

# **CROP RECOMMENDATION SYSTEM USING ML THROUGH SOIL ANALYSIS**

## **A PROJECT REPORT**

*Submitted by*

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# HINDUSTAN

INSTITUTE OF TECHNOLOGY & SCIENCE  
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## **ABSTRACT**

Agriculture is a major contributor to the Indian financial system. As we realize approximately 60% of population in Indians are rely on Agriculture. Now a days among the farmers who're educated peoples also doing agriculture. Farmers are dealing with problems related to less earnings, because loss of productiveness. Farmers are thinking in the event that they use extra fertilizers they may get precise yield, but it can growth the greater funding. If they do like this the bodily properties of soil may additionally decrease and they are able to't get the expected yield. To conquer this trouble, farmers have to realize which crop might healthy the specify piece of land. If they pick out the right sort of crop is cultivated then robotically, the yield of crop will growth. Hence the crop advice systems can be very beneficial to farmers. The yield of the crop can also depends many factors like, ph fee, nitrogen, phosphorus, potassium, rain fall. Hence this paper we are going to provide an explanation for how ML algorithms may be used to are expecting the crop yield and charge.

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## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Expansion</b>
SVM	Support Vector Machine
DT	Decision Tree
RF	Random Forest
HTML	Hypertext Markup Language
ML	Machine Learning

# CHAPTER 1

## INTRODUCTION

### 1.1 Overview

Agriculture performs a first-rate position in Indian. The mainstream of Indian population relies upon on agriculture for his or her livelihood. The majority of farmers accept as true with in depending on their own understanding to decide which crop to domesticate in a specific season. Now a days new farmers are hard to understand the cultivation method, crop type. As we know destiny agriculture depends on new farmers. But the new farmers are not so sturdy at farming. As we in advance mentioned the expienced farmers also are questioning the usage of of extra fertilizers will get precise yield, but it become growing their funding of soil and it additionally damage the physical houses so gadget mastering assist to solve their problems. In this paper, we present a machine called crop recommendation gadget through soil analysis, which intends to assist the Indian farmers of having correct yield and earnings. In this motive to overcome this trouble farmers want to get the consequences of soil checking out. The yield of crop precisely relies upon on the many factors of soil like nitrogen, ph, phosphorus, potassium.

The Crop Recommendation System targets to offer records to the farmers at the soil and crop traits. With this statistics the farmer can recognize which crop can be cultivated based totally on the soil features. This will similarly supply insights on the way to develop the vegetation at some point of the year to increase their earnings. By using the ML, It'll provide the proper yield for that crop and endorse the formers for a higher crop. Improving the excellent of crop and soil bodily houses of soil.ML algorithms will expect the most green output of yield. So this period may help them to are looking forward to the yield of the crop climate to go for that crop or now not. ML version will understand the pattern of crop and yield and predicts the yield and price based on location.

### 1.2 Motivation

The not unusual issue gift many of the Indian farmers is that they did now not select the right crop based mostly on their soil necessities. This hassle of the farmers has been solved thru precision agriculture. This approach is characterized through a crop database collected from the farm, crop furnished through agricultural experts and given to recommendation system it will use the acquire records and do tool learning version as rookies to advise a crop for website on-line precise parameter with excessive accuracy and overall performance.

### **1.3 Problem Statement**

The Accurate facts about history of crop yield is crucial for making selections related to agricultural chance manipulate and destiny predictions. Crop yield prediction is an vital agricultural problem. The Agricultural yield in most cases depends on climate conditions (rain, temperature, and so on), insecticides. Now, some new farmers or college students are inclined to paintings in agriculture approach they don't know approximately that area. So, we collected the beyond records and the usage of the machine learning set of rules to expect the crop and soil parameters primarily based on previous version. For the answer we must use precision agriculture and ML algorithm. This will advantage to farmers to maximize productiveness of their fields and decrease fertilizers use in crop manufacturing.

### **1.4 Organization of The Report**

Chapter 2 discusses about the references and research papers we used as a supplementary guide for completion of this project.

Chapter 3 describes the project description used in the system and also discusses about the existing system and its flaws. Then shows the importance of proposed system.

Chapter 4 describes the requirements block diagram and complete explanation of the architecture of the system and software requirements to complete the system design.

Chapter 5 describes the system requirements such as the hardware and software requirements.

Chapter 6 describes the modules present in the project and gives the short introduction about each module

Chapter 7 contains most of the implementation part and the division of complete implementation into various modules. And explanation of each module in a detailed manner. And also shows the snaps of the outputs and the model and brief explanation of the results achieved after implementation of the project.

Chapter 8 includes different test cases to run and check the working of the device and the results obtained for all the test cases

Chapter 9 is the conclusion part of the project wherein we declare what is achieved after implementation and what is the Future Enhancement or Future Scope of the project.

### **1.5 Summary**

In this chapter we discuss the over view of our project and how we overcome the problems related to our project meanwhile we are focusing on our motivation of project

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter is set evaluation of the distinctive papers which are published to date and approximately the venture the information that given and discussed within the analysis of paper in element.

#### **2.2 Analysis of the papers**

##### **2.2.1 Crop Yield Prediction and Efficient use of Fertilizers.**

In this paper they describe the crop yield prediction and use of fertilizer the use of statistics mining. Most of the farmers are involved to comprehend the crop yield before the crop this will help the farmer to get earnings. For this they've got Analyse the numerous related attributes like place, pH fee from which alkalinity of the soil is determined. Along with it, percent of nutrients like Nitrogen (N), Phosphorous (P), and Potassium (K) Location is used alongside aspect the use of 1/3-party packages like APIs for weather and temperature, type of soil, nutrient price of the soil in that vicinity, quantity of rainfall within the location, soil composition may be decided. All the ones attributes of statistics will be analysed, train the data with numerous suitable device studying algorithms for creating a model. The device comes with a model to be particular and accurate in predicting crop yield and deliver the give up patron with right guidelines approximately required fertilizer ratio based on atmospheric and soil parameters of the land which decorate to growth the crop yield and boom farmer sales.[1]

##### **2.2.2 Recommendation System for Crop Identification and Pest Control Technique in Agriculture**

In this project they describes the what are the primary Problems going through by means of farmers. After getting survey they instructed the primary problem facing by farmer is pest manipulate in vegetation. So, for this they've used SVM generation. The farmers are usually no longer aware About the necessities of the crop i.E. The minerals, soil moisture and other soil requirements. This can cause a distress to farmer every mentally and financially. One more trouble that a farmer normally encounters is the pest and illnesses that may have an effect on the plants they develop, which they're normally unaware of in an early degree. This problem of farmer is addressed in our paper and we have tried to treatment it with the help of a Recommendation System. By the help of our version, we count on the excellent appropriate crop to the farmer and stumble on the pest that could have an impact on as well as advocate the pest manage techniques. In this paper, we have got carried out SVM kind set of rules, Decision Tree algorithm and Logistic Regression set of rules and we've got determined that SVM kind version offers the better accuracy in evaluation to distinct algorithms.[2]

### **2.2.3 Three Crop Yield Prediction Using Machine Learning**

In this paper they describes the crop prediction. For this they have used the era is machine learning. In this challenge they may be mainly focusing on crop prediction. The consequences of the prediction may be made to be had to the farmer. Thus, for such form of statistics analytics in crop prediction, there are precise techniques or algorithms, and with the help of those algorithms we're capable of count on crop yield. Random wooded location set of rules is used. By analysing these types of troubles and troubles like climate, temperature, humidity, rainfall, moisture, there's no right answer and generation to conquer the situation faced with the aid folks. In India, there are numerous strategies to boom the monetary boom inside the field of agriculture. Data mining is likewise beneficial for predicting crop yield production. Generally, information mining is the method of analysing data from diverse point of view and summarizing it into crucial facts. [3]

### **2.2.4 Crop Yield Forecasting Methods**

In this the describes the crop yield prediction via focusing on one crop and it'll manual the farmers to get true yield's capability to reliably forecast crop prediction yield and high-quality is precious for economic planning and commodities forecasting as well ensuring global meals protection. Study regarding the assessment of the modern-day crop yield forecasting techniques, which consist of methods to use crop yield forecasting technique to improve agriculture to yield forecasting have been discussed on this paper.[4]

### **2.2.5 Crop Recommendation on Analysing Soil**

In this undertaking they describe the crop recommendation the usage of soil evaluation. For this the farmer need to get the values of soil parameters. Then he needs to enter the values in web websites then he'll get the endorsed crops.[5]

### **2.2.6 Crop Recommendation System the usage of Machine Learning**

In this challenge they're using IOT and ML to advocate the crop. The proposed device of IoT and ML is enabled for soil trying out the usage of the sensors, is primarily based on measuring and looking soil parameters. This tool lowers the probability of soil degradation and enables keep crop fitness. Different sensors along side soil temperature, soil moisture, pH, NPK, are used on this device for monitoring temperature, humidity, soil moisture, and soil pH along with NPK nutrients of the soil respectively. The data sensed by way of the usage of these sensors is saved on the microcontroller and analysed the usage of system getting to know algorithms like random forest based totally mostly on which hints for the growth of the first-rate crop are made. This undertaking moreover has a way that makes a speciality of using a convolutional neural community as a number one manner of figuring out if the plant is at risk of a disorder or no longer.[6]

### **2.2.7 Crop Cultivation Information System on Mobile**

In this project they in particular centered directly to encourage the farmer to get the higher yield and greater profitable. We know now a days Mobile generation is using in all of the fields. It can also clear up our trouble so what clean compared to farmer's know-how. In this paper, they have got proposed and implemented an records tool for farmers which may be operated on their cell phones. The device is advanced the use of Service Oriented Architecture (SOA) to technique spatial information and statistics base. The information base is maintained in the shape of ontologies. The system is an try and fill the space amongst farmers and agricultural specialists. A farmer can provide inputs associated with vegetation being cultivated and location unique statistics to get specific hints, signs and recommendations to enhance productiveness. It can be generated the usage of the understanding base. Whenever a farmer observes some anomalous behaviour for flowers or climate, the device is capable of generate pointers primarily based on inputs provided. They have resolved a number of the queries as a part of on-going work and consequences are displayed on an Android based absolutely cell gadgets for demonstration of the system [7]

### **2.2.8 Crop Prediction the usage of Machine Learning**

In this venture they particularly focussed on precision agriculture. This research paintings enables the novice farmer in one of these manner to manual them for sowing the reasonable plants with the aid of deploying machine getting to know, one of the advanced technology in crop prediction. Naive Bayes, a supervised studying set of rules places forth inside the manner to obtain it. The seed facts of the plants are accrued here, with the precise parameters like temperature, humidity and moisture content, which facilitates the flora to attain a a success growth. In addition, as the software program, a mobile application for Android is being evolved. The customers are endorsed to go into parameters like temperature and their place will be taken automatically in this application so as to start the prediction system.[8]

### **2.2.9 A survey on Data Mining Techniques for crop Yield Prediction**

This paper provides the different harvest yield forecast strategies making use of information mining strategies. Agrarian framework is unpredictable because it manages tremendous data situation which comes from various additives. Harvest yield expectation has been a topic of hobby for makers, professionals, and agrarian related associations. In this paper the creators centre across the uses of records mining methods in agrarian subject. Distinctive Data Mining techniques, as an example, K-Means, K-Nearest Neighbour (KNN), Artificial Neural Networks (ANN) and Support Vector Machines(SVM) for ongoing utilizations of statistics mining approaches in agribusiness subject. Information mining innovation has gotten an super advancement with the short improvement of software engineering, guy-made brainpower. Information Mining is an bobbing up research area in horticulture crop yield investigation. Information Mining is the manner in the direction of spotting the hid examples from giant measure of data. Yield expectation is a essential rural trouble that stays to be settled depending on the reachable statistics. The problem of yield expectation may be tackled by utilizing information mining techniques.[9]

### **2.2.10 Analysis of crop yield prediction the use of statistics mining approach to are expecting annual yield of most important vegetation**

India is for the most component a horticultural country. Agribusiness is the absolute most huge provider to the Indian financial system. Farming harvest advent is based upon the season, herbal, and monetary reason. The guess of agrarian yield is testing and satisfying errand for each us of a. These days, Farmers are threatening to create the yield due to inconsistent climatic modifications and shortage of water asset. The number one aim is collecting horticultural statistics which may be positioned away and broke down for useful harvest yield figuring out. To foresee the harvest yield with the assistance of statistics mining strategy, stepped forward techniques can be acquainted with assume Crop yield and it likewise encourages the rancher to pick the maximum suitable harvest, consequently improving the nicely well worth and gain of the cultivating territory. [10]

## **2.3 Summary**

This chapter says about different works that are done and related to the project of using various algorithms to give the solution to the problem in which each authors with came the different types of algorithms on existing systems and they implemented new system based on earlier systems with conclusion.

## **CHAPTER 3**

### **PROJECT DESCRIPTION**

#### **3.1 Objective of the project work**

India is one of the leading use in farming, throughout India 60% peoples are depending on farming, however still, they are going through problems with loss of productivity, yield and so on... So, we determine to give one solution for that and build one gadget. Our machine will help to Predict the Crop yield and deliver the surrender man or woman with proper pointers approximately required fertilizer ratio primarily based on soil parameters. We additionally advocate the crop price using machine gaining knowledge.

#### **3.2 Existing System**

Now an afternoon's, dilettante farmers are difficult to apprehend the cultivation method, crop type, climate exchange, and so forth. Farming is that the backbone for every kingdom's financial system. Future agriculture depends on dilettante formers. But new farmers not so strong at farming, So Machine studying assist to resolve their problems. The present machine predicts the crop yield by using the soil parameters and recommend Fertilizer using gadget mastering. It makes use of the crop yield records to make the stop users determine at the crop to be sown. Hence the device isn't easy enough for dilettante farmers to understand. Yield prediction is a very vital trouble in agriculture, any farmer is inquisitive about knowledge how lots yield he is about to anticipate. In the beyond, yield prediction have become completed by using considering farmer's enjoy on particular subject and crop. The yield prediction is a prime issue that remains to be solved based totally on available information, Machine reading strategies are the better preference for this reason. Different Machine analyzing strategies are used and evaluated in agriculture for estimating the future yr's crop manufacturing. This paper proposes and implements a system to are waiting for crop yield from preceding data. This is completed with the aid of the usage of making use of tool mastering algorithms and recommends fertilizer appropriate for each precise crop.

#### **3.3 Proposed System**

The gadget prepared predict major vegetation yield in a specific district in Tamil Nadu. The purchaser on their first login has to sign up themselves at the Web application created by using flask. The login info are stored in SQLite database. Once the user login into the gadget they get all the access for predicting crop yield and the use of the input together with region, nitrogen, phosphorous, potassium and pH values depends on their forming land surroundings. We can also find the primary vitamins of soil by using given the enter as crop call. It passes the numerous inputs to the controller which makes use of the Random Forest for class. We advocate to the previous how a great deal fertilizer required in ratio primarily based on soil parameters and the crop fee the use of device mastering strategies.

This task is especially primarily based on net application. The both client and user facet is net application. First the customer on their first login has to register themselves on the



web software. The login info are stored in SQL database. Here user need to get the outcomes of soil trying out and then consumer need to login to the net web page, then they receives all of the get right of entry to for predicting crop yield and using enter including Nitrogen, phosphorus, potassium and PH values depends on their farming land environment. It passes the diverse inputs to the controller which makes use of the Random Forest for class. We advise to the former how much fertilizer required in ratio based on soil parameters and the crop rate the usage of gadget getting to know strategies.

### **3.4 Benefits of proposed System**

- 1.This assignment facilitates farmer to choose the proper crop
2. It additionally facilitates farmer to present the correct ratio of fertilizer to the crop.
3. It also helps crop charge present in market so, the farmer without problems capable of pick out the crop.

### **3.5 Summary**

This is discussed about the project description in which includes the understanding of the existing system and detailed information on the proposed system There is thing called spiral model which gives the clear understanding of the project description in which the process of the project is started and ended The system is more detailed in this chapter and given the understanding of the project The analysis of the cost ,integration and the all the things given in this chapter, in this we included the part called testing that was discussed in the following chapter in the next chapter is discussed about the design part and flow diagram this is all the about this chapter.

## CHAPTER 4 SYSTEM DESIGN

### 4.1 Introduction

System layout is the method of planning a brand new system or to update the existing system. Simply, device layout is like the blueprint for constructing, it specifies all the functions that are to be in the finished product. System layout phase follows system evaluation phase. Design is involved with identifying features, information streams amongst those features, retaining a document of the layout selections and imparting a blueprint the implementation section.

### 4.2 ARCHITECTURE DIAGRAM

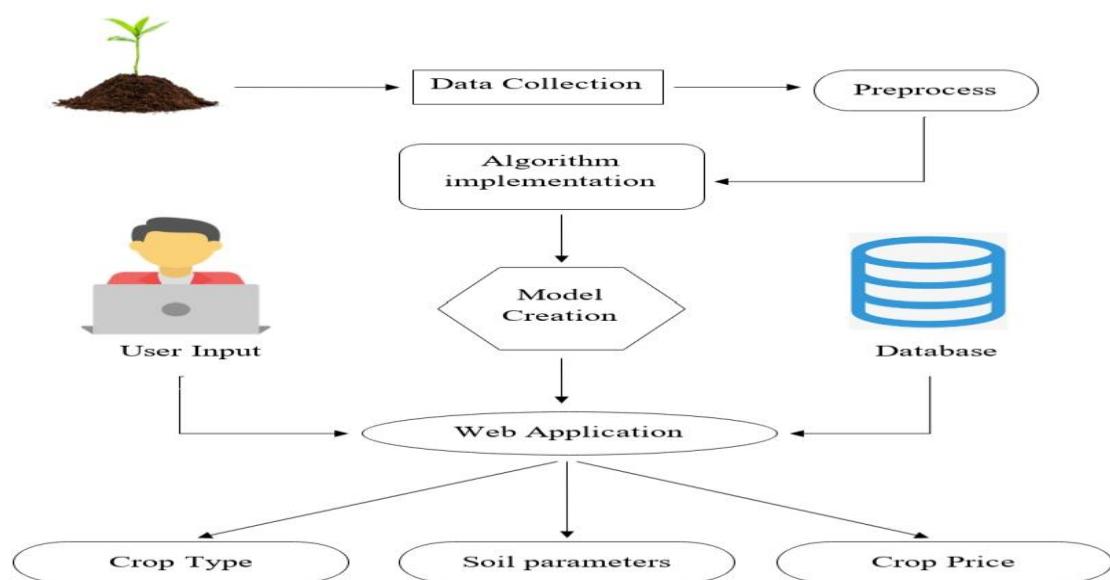
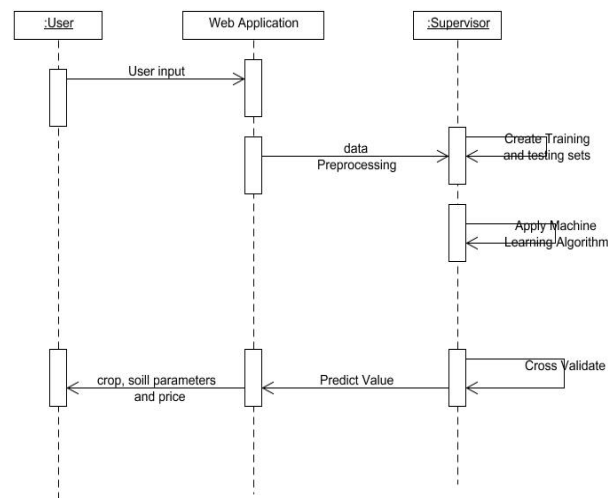


Fig 4.1-Architecture diagram

### 4.3 Sequence Diagram

The series diagram is a remarkable diagram to use to file a gadget's necessities and to flush out a device's design. The motive the collection diagram is so beneficial is because it shows the interaction good judgment between the objects in the device inside the time order that the interactions take vicinity.



**Fig 4.2 Sequence Diagram**

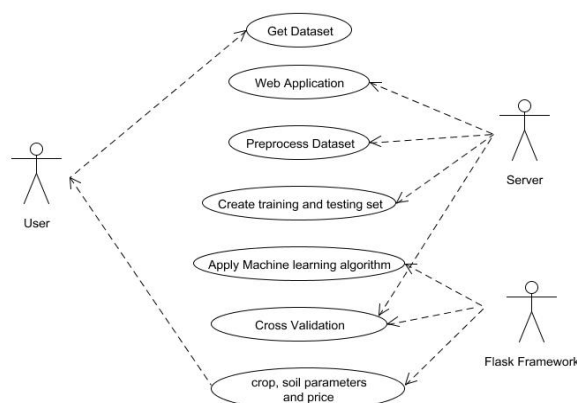
## 4.4 Use Case Diagram

A Use case Diagram is used to give a graphical review of the capability furnished by using a tool in phrases of actors, their desires and any dependencies among the ones use instances.

**Use case diagram includes elements:**

**Use case:** A use case describes a chain of actions that provided some component of measurable fee to an actor and is drawn as a horizontal ellipse.

**Actor:** An actor is someone, enterprise or external machine that performs a function in one or extra interaction with the device.



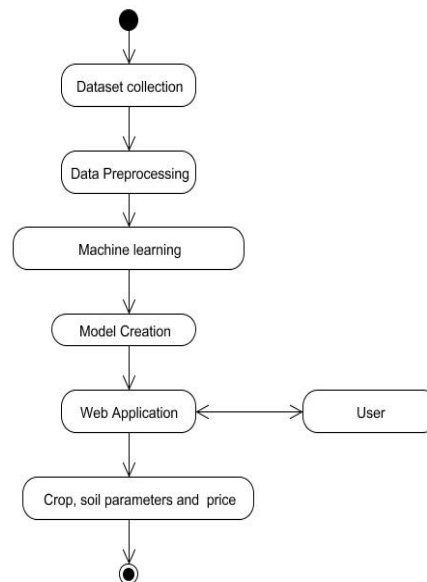
**Fig 4.3-Use Case Diagram**

## 4.5 Activity Diagram

Activity diagram is a graphical illustration of workflows of stepwise activities and movements with aid for desire, generation and concurrency. An pastime diagram suggests the general float of manipulate.

The maximum important shape sorts:

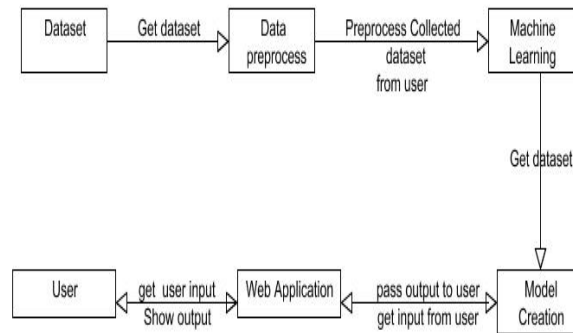
- Rounded rectangles constitute activities.
- Diamonds represent choices.
- Bars constitute the start or give up of concurrent sports activities.
- A black circle represents the start of the workflow.
- An encircled circle represents the cease of the workflow.



**Fig 4.4-Activity diagram**

## 4.6 Collaboration Diagram

UML Collaboration Diagrams illustrate the relationship and interaction among software items. They require use instances, device operation contracts and domain version to exist already. The collaboration diagram illustrates messages being despatched between instructions and devices.



**Fig 4.5-collaboration diagram**

## 4.7 Summary

In this chapter discussed about the system design in which the diagram , architecture diagram, uml diagrams. this gives the detail clarity of the design in which helps to understand the process of the system.

# CHAPTER 5

## SYSTEM REQUIREMENTS

### 5.1 Introduction

This chapter gives about the system requirements that are required for the project to do in this it based on the software.

### 5.2 Hardware and Software Specifications

#### 5.2.1 Software

Operating System	:	Windows 7, 8, 10 (64 bit)
Software	:	Python and Anaconda
Framework	:	Flask, HTML
Database	:	SQLite

#### 5.2.2 Hardware

Hard Disk	:	500GB and Above
RAM	:	4GB and Above
Processor	:	I3 and Above

### 5.3 Technologies Used

In this project we are used two technologies. They are

#### 5.3.1 Machine Learning

ML is the scientific have a look at of algorithms and statistical fashions that pc systems use to perform a specific undertaking without the usage of unique commands, relying on patterns and inference as an alternative. It is visible as a subset of artificial intelligence. Machine getting to know algorithms assemble a mathematical model primarily based on sample statistics, called "schooling records", with the intention to make predictions or picks without being explicitly programmed to perform the challenge. Machine getting to know algorithms are used in a wide style of programs, inclusive of email filtering and computer vision, wherein it's miles hard or infeasible to develop a traditional set of rules for effectively acting the task.

#### a) Support vector Algorithm

Support vector machines are many of the earliest of system studying algorithms, and SVM models were used in many packages, from statistics retrieval to text and picture type. SVMs can be used for both classification and regression duties. This SVM model

is a supervised getting to know version that requires classified records. From the use of svm we got 86% accuracy fee.

## **B) Decision tree Algorithm**

Decision Tree is taken into consideration one of the most beneficial Machine Learning algorithms since it is able to clear up diverse troubles. Here are some reasons why you ought to use the Decision Tree: It is taken into consideration to be the maximum comprehensible Machine Learning algorithm, and it can be effortlessly interpreted. It may be used for classification and regression troubles. From the use of DTA we got ninety two% accuracy fee.

## **C) Random Forest Algorithm**

Random wooded area is a supervised machine getting to know set of rules which may be utilized in each Classification and Regression troubles in Machine Learning. This easy but flexible set of rules produces good outcomes even without hyper-parameter tuning. Random forest is one of the most popular algorithms primarily based at the concept of ensemble gaining knowledge of. From the use of this we got 93% accuracy value.

## **5.3.2 Python Language**

Python is a appreciably used favored-purpose, excessive degree programming language. It became initially designed with the aid of Guido van Rossum in 1991 and evolved through Python Software Foundation. It become especially advanced for emphasis on code readability, and its syntax lets in programmers to explicit thoughts in fewer strains of code.

Python is a programming language that helps you to paintings rapid and combine structures extra correctly.

### **It is used for:**

- net improvement (server-aspect),
- software improvement,
- mathematics,
- System scripting.

### **A) why python**

- Python works on particular systems (Windows, Mac, Linux, Raspberry Pi, and so on).
- Python has a clean syntax similar to the English language.
- Python has syntax that permits developers to jot down applications with fewer traces than a few unique programming language.

- Python runs on an interpreter device, meaning that code may be accomplished as soon as it is written. This way that prototyping can be very short.
- Python may be handled in a procedural way, an item-orientated way or a realistic manner.

## **5.4 Summary**

This is discussed about system requirement such as hardware, software that used to the system to connect them. And also discussed Technologies used in the system.



# **CHAPTER 6**

## **MODULE DESCRIPTION**

### **6.1 Introduction**

This chapter about is to set the module and outline of the of the modules this modules are divided consistent with the machine layout and and analysis of the version from the spiral version this gives us the clear understanding of the version in which assignment is conducted. Implementation is the level of the undertaking while the the orifical layout Is turned out proper right into a operating device. Thus it could be taken into consideration to be the maximum important diploma in undertaking a successful new machine and in giving the person, self warranty that the cutting-edge machine will artwork and be powerful.

### **6.2 Modules**

After careful evaluation the gadget has been recognized to have the following modules:

#### **6.2.1 Dataset Collection:**

Our crop prediction mission dataset are accumulated from kaggle.Com. Data is pre-processed after series of diverse information. The dataset carries a greater variety of statistics, in which some statistics are with a few missing values. Those missing statistics were removed from the dataset and the ultimate information are used in pre-processing.

#### **6.2.2 Implementation:**

The Classification Algorithms to produce the fine results. We are using Random Forest Algorithm to are expecting the crop the use of ML. On an analysis carried out within various algorithms, the Random Forest changed into determined to provide highest performance and precision in comparison to Decision tree. Because RF include quantity of selection tree algorithm, that take the common to improve the predictive accuracy of dataset. Hence the RF set of rules is used inside the proposed machine to find the precise crop.

#### **6.2.3 Prediction:**

Pre-processed facts are skilled and input given by way of the consumer goes to the skilled dataset. After prediction the are expecting price given as an output on web application (Flask Framework).

### **6.3 summary**

In this chapter we discussed about the modules how the project is splinted into parts for the design process and their description

## CHAPTER 7

### RESULT AND TESTING

## 7.1 Data Pre-processing

In this module we are amassing the data set from the Kaggle. After getting the facts set, import the specified libraries to perform records cleansing and visualization. Here we are having two information units crop xl and plotted xl. In crop xl we are having the crop names and soil parameters like nitrogen, phosphorous and potassium values. Right here mainly we are gathering the facts sets for a hundred plants. In plotted xl we are having statistics set like region and soil parameters, here it will merge and it'll deliver the final pre prosses facts set.

```

(base) C:\Users\saiiki>python recommendation_system\11>python data_preprocess1.py
Cleveland data, Size=(101, 5)
Number of missing values
Crop      0
N         22
P         24
K         10
PH         0
dtype: int64
concatenated dataset, Size=(101, 5)
Number of missing values
Crop      0
N         22
P         24
K         10
PH         0
dtype: int64
Traceback (most recent call last):
  File "data_preprocess1.py", line 25, in <module>
    df.to_csv(os.path.join(path, 'preprocess_dataset/Crop.csv'), index=False)
  File "C:\Users\saiiki\Anaconda3\lib\site-packages\pandas\core\generic.py", line 3228, in to_csv
    formatter.save()
  File "C:\Users\saiiki\Anaconda3\lib\site-packages\pandas\io\formats\csvs.py", line 183, in to_csv
    compression=self.compression,
  File "C:\Users\saiiki\Anaconda3\lib\site-packages\pandas\io\common.py", line 399, in _get_handle
    f = open(path_or_buf, mode, encoding=encoding, newline='')
PermissionError: [Errno 13] Permission denied: '\\preprocess_dataset\Crop.csv'

(base) C:\Users\saiiki>python recommendation_system\11>

```

Fig 7.1- Data pre-process

Here we have to get the information set and pre-manner the information set using diverse libraries available in python. Such as pandas and NumPy is a Python package that makes it possible to work with arrays. It additionally includes utilities for operating in the linear algebra domain. It additionally includes utilities for running within the linear algebra domain. Pandas is a Python library for statistics analysis and manipulation this is available as an open-source project. After data pre-processing we are able to load the records set with crammed. The system for the pre-processing the records set, if the facts set is having null value at one row, then it'll take the common of the upper and the decrease value of the null cost. And it will update the null cost.

## 7.2 Training and Testing

Once the layout element of The system is finalizing the system enters into the coding and trying out phase. The coding phase brings the real machine into movement by converting the layout of the system into the code in a given programming language. Therefore, a first rate coding style must be taken whenever modifications are required it with out issues screwed into the device.

Unit trying out is finished to verify the functional ordinary overall performance of each modular detail of the software. Unit trying out focuses on the smallest unit of the software program layout (i.e.), the module. The white-field testing techniques have been carefully employed for unit attempting out.

### **7.3 USER INTERFACE**

The input layout is the hyperlink among the records device and the consumer. It contains the growing specification and methods for statistics instruction and people steps are vital to position transaction facts in to a usable form for processing may be performed by examining the laptop to We gave our project identify as header. We could be developing two capabilities in here one function is to add photo and the opposite one is to get the predicted elegance of the given photograph and their chances. In the primary function that is principal feature we ask the consumer to upload the image using st. File upload by means of showing textual content please add an photo and also, we point out the types that are allowed to upload. Here we created a loop as though the picture uploaded is not null then we are able to proceed to next step by way of proceeding for processing and plot the picture that has been uploaded. Next, we create 2d feature to expect the elegance of the picture in order a first step we are able to load our model the use of tf. Keras. Models from the specified course with stored version have .H5 extension. Next we specify the shape of the picture that has to be feed to the version.

### **7.4 Summary**

This chapter explains the various modules of the project how they are implemented clearly and give the brief discussion about them.

# CHAPTER 8

## RESULT AND ANALYSIS

### 8.1 Testing Model

In here we take our model where we train and test our model with data here, we have split the data into 80 to train the model and 20 percent to test the model and we are using results the activation function. We are giving the random state as 15 this shows how many times the model will be trained on the train data.

#### 8.1.1 Results

After completion of the training with the train data we implemented algorithms in this project we use three ML algorithms and we got accuracy levels as given below.

1. support vector machine-86.45
2. Decision tree algorithm- 92
3. Random Forest Algorithm-93

Based on that accuracy values we plotted the bar graph as below

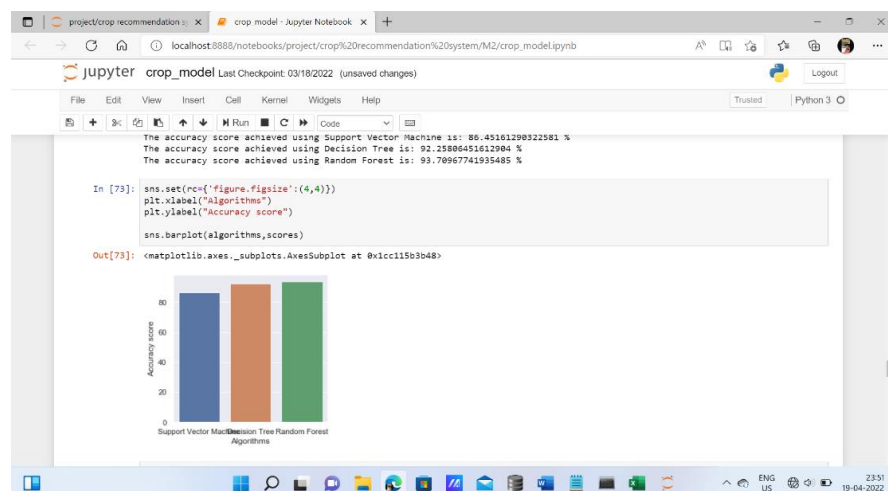


Fig 8.1-Bar graph

### 8.2 PROGRAM TESTING:

Testing is a method of executing a software with the motive of locating an errors. A exact take a look at case is one which has a immoderate opportunity of finding an as-but –undiscovered mistakes. A a hit check is one that uncovers an as-but- undiscovered mistakes. System sorting out is the diploma of implementation, which is geared closer to ensuring that the system works as it should be and correctly as predicted in advance than live operation commences. It verifies that the complete set of packages draw close together. System trying out requires a check consists of several key activities and steps for run program, string, device and is vital in adopting a a success new system. This is the final chance to stumble on and accurate mistakes earlier than the tool is hooked up for client popularity checking out.

The software program sorting out manner commences once the program is created and the documentation and associated statistics structures are designed. Software trying out is crucial for correcting errors. Otherwise, the program or the undertaking isn't always said to be whole. Software trying out is the vital detail of software excellent assurance and represents the ultimate the evaluate of specification format and coding. Testing is the method of executing the program with the purpose of finding the mistake. A exceptional check case format is one that as a possibility of locating a yet undiscovered errors. A successful take a look at is one that uncovers a but undiscovered errors. Any engineering product can be tested in one of the methods.

### 8.2.1 USER ACCEPTANCE TESTING

User reputation of the machine is essential difficulty for the achievement of any machine. The device underneath consideration is examined for purchaser splendor with the aid of constantly maintaining in contact with capacity tool and man or woman at the time of developing and making modifications each time required. This is finished in concerning to the subsequent factors.

- Input screen layout.
- Output show display screen layout.
- Source Code.

### 8.3 Screen shorts

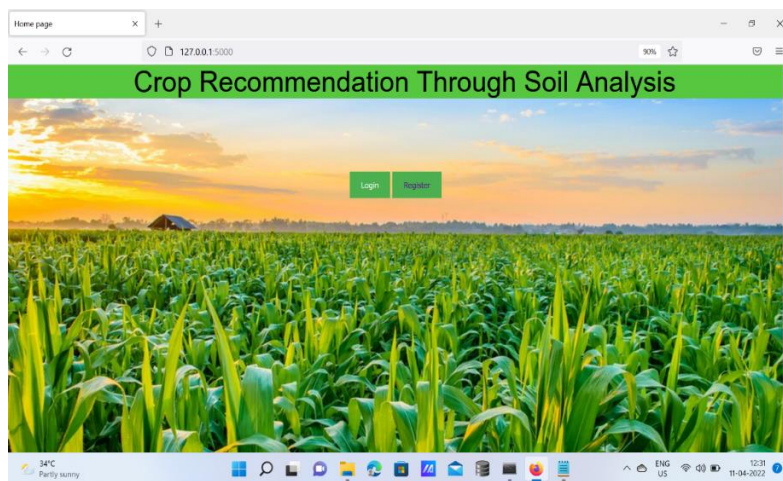
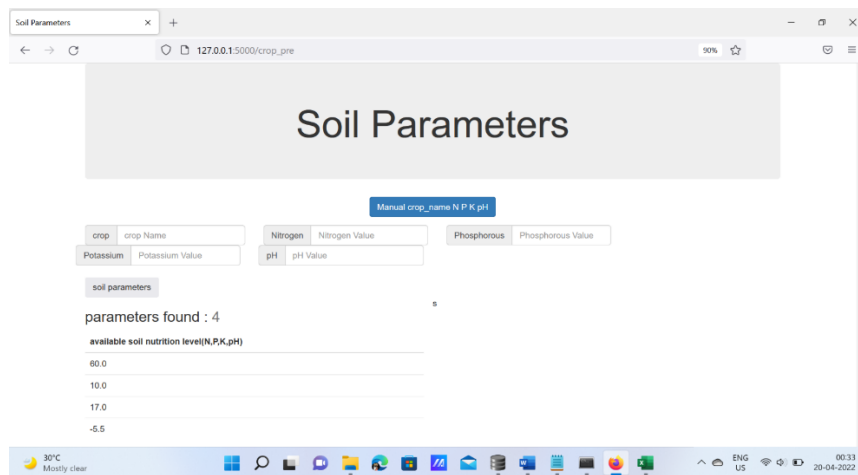


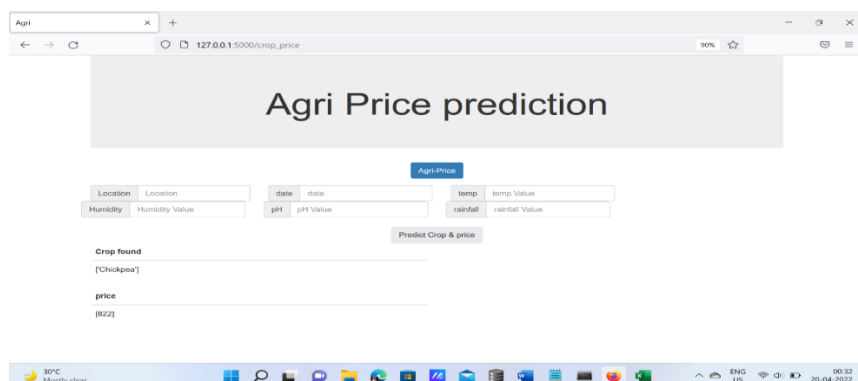
Fig 8.2-login and registration page



**Fig 8.3-Home page**



**Fig 8.4- Soil parameters**



**Fig 8.5- price prediction**

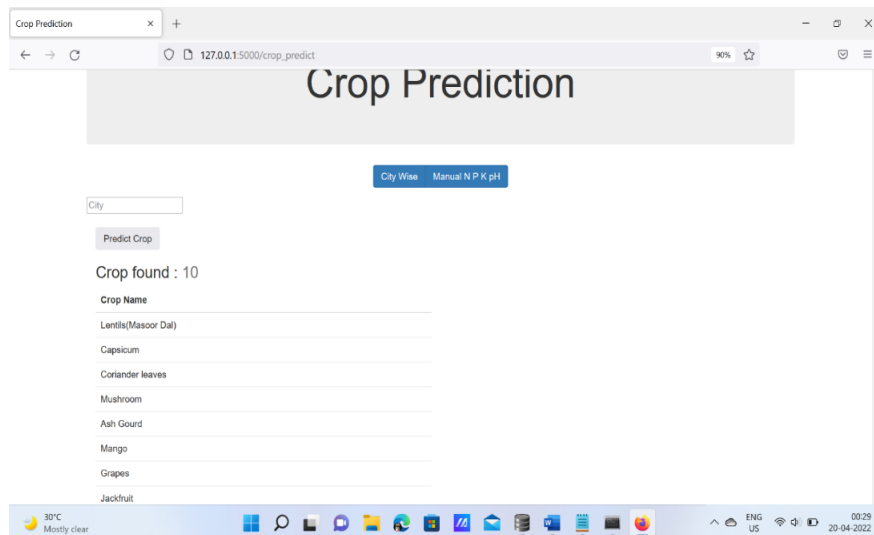


Fig 8.6 crop prediction

## 8.4 Summary

The chapter is all about the result and testing of parts that are used in which the testing stage is classified into stages such as unit test, integrated testing and coding of the parts that are implement in the system and the result part of the system and also the bread board testing which helps for correct working of the model.

## **CHAPTER 9**

### **CONCLUSION AND FUTURE WORK**

#### **9.1 Conclusion**

In this paper, we have effectively proposed and applied a crop recommendation machine, which may be effortlessly utilized by farmers throughout India. This gadget could help the farmers in making a knowledgeable choice about which crop to develop depending on a few parameters like Nitrogen, Phosphorous, Potassium, PH Value, Humidity, Temperature, and Rainfall. By the usage of this research, we will boom productivity of the country and produce income out of such a way. In this manner the farmers Can plant the right crop growing his yield and additionally growing the general profitability of the us of a. This studies has expressed the recommendation of diverse flora of India the usage of exceptional gadget getting to know algorithms like Decision Tree, Support Vector Machine, Random Forest. The Analysis has been performed on those three kinds of device studying algorithms and out of these three algorithms Random Forest finished first-rate accuracy result.”

#### **9.2 Future work**

The gadget can be superior further to feature following functionality:

- 1.The important destiny work’s aim is to stepped forward dataset with larger quantity of attributes.
2. We need to construct a version, that may classify among healthful and diseased crop leaves and additionally if the crop has any disorder, predict which sickness is it.”
3. To construct website and cell app for clean to use.



# CHAPTER 10

## INDIVIDUAL TEAM CONTRIBUTION

### 10.1 Individual objective

**Name:** B SaiKiran

The objective is to identify the data required for the system and preprocessing the data that is acquired from the source and installing and testing the required libraries.

**Name:** N Karthik

The objective is to designing the user Application and research about existing systems and implementing idea in application.

**Name:** K Hari Krishna

The Objective is to designing and building the model, programming the systems as per the requirements and managing the project.

### 10.2 Role

**Name:** B Saikiran

Role: data preprocessing and tools installation.

**Name:** N Karthik

Role: application Designer, research

**Name:** K Hari Krishna

Role: programmer, team lead.

### 10.3 Contribution

**Name:** B Saikiran

Contribution: identifying the requirements and data preprocessing.

**Name:** N Karthik

Contribution: researching and testing

**Name:** K Hari Krishna

Contribution: model designing, project management, user interface

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# APPENDIX A

## SAMPLE SCREEN SHOT

The screenshot shows a Jupyter Notebook interface with the following code cells:

```
In [43]: import pandas as pd
In [44]: import matplotlib.pyplot as plt
In [45]: import seaborn as sns
In [46]: import warnings
         warnings.filterwarnings('ignore')

Importing the Dataset

In [47]: # Importing dataset
         dataset = pd.read_csv(r'Dataset.csv')

In [48]: # Preview data
         dataset.head()
```

The output of the last cell shows the first three rows of the dataset:

	Location	temperature	humidity	ph	rainfall	label	price	Price_Date
0	Yercaud	26.879744	82.002744	6.502985	202.935536	rice	210	30-Apr-11
1	Vidhachalam	21.770462	80.319644	7.030096	226.655537	rice	45	01-May-11
2	Virugambakkam	23.004459	82.320763	7.840207	263.964248	rice	70	02-May-11

The screenshot shows a Jupyter Notebook interface with the following code cells:

```
In [61]: # Splitting X and Y
         #Controls the shuffling applied to the data before applying the split
         from sklearn.model_selection import train_test_split
         X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = 0.20, random_state = 42 )

In [62]: # Checking dimensions
         print("X_train shape:", X_train.shape)
         print("X_test shape:", X_test.shape)
         print("Y_train shape:", Y_train.shape)
         print("Y_test shape:", Y_test.shape)

         X_train shape: (2480, 4)
         X_test shape: (620, 4)
         Y_train shape: (2480, 1)
         Y_test shape: (620, 1)

In [63]: print(X_train)
```

The output of the last cell shows the first few rows of the X\_train dataset:

[ 17.19628279	13.68862614	5.97852042	53.8727743 ]
[ 31.32720734	54.17967763	6.62167846	144.8018325 ]
[ 38.01821337	58.0983181	5.67683258	96.08745082 ]
...	...	...	...
[ 17.92114547	13.04534931	6.43169009	54.56423739 ]
[ 38.85454844	70.0216622	5.42808436	219.745306 ]
[ 26.36629861	52.25738495	7.45646037	177.3176161 ]

## APPENDIX B

### SAMPLE CODE

```
import sqlite3 as sql
import base64
import pandas as pd
from sklearn.preprocessing import LabelEncoder
#from flask_bootstrap import Bootstrap
import numpy as np
from sklearn.utils import shuffle
import joblib
app = Flask(__name__)
app.secret_key = 'any random string'

@app.route('/', methods=['GET', 'POST'])
def home():
    return render_template('index.html')
def validate(username,password):
    con = sql.connect('static/chat.db')
    completion = False
    with con:
        cur = con.cursor()
        cur.execute('SELECT * FROM persons')
        rows = cur.fetchall()
        for row in rows:
            dbuser = row[1]
            dbpass = row[2]
            if dbuser == username:
                completion = (dbpass == password)
    return completion
@app.route('/login', methods=['GET', 'POST'])
def login():
    error = None
    if request.method == 'POST':
        username = request.form['username']
        password = request.form['password']
        completion = validate(username,password)
        if completion == False:
            error = 'invalid Credentials. please try again.'
        else:
            session['username'] = request.form['username']
            return render_template('index111.html')
    return render_template('index.html', error=error)
@app.route('/view', methods=['GET', 'POST'])
def view():
    return render_template('index111.html')
    @app.route('/cropa', methods=['GET', 'POST'])
def cropa();
    return render_template('cropdetails.html')
```

```

@app.route('/about', methods=['GET', 'POST'])
def about():
    return render_template('About.html')
@app.route('/register', methods = ['GET','POST'])
def register():
    if request.method == 'POST':
        try:
            name = request.form['name']
            username = request.form['username']
            password = request.form['password']
            with sql.connect("static/chat.db") as con:
                cur = con.cursor()
            cur.execute("INSERT INTO persons(name,username,password) VALUES
(?,?,?)" ,(name,username,password))
            con.commit()
            msg = "Record successfully added"
        except:
            con.rollback()
            msg = "error in insert operation"
        finally:
            return render_template("index.html",msg = msg)
            con.close()
    return render_template('register.html')
@app.route('/list')
def list():
    con = sql.connect("static/chat.db")
    con.row_factory = sql.Row
    cur = con.cursor()
    cur.execute("select * from persons")
    rows = cur.fetchall();
    return render_template("list.html",rows = rows)
    @app.route('/crop_predict',methods=['GET','POST'])
def cr():
    lt= []
    lst = []
    data = pd.read_csv(r'dataset\Crop.csv')
    city = pd.read_csv(r'dataset\Ploted_600.csv')

```

# APPENDIX C

## PLAGIARISM REPORT

[https://www.turnitin.com/newreport\\_printview.asp?eq=1&cb=1](https://www.turnitin.com/newreport_printview.asp?eq=1&cb=1)

Turnitin Originality Report					
Processed on: 28-Apr-2022 22:53 PDT ID: 1823563226 Word Count: 5334 Submitted: 2 Team 13 By Saikiran Botla	<table> <tr> <th>Similarity Index</th><th>Similarity by Source</th></tr> <tr> <td>14%</td><td>           Internet Sources: 9%            Publications: 4%            Student Papers: 5%         </td></tr> </table>	Similarity Index	Similarity by Source	14%	Internet Sources: 9% Publications: 4% Student Papers: 5%
Similarity Index	Similarity by Source				
14%	Internet Sources: 9% Publications: 4% Student Papers: 5%				
4% match (Internet from 26-Oct-2021) <a href="https://ijsrcseit.com/paper/CSEIT2173129.pdf">https://ijsrcseit.com/paper/CSEIT2173129.pdf</a>					
2% match (student papers from 29-Apr-2019) <a href="#">Submitted to Vel Tech University on 2019-04-29</a>					
2% match (Internet from 23-Nov-2021) <a href="https://jpinfotech.org/crop-yield-prediction-and-efficient-use-of-fertilizers/">https://jpinfotech.org/crop-yield-prediction-and-efficient-use-of-fertilizers/</a>					
1% match (publications) <a href="#">Amit Neil Ramkissoon, Shareeda Mohammed, Wayne Goodridge, "Determining an Optimal Data Classification Model for Credibility-Based Fake News Detection", The Review of Socionetwork Strategies, 2021</a>					
1% match (Internet from 26-Jul-2021) <a href="https://www.ijert.org/meta-path-guided-heterogeneous-graph-neural-network-for-intent-recommendation">https://www.ijert.org/meta-path-guided-heterogeneous-graph-neural-network-for-intent-recommendation</a>					
1% match (student papers from 27-Nov-2021) <a href="#">Submitted to The University of the South Pacific on 2021-11-27</a>					
1% match (publications) <a href="#">K Mythili, R Rangaraj, "Deep Learning with Particle Swarm Based Hyper Parameter Tuning Based Crop Recommendation for Better Crop Yield for Precision Agriculture", Indian Journal of Science and Technology, 2021</a>					
1% match () <a href="#">Perumalla, Manikanta, "Demand Bidding Program and Its Application in Hotel Energy Management", OPUS Open Portal to University Scholarship, 2015</a>					
1% match (student papers from 08-Nov-2011) <a href="#">Submitted to University of Queensland on 2011-11-08</a>					
< 1% match (student papers from 22-Apr-2022) <a href="#">Submitted to Emirates Aviation College, Aerospace &amp; Academic Studies on 2022-04-22</a>					
< 1% match (publications) <a href="#">S. Bhanumathi, M. Vineeth, N. Rohit, "Crop Yield Prediction and Efficient use of Fertilizers", 2019 International Conference on Communication and Signal Processing (ICCSPP), 2019</a>					
< 1% match (student papers from 03-Sep-2021) <a href="#">Submitted to The University of Memphis on 2021-09-03</a>					
< 1% match (Internet from 22-Oct-2021) <a href="http://ijariie.com/AdminUploadPdf/BRAIN_TUMOR_IDENTIFICATION_AND_CLASSIFICATION_OF_MRI_IMAGES_USING_DEEP_LEARNING_TECHNIQUES.ijariie15081">http://ijariie.com/AdminUploadPdf/BRAIN_TUMOR_IDENTIFICATION_AND_CLASSIFICATION_OF_MRI_IMAGES_USING_DEEP_LEARNING_TECHNIQUES.ijariie15081</a>					
< 1% match (Internet from 19-Jul-2021) <a href="https://sersc.org/journals/index.php/IJAST/article/download/27238/14942/">https://sersc.org/journals/index.php/IJAST/article/download/27238/14942/</a>					
< 1% match (Internet from 10-Aug-2021) <a href="http://eprints.uthm.edu.my/563/1/24p%20MOHAMMED%20QASIM%20ALI.pdf">http://eprints.uthm.edu.my/563/1/24p%20MOHAMMED%20QASIM%20ALI.pdf</a>					
< 1% match (student papers from 16-Jan-2022) <a href="#">Submitted to Trine University on 2022-01-16</a>					
< 1% match (Internet from 17-Sep-2020) <a href="https://ukdiss.com/examples/public-grievance-redressal-system-application.php">https://ukdiss.com/examples/public-grievance-redressal-system-application.php</a>					
< 1% match (student papers from 22-Jul-2020) <a href="#">Submitted to University of London External System on 2020-07-22</a>					

29-04-2

# APPENDIX D

## PUBLICATION DETAILS

The screenshot shows the 'Author Console' for IEEE CONIT 2022. The page is titled 'Author Console' and includes a navigation bar with 'Submissions', 'Help Center', 'Select Your Role: Author', 'IEEECONIT2022', and 'Nimmagadda Karthik'. Below the navigation bar, there are pagination controls showing '1 of 1' and a 'Show' dropdown set to '25'. A search bar is present with the placeholder 'filter...'. The main content area displays a table with columns for 'Paper ID', 'Title', 'Files', and 'Actions'. The first row shows paper ID '1188' with the title 'Crop Recommendation System using ML Through Soil Analysis'. The abstract text is visible, and the 'Files' column shows a submission file named 'paper batch 13.pdf'. The 'Actions' column includes links for 'Edit Submission', 'Edit Conflicts', and 'Delete Submission'. The footer of the page contains copyright information for Microsoft Corporation and links to 'About CMT', 'Docs', 'Terms of Use', 'Privacy & Cookies', and 'Request Free Site'. The Windows taskbar at the bottom shows the date as 30-04-2022 and the time as 11:48.

Paper ID	Title	Files	Actions
1188	<b>Crop Recommendation System using ML Through Soil Analysis</b> <a href="#">Hide abstract</a> Agriculture is a major contributor to the Indian economy. As we know approximately 60% of population in Indians are depend on Agriculture. Now a days many of the farmers who are educated peoples also doing agriculture. Farmers are facing problems related to less income, because lack of productivity, farmers are thinking if they use more fertilizers they will get good yield, but it may increase the more investment. If they do like this the physical properties of soil may decrease and they can't get the expected yield. To overcome this problem, farmers should know which crop would suit the specify piece of land. if they choose the right type of crop is cultivated then automatically, the yield of crop will increase. Hence the crop recommendation systems can be very useful to farmers. the yield of the crop may depend on many factors like, ph value, phosphorus, potassium, rain fall. Hence this paper we are going to explain how ML algorithms can be used to predict the crop yield and price.	<b>Submission files:</b> paper batch 13.pdf	<b>Submission:</b> <a href="#">Edit Submission</a> <a href="#">Edit Conflicts</a> <a href="#">Delete Submission</a>

**APPENDIX E**  
**TEAM DETAILS**

<b>NAME</b>	<b>CONTACT NO</b>	<b>MAIL ID</b>	<b>ROLE</b>
R.Magdalene	9701157316	magdalener@hindustanuniv.ac.in	Supervisor
B.Saikiran	6303723036	18113008@student.hindustanuniv.ac.in	Team Member
N.Karthik	9989774928	18113027@student.hindustanuniv.ac.in	Team Member
K.Hari Krishna	6303763262	18113034@student.hindustanuniv.ac.in	Team Member