Survey on Crop Recommendation System

Ritika Adhav, AghilaUnnikrishnan, VaishnaviDhumal, SakshiKarade, K.Vengatesan*

Computer Engineering, Sanjivani College of Engineering, Kopargoan, Savitribai Phule Pune University, India.

Emails: rittikkaadhav@gmail.com; akhilaaynikkadan@gmail.com; dhunalvaishnavi05@gmail.com; sakshi.karade16@gmail.com; Vengicse2005@gmail.com

Abstract

The main purpose of the planned system is to develop a system which can intelligently recommend crop and suggest required measures to farmers for their profitable income. For this purpose, machine learning algorithms are used. The main goal of these systems is to achieve maximum yield rate of crop using land resource. In this system, the farmer / beginner will classify and predict the crop cultivation based on their weather, monsoon and soil type along with their pH level. Forclassification we have used the K-Means algorithm for the choosing crop, the cultivation process is recommended in the form of text. During the cultivation of crops, the fertilizers, insecticides and fungicides are recommended using Machine Learning Technique. The system also predicts the name of disease and its remedies if leaf of crop is diseased .Finally, using this system the farmers will have a well guided approach to begin with farming.The pandemic has affected a lot of fields around the world. One of them is the agricultural sector. Many farmers in the urban as well as the rural parts of India were not able to earn their profile in spite of having good production. This system would eliminate these worries. All the information needed can be accessed online.

Keywords: Machine learning; Deep learning; crop recommendation; fertilizer recommendation; plant disease; Naïve Bayes; image processing; classification; K-means.

1. Introduction

India is one of the biggest producers of agricultural products and still has very less farm productivity. The most common problem faced by the Indian farmers is they do not opt crop based on the necessity of soil, as a result they face serious setback in productivity. Also, there are various factors that affects the quality and quantity of crops cultivated. Due to different weather and local conditions these plants are exposed to various diseases. And if these diseases remain undetected may cause some serious losses.

In this system, we have used Machine Learning and Deep Learning techniques to solve these problems and help farmers to maximize crop productivity. The user provides the area, soil type and image of disease plant as input and machine learning and deep learning algorithms allow choosing the most profitable crop list and detecting the plant disease and the suggestions to cure it.

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2. Literature survey

"Machine learning convergence for weather based crop selection" proposed by Sonal Jain and Dharavath Ramesh, in 2020. The proposed method represents a novel weather based crop selection system to select crops for land, based on predicted weather and its soil parameters. The weather forecasting is carried out using RNN. In order to get better prediction accuracy, the results are compared with conventional ANN.Also to get more than one suitable crop for cultivating a random forest classifier with additional threshold parameter is used. The proposed system also suggests the proper sowing time for each crop.[1]

"Smart Crop and Fertilizer Prediction System" proposed by C.P.Wickramasinghe ,P.L.N.Lakshitha, H.P.H.S.Hemapriya , AnuradhaJayakody, P.G.N.S.Ranasinghe , in 2019. This system mainly focuses on suggesting the best crop according to soil fertility of land. To optimize the amount of fertilizers which is to be applied for suggested crops, this system recommends a fertilizer plan. The proposed system presents a tool with embedded sensors which will measure soil fertility. The system also developed a mobile application to suggest the best crops on the basis of soil fertility available and then a fertilizer plan will be suggested to farmer to optimize fertilizer usage so that farmer's profitability will be increased avoid soil degradation. [2]

"Classification of Plant Leaf Diseases Using Machine Learning And Image Pre-processing Techniques" proposed by Pushkara Sharma, Pankaj Hans and Subhash Chand Gupta, in 2020. In this proposed system, with the help of artificial intelligence a solution for detection and classification of different plant leaf disease was presented. For, classifying plant leaf disease, convolutional neural network is used and for the classified disease some remedies are also suggested in this proposed model. [3]

"Plant Diseases Detection and Classification using Machine Learning Models" proposed by PoojaPanchal, Vignesh Charan Raman and Shamla Mantri, in 2019. This proposed system represents different type of technical methods for automated computerized detection of plant disease. This can be done using image classification and segmentation. The algorithms were tested on three diseases namely Early Blight, Late Blight and Bacterial Spot. The main purpose of this proposed system was identifying the plant disease. For recognition of diseases part from the leaf, HSV alteration method proved to be very efficient. Hence by evaluating the results, the proposed approach yields accurate detection of plant leaf diseases [4]

3.Proposed system

Step 1: Open the system, ask users to enter questions in text.
Step 2: After all the questionnaires, save the data.
Step 3: Recommend the crop according to entered details by the user, using ML algorithms.
Step 4: Suggest fertilizers according to crop recommended using ML algorithms.
Step 5: Similarly suggests nearest trustworthy dealers details to purchase fertilizers at reasonable rate.
Step 6: Ask the users for plant health, if diseased ask to upload photo of the plant.
Step 7: Process the photo and suggest organic cure and also nearest details of plant doctor.

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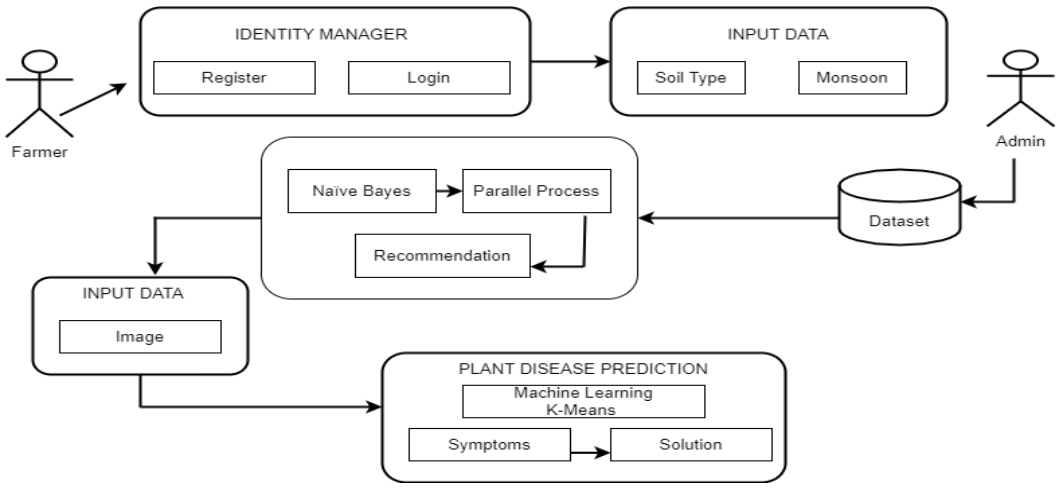

Figure 1: The Proposed system

4. Methodology

a) Dataset: In the subject of Machine Learning, we believe this stage is the system's decisive element. We've reduced the data as much as possible, allowing the model to train more simply and quickly. If raw data is being utilized, it should be cleaned beforehand before being fed to the model. We can sanitize the data in a variety of ways; there is no one-size-fits-all solution. Our dataset is particularly in the text or string format. The most important part of our dataset preparation is tokenizing the sentences into words.

b) Pre-processing: Data pre-processing is a technique which is used to transform the raw data in a useful and efficient format.

c) Data cleaning: The data can have many irrelevant and missing parts.Hence data cleaning is done. It involves handling of missing data, noisy data etc.

d) Data split(Train Test): The next step is to partition the dataset into a training and validation set after the data is ready for modelling. This shape of data is obtained by dividing the dataset into 80% of the training set and 20% of the validation set.

e) User input: We will accept the input from the user.

5. Algorithm

5.1. NaiveBayes: Naive Bayes classifier works on Bayes theorem. Naive Bayes Classifier is used to assign label to the class where the class labels are drawn from some finite Set. It works on the principle that the features are independent from each other. The Class label are identified on the basis of the input dataset. Following are the steps for the modified algorithm:

Step-1: Input the area of crop and monsoon details.

Step-2: Read the dataset for the training purpose with class labels.Dataset contain the parameter for recommendation with class labels.

Step-3: Pre-process the data to remove inconsistency and outlier detection.Unknown variables and outliers are detected and corrected to improve the accuracy.

Step-4: Apply data cleaning with suitable Technique.

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Step-5: Apply the Naive Bayesian Classification technique to obtain the classes for the cleaned data. Output of the classifier is the label for the input data.
Step-6: Generate the model to obtain the appropriate fertilizer Recommendation. The Model is generated with class labels which is useful for decision making.
Step-7: Obtain required Crop Recommendation from the developed mode.

5.2.K-means:K-Means Clustering is an unsupervised learning algorithm that is used to solve the clustering problems in machine learning or data science-Means Clustering is an Unsupervised Learning algorithm, which groups the unlabelled dataset into different clusters. Here K defines the number of pre-defined clusters that need to be created in the process. The working of the K-Means algorithm is explained in the below steps:
Step-1: Select the number K to decide the number of clusters.
Step-2: Select random K points or centroids. (It can be other from the input dataset).
Step-3: Assign each data point to their closest centroid, which will form the predefined K clusters.
Step-4: Calculate the variance and place a new centroid of each cluster.
Step-5: Repeat the third steps, which means reassign each data point to the new closest centroid of each cluster.
Step-6: If any reassignment occurs, then go to step-4 else go to FINISH.
Step-7: The model is ready

6. Applications

- The proposed system will be helpful for farmers to make an informed decision before starting the cultivation of crops.
- This system will suggest suitable crops to be cultivated based on various factors such as rainfall, temperature, soil type, etc.
- According to the nutrient content in the soil and the crop you want to grow, the system will provide suggestions for buying fertilizer.
- This system will be helpful in predicting whether the plant leaf is healthy or diseased and if diseased the system will tell the cause of disease and provide remedies to cure it.

7. Conclusion

Crop and yield of the crop prediction using intelligent machine learning techniques may improve the crop planning decisions and it becomes easier for farmers to grow and maximize their yield and profit. The crop recommendation system recommends crops to the user based on the data provided by the user. Based on the input, a suitable crop will be recommended which helps the farmers in choosing the specific crop for their agriculture land which in turn will increase the yield and the profit. Fertilizer recommendation system recommends a fertilizer plan to optimize the amount of fertilizers applied for suggested crops. Accurate detection and suggestion of remedies for plant disease decreases the risk of crop failure, hence, higher yield increases farmers' economic benefits.

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