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Prediction of Crop Using SVM Algorithm

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Abstract: ***Crop prediction is the process of forecasting the yield or production of crops for a given period, based on historical data, weather patterns, and other relevant factors. The prediction can be used to inform decisions regarding planting, harvesting, and marketing of crops. Machine learning and artificial intelligence techniques are increasingly being used to improve crop prediction accuracy. These techniques use algorithms to analyze large amounts of data, such as weather patterns, soil conditions, and crop history, to make predictions about future crop yields.***
Crop prediction models can be used by farmers, agribusinesses, and governments to optimize crop management, reduce waste, and maximize profits. Accurate crop prediction can also help to mitigate the impact of climate change on agricultural production by enabling farmers to adapt to changing weather patterns and other environmental factors
Keywords: Crop yield Prediction, SVM Algorithm, Machine Learning, Agriculture, Supervised Learning.

I. INTRODUCTION

Crop prediction using machine learning is an application of artificial intelligence that enables farmers to make more informed decisions about crop management. It involves the use of historical data on weather conditions, soil quality, and crop yields to create predictive models that can forecast future crop yields.
Machine learning algorithms such as Random Forest, Support Vector Machines (SVM), and Artificial Neural Networks (ANN) can be used to predict crop yields. These algorithms analyze historical data and identify patterns that can be used to forecast future crop yields. The use of machine learning for crop prediction has several benefits. Farmers can make more informed decisions about crop management, such as the best time to plant, fertilize, or irrigate crops. Predictive models can also help farmers estimate future crop yields and plan for harvest and storage accordingly. Machine learning can also be used to identify early signs of crop disease or pests. By analyzing historical data on pest and disease outbreaks, machine learning algorithms can identify potential risks and alert farmers to take preventive measures.
In summary, crop prediction using machine learning is a valuable tool for farmers to optimize crop management and maximize crop yields. By using historical data to create predictive models, farmers can make more informed decisions about crop management and identify potential risks before they become major problems.

II. LITERATURE SURVEY

1) Crop Yield Analysis Using Machine Learning Algorithms by Fatin Farhan Haque, Ahmed Abdelgawad, Venkata Prasanth Yanambaka, Kumar Yelamarthi (2020): The paper processes Machine Learning approach for Crop yield analysis using Support vector regression (SVR) and Linear Regression (LR). After going through a series of data recognition the result has been satisfiable depending on the per step taken on validation of the result. The uncontrollable environment parameter helped in understanding the effect on the yield, further assessment with the controllable environment would suffice the everyday need for yield measurement.

2) Crop Yield Prediction using Machine Learning Techniques by Ramesh Medar, Vijay Rajpurohit, and Shweta (2019): This paper concluded that we can improve using Naïve Bayes and K-NN classifier the performance by checking the accuracy between different crops. It helps in selecting the proper crop for their selected land and selected season and helps in getting the maximum yield rate of the crops.

3) A Study on Various Data Mining Techniques for Crop Yield Prediction by Yogesh Gandge, Sandhya (2017): They concluded that predicting a crop well in advance requires a systematic study of huge data coming from various variables like soil quality, pH, EC, N, P, K, etc. According to the study, there is still scope for improvement in the result because most of the authors do not use a unified approach where all the factors affecting the crop yield can be utilized simultaneously for predicting the crop yield.

4) Crop prediction using predictive analytics by P. S. Vijayabaskar, Sreemathi R, Keertanaa E (2017): The paper processes IoT for crop prediction. Application is mainly developed for the farmers to help to the soil fertility and suggest which crop has to be planted. It also suggests the fertilizer which has to be added to the soil to increase the crop yield.
5) Supervised Classification of Spectral Signatures from Agricultural Land-Cover in Panama Using the Spectral Angle Mapper Algorithm by Javier E. Sanchez-Gal (2019): The paper concluded that The Spectral Angle Mapping algorithm (SAM) is used for the supervised classification of the agricultural coverages in the database. On the one hand, results indicate the possibility of using this classification technique for the automatic determination of crops and even different phenological stages in a crop via a satellite image.
6) Supervised Machine learning Approach for Crop Yield Prediction in Agriculture Sector by DR. Y. Jeevan, Nagendra Kumar (2022): The paper processes supervised learning for crop yield prediction using Convolution Neural Network and Tensorflow. Implement a system to predict crop production from the collection of past data. This work is employed to search out the gain knowledge about the crop that can be deployed to make efficient and useful harvesting. The accurate prediction of different specified crops across different districts will help farmers in India.
7) Crop yield prediction using machine learning by Mayank Champaneri, Chaitanya Chandvidkar, Darpan Chachpara, and Mansing Rathod (2020): They concluded that using supervised learning and based on the climatic input parameters the study provided the demonstration of the potential use of data ming techniques in predicting the crop yield based. The developed webpage is user-friendly and the accuracy of prediction is above 75% in all the crops and districts selected in the study indicating higher accuracy of prediction.
8) Crop yield prediction using Deep Neural Networks by Saeed Khaki, and Lizhi Wang (2019): The approach used deep neural networks to make yield predictions based on genotype and environment data. The performance of the model was found to be relatively sensitive to the quality of weather prediction, which suggested the importance of weather prediction techniques. To make the model less of a black box, we performed feature selection based on the trained DNN model using the backpropagation method. The feature selection approach successfully found important features and revealed that environmental factors had a greater effect on crop yield than genotype.

III. ARCHITECTURE

The architecture for crop prediction using machine learning (ML) generally follows a similar pattern, consisting of the following components:

1) *Data Collection:* The first step is to collect data related to crop production, including historical yield data, weather data, soil data, crop management data, and any other relevant information that may impact crop yield or quality.
2) *Data Preprocessing:* The collected data needs to be cleaned, preprocessed, and formatted to make it suitable for use by the ML algorithms. This includes tasks such as data cleaning, data normalization, and data augmentation.
3) Feature selection: The next step is to identify the relevant features or variables that can help predict crop yield. Feature selection can be done using techniques such as correlation analysis, principal component analysis, and mutual information analysis.
4) *Split Data:* Split the pre-processed data into training and testing sets. The training set is used to train the machine learning model, while the testing set is used to evaluate the performance of the model.
5) *Model Selection:* After selecting the features, the appropriate ML model needs to be selected. This will depend on the type of data and the problem being solved. Popular models for crop yield prediction include random forest, support vector machines, artificial neural networks, and K-nearest neighbors.
6) *Model Training:* The selected ML model needs to be trained on the preprocessed data. This involves splitting the data into training and validation sets and then using the training set to train the model.
7) *Model Evaluation:* Once the model is trained, it needs to be evaluated using the validation set. This involves testing the model's accuracy and performance and fine-tuning the model parameters to improve its performance.
8) *Deploy the Model:* Once you are satisfied with the performance of the machine learning model, deploy it in a production environment where it can be used to make crop predictions on new data. This could be in the form of a web or mobile application that farmers can use to get recommendations on which crops to plant and when to plant them
9) *Prediction:* After the model is trained and validated, it can be used to make predictions on new data. For example, given weather and soil data for a particular season, the model can predict the crop yield for that season.
10) *Monitor and Improve:* Continuously monitor the machine learning model's performance and gather feedback from farmers and other users. Use this feedback to improve the model and make it more accurate over time.

Overall, the architecture for crop prediction using ML involves collecting and preprocessing data, selecting relevant features, selecting and training a suitable ML model, evaluating the model's performance, and making predictions on new data.
This architecture provides a general overview of the steps involved in using machine learning for crop prediction. The specific details and requirements of each step may vary depending on the specific problem at hand.
Note: This architecture is a general overview of the process and may vary based on the specific requirements and constraints of the crop prediction system.

IV. BLOCK DIAGRAM

As in Fig.1, below is the in-general process of how the prediction of the crop is done using Machine Learning:

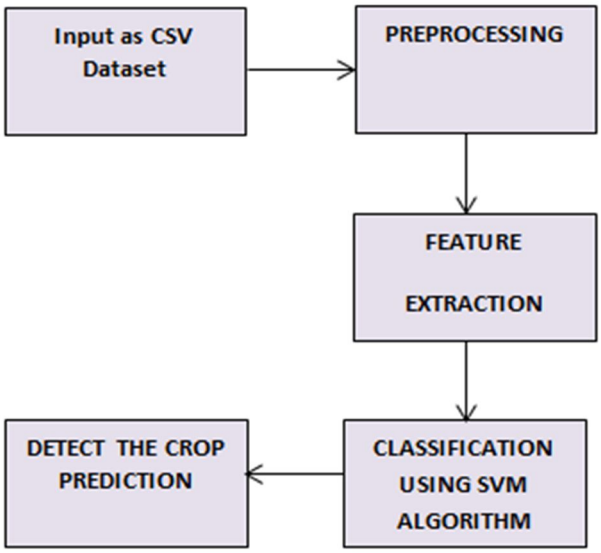

Fig.1 A general Workflow of Crop Prediction

V. CONCLUSION

In conclusion, using machine learning for crop prediction has shown promising results in recent years. By utilizing various techniques such as data analysis, statistical modeling, and pattern recognition, machine learning algorithms can accurately predict crop yield, disease outbreaks, and optimal harvest times. This technology is especially useful for large-scale farming operations where the timely and accurate prediction of crop yield and potential issues can significantly impact productivity and profitability. However, it is important to note that machine learning models require large amounts of data to train and optimize the algorithms. Additionally, the quality and accuracy of the data used can greatly affect the performance of the models. Therefore, it is essential to ensure the quality and accuracy of the data used in crop prediction to obtain reliable and useful results.
Overall, using machine learning in crop prediction can revolutionize the agriculture industry by providing accurate and timely information to farmers, allowing for better planning and decision-making.

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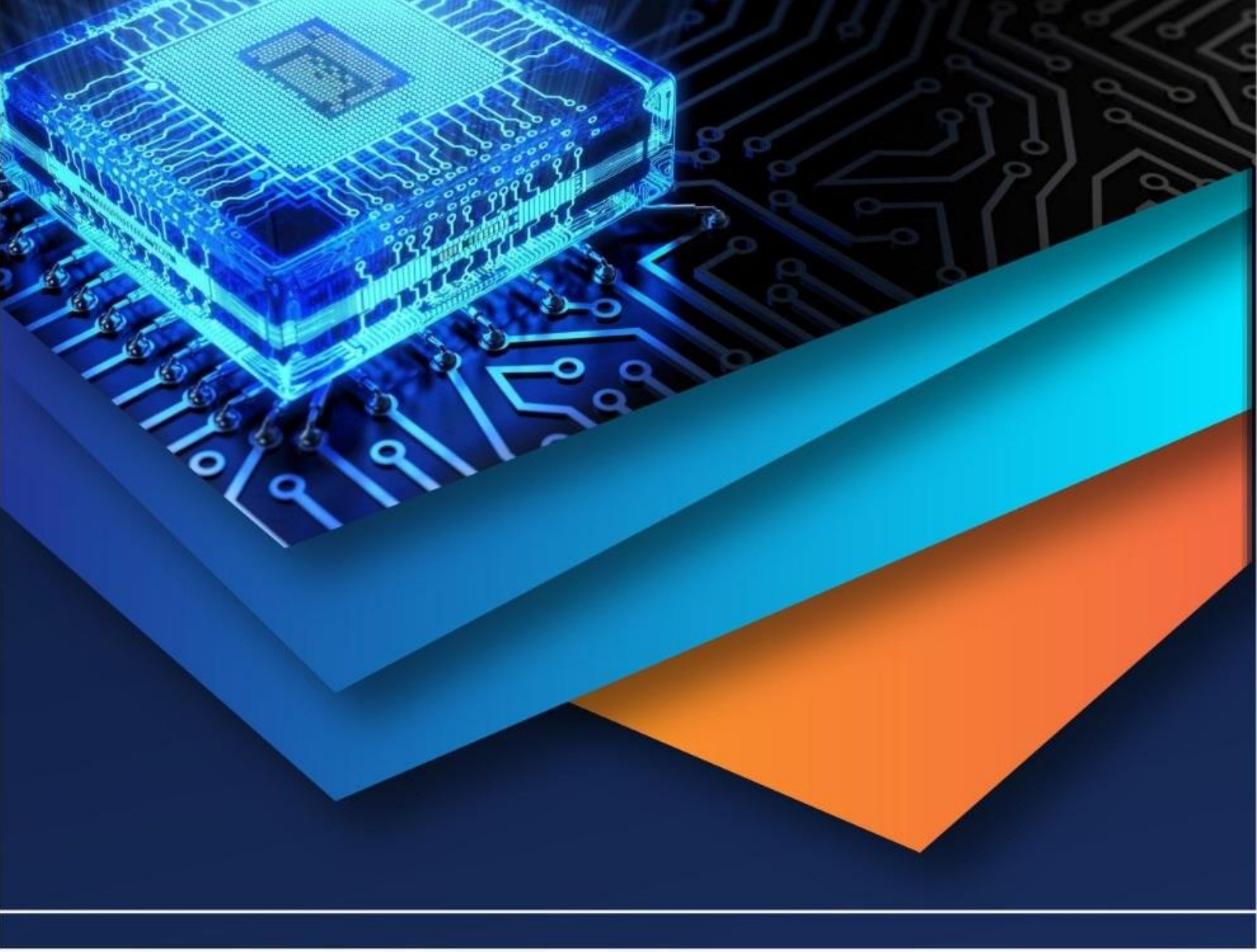

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