

# “Smart Crop Prediction System and Farm Monitoring System for Smart Farming”

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## Abstract –

Agriculture is main part of our Nation and also have an important role in Indian economy by providing large amount of Domestic food security. However nowadays, agricultural production and prediction is getting impoverished due to climatic changes, that will negatively affect the economy of farmers by getting poor yield and also farmers will be less friendly towards prediction of crops. This research will help learner and poor farmer as a guidance for cultivation of crops according to soil and climate condition by the use of modern technologies like Machine Learning (ML) and Internet of Things (IOT). The data regarding seeds and crops are collected with appropriate parameters like Soil types, Temperature, Moisture holding capacity of soil and Humidity which will help to get prosperous growth. Moreover, to this we have developed a module by which farmer will be able to monitor the farm from a remote distance.

## 1. INTRODUCTION

Agriculture is the vital source of income for the bulkiest community in India and it also contributes towards Indian economy. Although, technological involvement and its application are still in development stage for agricultural sector in India.

People use local techniques like smell of rotten eggs to prevent the damage caused by animal intervention from animals such as wild boar, elephants and rats. So, farmers used to spray solution of rotten eggs physically in their field and use fire crackers to avoid entering of animals into the field. This leads to low crop yield and substantial financial loss for farmland owners. This problem is so severe that due to such regular attacks on animals, the farmers often prefer to leave the areas barren. This system allows us to keep inform about entrance of animals away from the farmlands and also provides flexibility for surveillance.

Due to Global Warming and sudden climatic changes leads to damaging of crops and increasing suicide rate of farmers. With the continuous growth in population the demand for food supply is increasing day by day, so farmers are using extensive amount pesticides and fertilizers to increase profit in limited time which results in poor crop quality and damaging the soil nutrients and water holding capacity of soil.

Growing industrialism needs land for expansion of industries, which results in lack of land for agriculture. Not only this but also pollutants from industry increase salinity of soil and contaminates it which makes it less useful for agriculture.

People need to focus to implement automation in agricultural sector to get maximum possible yield. For that purpose, we need smart system for making crop selection easier and to monitor the farm from remote places. In addition to this an intelligent system is required to control and manage the farm. This can be achieved by using modern technologies like Machine Learning (ML) and Internet of Things (IOT) with the help of different electronics component such as microprocessors, sensors to detect temperature, moisture content, and an Internet or devices such as smart phone or computers.

## 1.2 MOTIVATION

While rise in the population of country results in increasing food demand. For that farmer needs to understand smart and developed farming techniques to overcome the result which was given by old and local techniques. So the main motivation is to develop a easy and farmer friendly techniques for smart farming.

## 1.3 PROBLEM STATEMENT

We need to understand the features and characteristics of different soil types to know which crops grow better in certain soil types. Machine learning techniques can be helpful in this case. Here we can use clustering technique to group data, and then classified the data by the order of soil and places with Random Tree algorithm. Then use apriority Mining process to create an association rule to get suitable crops for the specific soil. Series of soil and land types.

## 2. LITERATURE SURVEY

In [1] the authors A. V. Deorankar and A. A. Rohankar proposed “the study of current researches, the problems it addressed, and its prospects. The emphasis is focused on the analytical study of various advanced and efficient classification mechanisms and techniques. Proper utilization of the number of features of remotely sensed data and selecting the best suitable classifier are most important for improving the accuracy of the classification.

The knowledge based classification or Non-parametric classifiers like decision tree classifier or neural network have gained more popularity for multisource data classification in recent times.”[1]

In [2] the authors Medar, Ramesh & Rajpurohit, Vijay & Shweta, Shweta have done crop prediction using machine learning techniques. Farming techniques can be improved using machine learning techniques. By using Machine learning techniques farmers can get accurate and useful information which will improve yield.

In [3] the authors P. S. Vijayabaskar, R. Sreemathi and E. Keertanaa had constructed “a model for testing the soil fertility. It also suggests the crop which has to be planted depending upon the value obtained from the sensor. It also provides the regional wise information about the crop in the form of graph. It also suggests the fertilizer which has to be added to the soil in order to increase the crop productivity”[3]

In [4] authors R. Nikhil, B. S. Anisha and R. Kumar P. constructed a system that describes ML and IOT techniques combination to make farming smart and efficient.” Crop prediction helps the farmers to grow suitable crops depending on the soil parameters by the use of machine learning techniques and it also helps in prevention of the intruders like wild animals into the field. It also helps in water conservation by supplying the plants / field with minimal amount of water automatically through the help of sensors depending on the water requirements.”[4]

In [5] the authors N. A. M. Leh, M. S. A. M. Kamaldin, Z. Muhammad and N. A. Kamarzaman constructed a system for smart irrigation using Internet of Things(IOT) and Arduino Mega 2560. Authors also provided the limitation of project which is they have to apply soil moisture sensor to every plant, that makes project very large and expensive. In the system a blynk application software is used on the Smartphone.

In [10] the authors D. J. Reddy and M. R. Kumar had done research over “a systematic review that extracts and synthesize the features used for CYP and furthermore, there are a variety of methods that were developed to analyze crop yield prediction using artificial intelligence techniques. The major limitations of the Neural Network are reduction in the relative error and decreased prediction efficiency of Crop Yield. Similarly, supervised learning techniques were incapable to capture the nonlinear bond between input and output variables faced a problem during the selection of fruits grading or sorting.”[10]

### 3. PROPOSED SYSTEM

This system will predict the soil type and then after it will suggest suitable crops according to the soil type. We propose a system for prediction of crops and farm monitoring comprises of hardware. The proposed hardware combination consists of controller (Raspberry Pi), Camera, Soil moisture sensor, Motor. The designed module continuously monitors the Farm. Camera gives input as image. It undergoes image processing i.e. first it undergoes Pre-processing. Then that pre-processed image is send for segmentation. After segmentation feature extraction of image will take place. Then it undergoes classification which will be done with CNN algorithm and it will predict suitable crop according to soil type. Soil moisture sensor is input to raspberry pi and motor is output for raspberry pi

### 4. BLOCK DIAGRAM

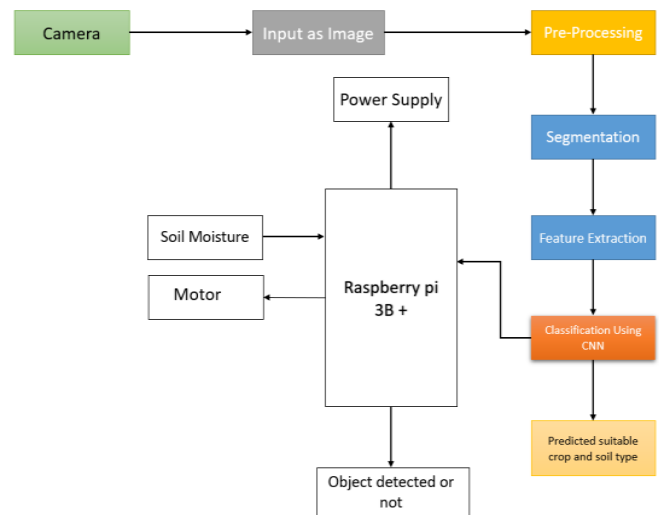


Fig (4.1)

### 5. Methodology

In this system there are total 2 subsystem, First one will predict the soil type from given image and suggest a suitable crop according to the soil type. In this system we are going to use CNN (Convolutional Neural Network) algorithm. In this image given from user goes under processes such as pre-processing, feature extraction and segmentation and then it will be classified using CNN and predict the soil type and will suggest a suitable crop according to the soil type. The below table (5.1) is table for analysis for crops according to the soil type.

Soil Type	Crops
Alluvial Soil	Wheat, Bajra, Maize, Green and Black Gram, Cotton, Barley, Jute, Tobacco.
Clay soil	Brussels sprouts, Cauliflower, Broccoli, Cabbage.
Black Soil	Jowar, Cotton, Sugarcane, Rice.
Arid Soil	Millets, Barley, Wheat, Maize.
Sandy Soil	Potatoes, Carrots, Tomatoes, Radishes, Watermelon, Beans, Cucumber.

Table (5.1)

Second system is field monitoring system, In this we are going to use the camera and detect the animals or objects that are entered in the field and communicate with the farmer via sending a SMS and also going to check the water level of soil as low or high and according to water level irrigation will be done and the SMS will also be sent to farmer regarding water level in soil. For Object detection we are going to use camera and the dataset will be COCO dataset, Camera will capture image and dataset will do the Segmentation and key-point detection and accordingly result will provided on screen and SMS will be sent to the Farmer. For checking the water level in soil we are going to use soil moisture sensor which will measure volumetric water content in soil and SMS will be sent to Farmer regarding it, if water level is low then Motor will be on and water will be circulated in the field.

### 5.2 ALGORITHM

Algorithm which is used in the proposed system for identification of soil type is CNN (Convolutional Neural Network) Algorithm. As in any other neural network, the input of a CNN in this case is an image, which is passed through a series of filters in order to obtain a labeled output that can then be classified. The particularity of a CNN lies in its filtering layers, which include at least one convolution layer. These allow it to process more complex pictures than a regular neural network. Whereas the latter is well adapted for simple, well-centered images such as hand-written digits, the use of CNNs in image analysis ranges from Face book’s automatic tagging algorithms, to object classification and detection, in particular in the field of radiology. Convolutional Neural Networks specialized for applications in image video recognition. CNN is mainly used in image analysis tasks like Image recognition, Object detection Segmentation.

Fig (5.1.1) shows layers and process of CNN algorithm.

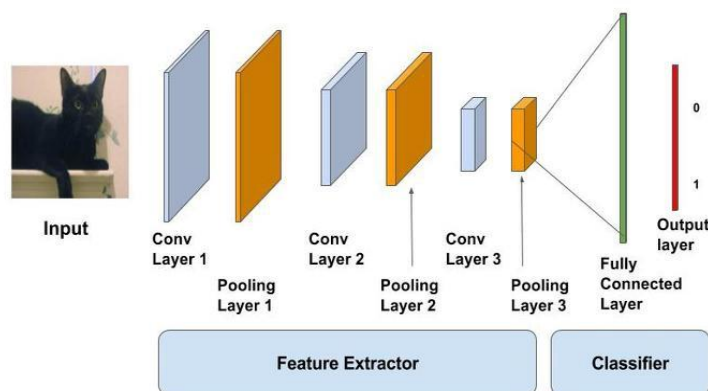


Fig (5.1.1)

In the proposed system, there are three Convolutional layers followed by pooling layers as shown in Fig (5.1.1). The combination of convolutional layers and pooling layer known as Feature extractor. After passing image through Feature extractor it will be flattened again and will be classified through Classifier.

### 6. RESULT AND ANALYSIS

Results of the implemented project are as follows. The below figures show the software results.

1. Fig (6.1) shows suggested crops and soil type of the given image.
2. Fig (6.2) shows object (Person) which is detected by using the camera.
3. Fig (6.3) shows messages which are sent to farmer that “Object is detected in the farm”.
4. Fig (6.4) shows messages sent to farmer that “Moisture is Low in the Soil” when there is low moisture.

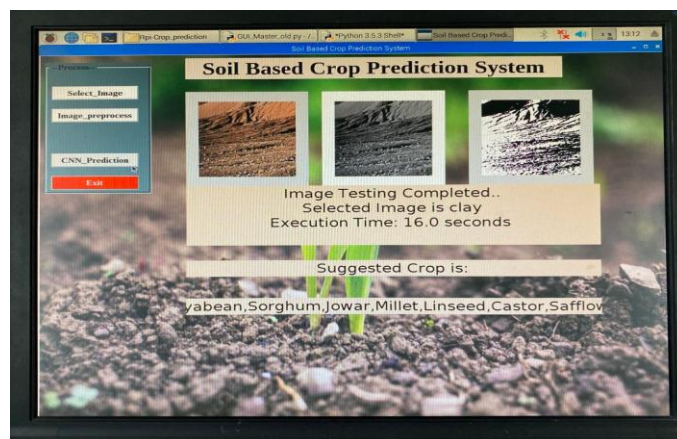


Fig (6.1)



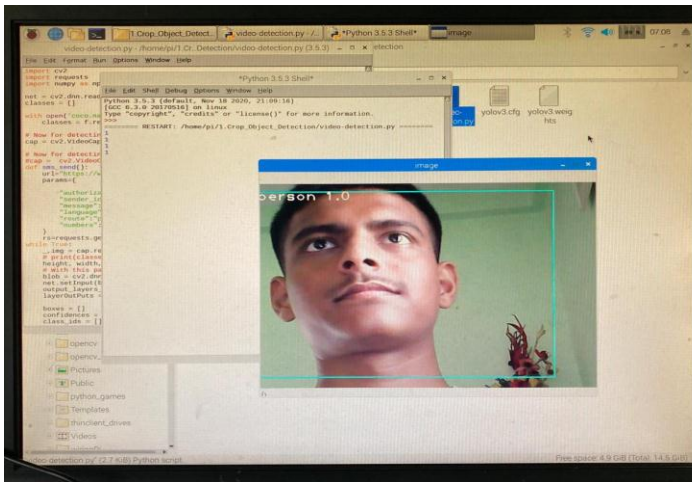


Fig (6.2)



Fig (6.3)



Fig (6.4)

## 7. CONCLUSION

Agriculture is the sector which plays a major role in economical expansion of the country. However this is lacking behind in the usage of Machine Learning techniques. So farmers of our country should know new techniques of Machine Learning. This techniques will be helpful to farmer for getting higher income from the crops. This techniques are helpful in solving problems faced by farmers. We have proposed system for the problem of field monitoring and predicting the suitable crop according to the soil type.

## FUTURE WORK

The project presents prediction of crop according to suitable crop type and field monitoring. For the future work we can use higher level of processor so that it can work more efficiently. Also we can use different sensors like Temperature sensor, Rain sensor, etc.

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