like a possible flood, this project when tied up with the weather forecasts can help by letting the farmers realize much faster as how to protect their living, by giving away predictions that take into account these extreme scenarios.

5. Conclusion: -

Agriculture is the backbone and important sector of developing countries' economies. It contributes to the development and is considered as an important source. Crop yield prediction is remaining as a challenging issue for farmers. The proposed framework nulls over the information identified with soil, climate and past year creation and recommends which are the best productive harvests that can be developed in the opportune ecological condition. As the system lists out all possible crops, it helps the farmer in the decision making of which crop to cultivate. Also, this system takes into consideration the past production of data which will help the farmer get insight into the demand and the cost of various crops in the market. As maximum types of crops will be covered under this system, a farmer may get to know about the crop which may never have been cultivated. This project aims to improve accuracy by using deep nets. We presented a machine learning and artificial intelligence approach for crop prediction, which demonstrated performance in various crops. In this way, we concluded Deep nets for crop prediction. Deep nets will be used to search an acquire data sets for crop prediction. Thus, processing all those attributes will increase the accuracy of the normal prediction.

References: -

1. Teresa Priyanka, Pratishtha Soni, C. Malathy,Eurasian Journal of Analytical Chemistry, Issue 02 December 2018, ISSN:1306-3057 OPENACCESS 2018 13 (SP): 6-12.
2. Radhika, Narendiran, International Journal of Computer & Mathematical Sciences IJCMS ISSN 2347 – 8527 Volume 7, Issue 4 April 2018.
3. Dumitru Erhan, Christian Szegedy, Alexander Toshev, Dragomir Anguelov; The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2014, pp. 2147-2154.
4. G Ruß, "Data Mining of Agricultural Yield Data: A Comparison of Regression Models", Conference Proceedings, Advances in Data Mining – Applications and Theoretical Aspects, P Perner (Ed.), Lecture Notes in Artificial Intelligence 6171, Berlin, Heidelberg, Springer, 2009, pages: 24-37.
5. Tripathi S, Srinivas V V, Nanjundiah R S, "Downscaling of Precipitation for Climate Change Scenarios: A Support Vector Machine Approach", J Hydrol, 2006, pages: 621-640.
6. Camps-Valls G, Gomez-Chova L, Calpe-Maravilla J, Soria-Olivas E, Martin-Guerrero J D, Moreno J, "Support Vector Machines for Crop Classification using Hyper Spectral Data", Lect Notes Comp Sci 2652, 2003, pages: 134-141.
7. B. Devika, B. Ananthi,International Research Journal of Engineering and Technology (IRJET),Volume: 05 Issue: 12 | Dec 2018, e-ISSN: 2395-0056, p-ISSN:2395-0072, www.irjet.net.
8. Rub, G., "Data Mining of Agricultural Yield Data: A Comparison of Regression Models", 9th Industrial Conference, Vol.5633, pp.24-37, 2009.
9. Sellam,V., Poovammal, E., "Prediction of Crop Yield using Regression Analysis", Indian Journal of Science and Technology, Vol. 9(38), pp.15, 2016.
10. Perpetua Noronha, Divya. J, Shruthi. B.S, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 5, Special Issue 2, October 2016.

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