**ALTERNATE CROP RECOMMENDATION**

**&**

**WEED DETECTION**

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***Introduction***

Agriculture in India plays a major role in the economy and employment.

70% of Indian population directly relies on agriculture. This project focuses on solving multiple problems which the farmers would face. The common difficulty present among the Indian farmers is, they don’t opt for the proper crop based on their soil requirements. Due to this, they face a serious setback in productivity. This problem of the farmers has been solved through precision agriculture.

In this project, we propose a system which would suggest crops based on the results obtained using a machine learning approach. The system maps the soil and crop data to predict the list of suitable crops for the soil. Hence it leaves upon the user to decide on the crop to be sown. Thus, the system helps to provide knowledge to the dilettante farmers.

Another problem which farmers while crop production is weed growth. Farmers are often concerned that weeds may reduce crop yields. Weeds use the same nutrients that crop plants use. This project would solve this problem by distinguishing between crops and weeds using machine learning classification techniques. So, this would be super helpful for farmers and would eventually increase crop yield/production.

***Proposed system***

The existing system predicts the crop yield by using the soil parameters. The proposed system obtains the soil and crop parameters automatically and maps those to list the suitable crops. It passes the various inputs to the controller which uses the KNN algorithm for classification. The system uses the Classification algorithm of K nearest neighbour to improve the efficiency of Crop Recommendation System. In the existing system, the recommended crop is just based on the environmental factors and seasonal changes. But in the proposed new system, the crop is based on the farmers interest in the use of fertilizers and this also would increase the efficiency and the accuracy of the previously proposed system.

Artificial intelligence, specifically deep learning, is a fast-growing research field today. One of its various applications is object recognition, making use of computer vision. In this project, a system for the identification of different crops and weeds has been developed. After receiving the image from the user, by using computer vision for image processing, and deep learning for the application of transfer learning to a CNN that performs the plant identification autonomously. Moreover, the coordinates of the weeds are also given as results. From a technological perspective, this study presents an alternative to traditional weed detection methodologies in agriculture and opens the doors to more intelligent and advanced systems.

This system would also calculate the amount of crop that the user can produce, so based on this the user can decide whether to choose the desired crop or to go with a different crop for higher production.

**Module 1**

***Crop Recommendation***

*Models required*

* Crop recommendation model
  + By using various parameters like Temperature, Humidity and Rainfall the crop which is suitable for that particular environment is predicted.
* NPK prediction model
  + It is used to predict the amount of nitrogen, phosphorus and potassium that is required for crop production.
* Fertilizer prediction model
  + If the amount of NPK is not sufficient for the user desired crop’s yield, then the user can use this particular fertilizer to make the yield better.

*Predictions*

* Crop
  + Features required for prediction
    - Temperature
    - Humidity
    - Rainfall
  + These features can be automatically predicted by knowing the user's location, so no user input is required.
  + Output
    - Crop Name
* NPK Prediction
  + Features required for prediction
    - Temperature
    - Humidity
    - Rainfall
    - Crop
  + Here Temperature, Humidity, Rainfall is automatically determined using location based weather API, so crop is one among the required user inputs.
  + Output
    - Nitrogen content
    - Phosphorus content
    - Potassium content
* Fertilizer Recommendation
  + Features required for prediction
    - Nitrogen
    - Phosphorus
    - Potassium
    - Soil Type
    - Crop Type
    - Temperature
    - Humidity
  + Here Soil type is a required user input, other things are automatically known using the model and the API.
  + Output
    - Fertilizer Name
  + This project also focuses on Fertilizer recommendation, whenever required.

*Algorithm used*

* KNN(K-Nearest Neighbours).

In the above phase the prediction is done in the following manner,

* If the user is not interested in using Fertilizers, then the user has to provide the NPK values, then this system would recommend a crop based on these NPK values.
* Or on the other hand, if the user has no problems using Fertilizers, then the crop recommendation is done by knowing the user's location. After that, the NPK values are predicted using the chosen crop and environmental factors. Using these NPK values, crop type and soil type, this system would predict the fertilizer which is required to maximize the production.

**Module 2**

***Crop-Weed Detection***

*Models* *required*

* SVM Classifier model

*Inputs required*

* Dataset - Collection of various images which contains crops and weeds.

*Output*

* To detect whether the given image consist of weeds

This project is based on weed detection present in crops, which is very much helpful for farmers in boosting production. It has focused on the creation of an image-processing algorithm to detect the existence of weeds in a specific site of crops. The main objective has been to obtain a formula so that a weed detection system can be developed through binary classifications. Finally, a labeling of objects has been made in the image so that weed detection can be done using a threshold based on the area of detection. This algorithm establishes an accurate monitoring of weeds and can be implemented in automated systems for the eradication of weeds in crops. In addition, it increases the performance of operational processes in crop management, reducing the time spent searching for weeds throughout a plot of land and focusing weed removal tasks on specific sites for effective control.

**Module 3**

***Crop Yield/Production***

*Models* *required*

* Yield prediction model

*Inputs required*

* State
* District
* Season
* Crop
* Area

*Output*

* Production

In this project, it also predicts the amount of crop that the user can cultivate, this prediction is based on the user’s location, seasonal changes, crop type and the amount of area used for cultivation. So based on this the user can decide whether to go ahead with the chosen crop or to choose a different crop.

**Reference**

# ***AgroConsultant: Intelligent Crop Recommendation System Using Machine Learning Algorithms*** [***https://ieeexplore.ieee.org/document/8697349***](https://ieeexplore.ieee.org/document/8697349)

# ***Algorithm of Weed Detection in Crops by Computational Vision***

# [***https://ieeexplore.ieee.org/document/8673182***](https://ieeexplore.ieee.org/document/8673182)