Dissertation on

"Implementation of Agriculture Monitoring System Using Raspberry pi and Crop Prediction Using Machine Learning Algorithm"

Submitted in partial fulfilment of the requirements for the award of degree of

Bachelor of Technology
in
Computer Science & Engineering

UE17CS490B – Capstone Project Phase - 2

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January - May 2021

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CERTIFICATE

This is to certify that the dissertation entitled

'Implementation of Agriculture Monitoring System Using Raspberry pi and Crop Prediction Using Machine Learning Algorithm'

is a bonafide work carried out by

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in partial fulfilment for the completion of Eighth Semester Capstone Project Phase - 2 (UE17CS490B) in the Program of Study - Bachelor of Technology in Computer Science and Engineering under rules and regulations of PES University, Bengaluru during the period Jan. 2021 – May. 2021. It is certified that all corrections / suggestions indicated for internal assessment have been incorporated in the report. The dissertation has been approved as it satisfies the 8th semester academic requirements in respect of project work.

Signature Prof.Charanraj B R Assistant Professor	Signature Dr. Shylaja S S Chairperson	Signature Dr. B K Keshavan Dean of Faculty

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Name of the Examiners	**Signature with Date**
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2. _____	_____

DECLARATION

We hereby declare that the Capstone Project Phase - 2 entitled **"Implementation of Precision Agriculture Monitoring System Using Raspberry pi and Crop Prediction Using Machine Learning** has been carried out by us under the guidance of Prof. CHARANRAJ B R, Assistant Professor> and submitted in partial fulfilment of the course requirements for the award of degree of **Bachelor of Technology** in **Computer Science and Engineering** of **PES University, Bengaluru** during the academic semester January – May 2021. The matter embodied in this report has not been submitted to any other university or institution for the award of any degree.

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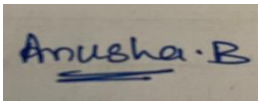
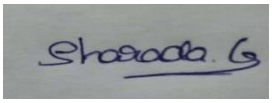
PES12017010161	**Anusha B**	
PES1201802412	**Sharada G**	
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ACKNOWLEDGEMENT

I would like to express my gratitude to Prof.Charanraj B R, Department of Computer Science and Engineering, PES University, for his continuous guidance, assistance, and encouragement throughout the development of this UE17CS490B - Capstone Project Phase – 2.

I am grateful to the project coordinators, Prof.Silviya Nancy, for organizing, managing, and helping with the entire process.

I take this opportunity to thank Dr. Shylaja S S, Chairperson, Department of Computer Science and Engineering, PES University, for all the knowledge and support I have received from the department. I would like to thank Dr. B.K. Keshavan, Dean of Faculty, PES University for his help.

I am deeply grateful to Dr. M. R. Doreswamy, Chancellor, PES University, Prof. Jawahar Doreswamy, Pro Chancellor – PES University, Dr. Suryaprasad J, Vice-Chancellor, PES University for providing to me various opportunities and enlightenment every step of the way. Finally, this project could not have been completed without the continual support and encouragement I have received from my family and friends.

ABSTRACT

In phase-1 we have worked on monitoring the crops parameter such as temperature humidity, soil moisture these sensor senses the values and then those data are stored in iot that is cloud thing speak visualization graph can also be fetched in things speak it shows the data's date and temperature value and humidity value. Those details are taken in xml file and used it for predication purpose.

Those data are used in prediction, when temperature & humidity value, soil moisture value are accurate. Our aim was to get the accurate value of the parameters and use those in the algorithm. So as of now we are using decision algorithm which is used for regression and classification. In this algorithm we have sub divided in to leaf node and root node is a parent node for classification purposes. Before this me clean our dataset which is used for the project. First we go for per-processing the dataset, and then splitting of dataset in to training and testing purpose in the ratio of 20:80. 20 is for testing & 80 is for training. We must train the machine as per our requirements so that we can get the accurate and precise accuracy value. In the dataset if we found any missing data we go for filling the missing field using mean method. Mean of the entire column gives us the value to fill the missed fields in the dataset, this is done because if there is any missing data in dataset then we may not get the extract accuracy value as expected. So we fill the missing values. We also created a simple GUI which is used to display outcome from the prediction. For that we have used tkinter. Four number of field such as temperature, humidity, soil moisture, ph. Sensor, when we enter those value as per the dataset give to the algorithm it predicts the outcome that is name of the crop which can be grown in those particular conditions.

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INTRODUCTION

In olden days farming was the main occupation but people from the rural areas where shifting to urban areas for economy propose. In those days they used to predict climate conditions based on the previous day's soil moisture, water level, temperature, humidity etc. Farmer sometimes are away from the farm he may not the condition of the farm and need human effort he cannot be all time in farm to observer the condition

So to get an easy way out of this we can use sensors which gives us the above mentioned parameters details with accurate value. We also use cloud that is Thing speak. We use the graph to see the present change in the climate and temperature, humidity, soil wetness etc.in thing speak we can access those data information in the format of xml file and using in algorithm so that prediction of the crop will be easy based on the prediction farmers can grow their crop depending upon these but in some cases this may be not that accurate to use such as defect in hardware's those will affect the prediction may get false output this may be considered as disadvantage of this method other than this there is no issues in using this advantage is that the farmer will be aware of the condition of farm well before so that he can take the precautions well before. He will also get the sms alert if any changes happen so that he may be aware in all the aspects.

For example, let's consider temperature should not increase by 35c and humidity should not decrease by 35c, when temperature increases by 35 then user will get the notification saying that temperature is more and relay automatically no the water to the field where as in humidity when temperature increases humidity decrease he gets the sms saying that humidity is less. Similarly, in soil moisture when the sensor sense if there is no water detected then it shows output as no water detected and relay no the water automatically here relay works as the switch where it no the motor and off it whenever required based on the condition given.

When the above condition is obeyed then we will get an accurate value for the dataset and can use it to algorithm. In the process of the working algorithm it first imports all the necessary modules required for the present file. Here we use decision tree algorithm that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. We are using raspberry pi 3 B+ model for our project so before implementing the code we have to install the packages required for the project and software required such as pandas, numpy, importing the modules can be done only after downloading particular software required. Then after all the imports dataset is read the details of how many rows and columns will be displayed and then assign a variable to dependent variable and independent variables. Here independent column is temperature, humidity, soil moisture sensor, PH sensor. dependent column is crops name. then slitting the dataset in ratio of 20:80. 20% is for testing and 80% is for training the dataset. As the algorithm is used to predict the accurate value.

We have used a simple GUI for displaying the output, we have used tkinter for the GUI it has four input fields temperature, humidity, soil moisture, ph sensor. When user gives the input value it predicts the value based on the values and it gives the crop name which can be grown in the that particular area and how much of production can be done in that place in that much of area can be done in the future enchainment work

CHAPTER-2

PROBLEM DEFINITION

Agriculture is the unpredictable way of yielding the crop where the farmers only test the soil such as moisture level, soil type, and soil moisture, ph value. In those days the farmer would not get the accurate value of those parameters. Different place has different climate condition at different times and various types of soil types to those which crop can grow. A farmer may not have the details of the crop which he wants to grow and cultivate, he should have the complete information of the crop to its depth and so that he can grow his crop without any hindrance in further growth of the crop. Whenever the soil loses its moisture level, the water pump should be on immediately so the farmer should on the pump. It takes the time for farmers to do manual work. The farmer uses pesticides to get the high yield of the crop, without knowing much about the pesticide and how much quantity should that be used. Farmer should check the daily climate condition or the previous year's parameters he should go through for the present yielding purpose.

So to overcome these problems farmers can use the smart agriculture method, so that farmers can easily get the details of the farm as well as immediately get the accurate value of the parameters.

The sensors are inserted in some part of the field and the data is sensed by the sensor and sent to the cloud and as well as to the farmers mobile through SMS, he can get to the condition of the farmer whenever he is far away from farmer

3. LITERATURE SURVEY

3.1 Abstract

Agriculture is the focal occupation of India from ages, has the most essential in the development of our country. In our country most of the land is used for agriculture propose to full fill the needs of billions of peoples, to meet the expectation of peoples crop production is only aspect of agriculture. If a farmer has a land he should know the complete information of the land and growth of the crop and soil type and moisture and ph value of the water how much water the plant need, temperature, humidity. He should be precise about the details he got from the manual work. Crop production is the difficult duty because it includes different components such as temperature, humidity etc., if it is possible to predict the crop for sowing it, it would be help for farmers and also people involved to make suitable decision of storing and for business propose

Observing all the issues this project would help the farmers in solving the issues regarding the agriculture problems by monitoring system to monitor the agriculture field on the basis of soil features such as soil type and soil moisture, ph value and suitable temperature and humidity and recommending farmers the suitable crop, therefore by helping them in increase the productivity of the yield and reduce the loss.

The project is about the recommendation system using machine learning algorithm, it suggests the suitable crop based on the input soil parameters. This also helps farmers to reduces in financial losses which are faced by farmers by planting the wrong crops and helps them to know about variety of crops which can be cultivated in those areas.

3.2 Introduction

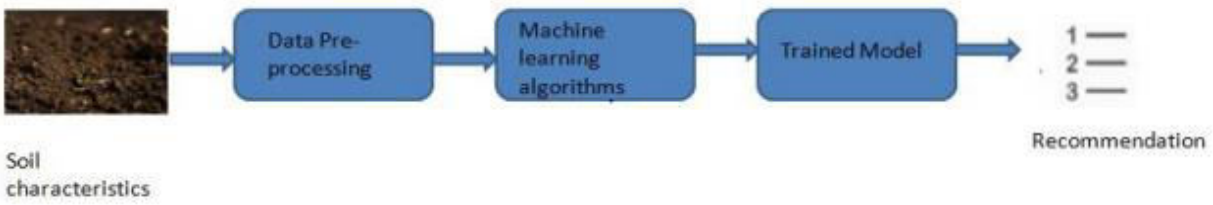
Agriculture is the vital role in every individual in India. It is considering as the olden practices in India. In that time farmers used to have their own piece of land to cultivate the crops to reach their demands. Agriculture sector is backbone of India, with fast growth of technologies and innovation they should reach the expectation in terms of crop production.

Farmers cultivate the crop based on highest price of crop in market so to get the huge profit from their field. In some region this resulted in huge supply of the crop while all other regions farmers faced problem due to losses of crop production and lost in huge amount of money. This issue is caused due to many unsuitable condition for the crop which led to loss of the crop. The increase in the human population leads cultivation of crop at actual time and place. Even climate becomes a vital role in crop growth because the climate is dynamically changes based on the climatic conditions crop is grown. Lack of food may lead to the drawback of traditional weather patterns. To avoid this human should use the innovative technologies to overcome the cause, if they use the new method using technologies he can get the proper value of the properties such as the soil, water, climate, temperature, humidity etc. the new method would give the accurate value of the huge crop. The information difference between traditional cultivating of crop and new way of technologies may help to overcome problem. The new technologies are designed as interconnect to climatic factors so that the farmer is well aware of the climatic conditions. To get huge profit they go for the random cultivation if the crop with lack of awareness of the crop production may lead to severe loss in the production and waste of time and amount. A wrong choice taken by the farmer may show huge financial loss. For these reasons farmer may be confused of which crop can be grown in this land. So the farmer can choose the recommendation system so that he can get some idea of which crop can be grown and how much production can get. So this project is to recommend the farmer that which and what type of crop can be grown using machine learning algorithm which predicts the crop type is grown in a particular land this may be helpful for farmers.

3.3 Component Descriptions:

1. **Power supply:** The sensors are connected to raspberry pi to the respective pin connection but without power supply, raspberry pi won't work.
2. **Sensors:**
    - The sensor which is used to get the soil parameters details such as ph value, moisture value, we use soil moisture sensor
    - To get temperature and humidity value we use DHT 11 sensor
    - To get Ph. value we use Ph. sensor
    - If there is any fire detected in the fire, to be well before aware of that we use flame sensor.

3.4 Proposed System:



a. Training Dataset:

To get the accuracy of the dataset used in the algorithm based on the number of parameters used. Here the dataset contains the columns of different kind of soil type as parameters correlates with crop that can be grown as the named in dataset column.so similarly using ML Algorithm to train dataset & predict the suitable crop that can be grown as per the condition of input given.

b. Data pre-processing:

Data per processing is the next step in algorithm which has two steps. The actual dataset may contain many missing data, so those data are may lead to get wrong accuracy value.so to solve problem we replace the missing value with mean of that column, to get the accuracy. This a supervised learning in that there should be a class label which is created in pre-processing step.

c. ML Algorithm:

They have used different algorithm which help them to get the precise and accurate value of the predicted value. Comparisons propose.

- **K-Nearest Neighbour**:

In this algorithm, input given be the K nearest training dataset, output depends on classification and regression problem. It performs depending on the minimum distance from the input value given soil parameters to the trained values to fine the nearest k neighbours and then majority of the same output is predicted as the output

Euclidean distance is used as a distance measure. It is calculated by the given formula,

$$d(x, y) = \sqrt{\sum_{i=1}^{n}(x_i - y_i)^2}$$

where "d" is the Euclidean distance, "x" is the new point, y is the existing point, "I" is the input parameter and n are the number of data points

- **Decision Tree**:

A decision tree algorithm is the non- parametric method of supervised learning technique. In the process a tree like structure is formed. The dataset is divided into many sub leaf nodes which are used in the branch of the other leaf node. This is nodes indicates the classification and regression result. Decision tree algorithm have a capacity to classify both categorical and numerical data.

- **Naïve Bayes**:

In this algorithm, it is based on the conditional probability. The dataset taken is divided in to dependent and independent column. In this algorithm the dataset is first trained and then tested but in the ratio of 20:80. First 20% of the dataset is tested and other 80% dataset is trained. This is because machine should be trained as per the dataset so that we could get the accuracy value as per the prediction. Naïve Bayes algorithm can take high level dimension feature with less dataset with a scalable classifier.

- **KNN with cross Validation**:

Cross validation is a technique that is used to finding out the accuracy of the output regarding the particular type of classifier which is partition of training and testing of given dataset. Cross validation is followed by the partitioning of dataset into K groups. Among these K group one of the group is considered as the testing and remaining dataset is k-1 groups for training. This process is on repeat until get the proper accuracy value.

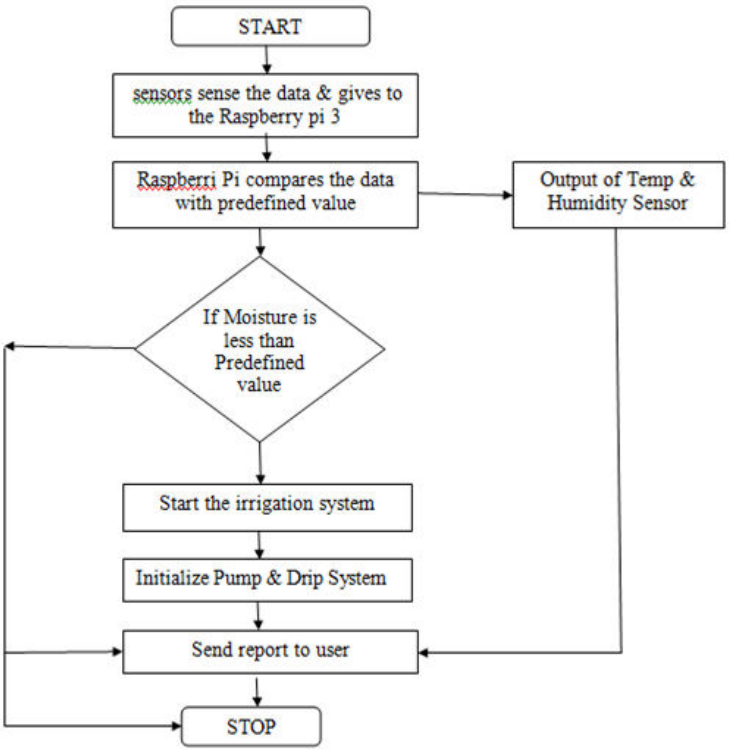
- **Support Vector Machine(SVM):**

It is supervised learning model which has many learning algorithms that inspect the data is used for solving both classification & regression problems. Support Vector Model algorithm creates a model. The output of the SVM algorithm is to do the decision boundary that can divide into n-dimensional space into classes so that we can segregate new data in correct category in future. SVM selects the vector to help in forming hyperplane.so these vectors are called as support Vector, so this is called as Support Vector Machine.

SYSTEM WORKING:

Arduino UNO is used software where all the sensors are connected to it, it is a micro-controller which has 20 digital I/O pins. Arduino programming software is used to collect the data from the field where the sensors are inserted into the soil so that the frequently changing data can be noted in cloud. DHT 11 module is used to get the changing temperature and humidity accurate value. The DHT 11 sensor has two pins for input and one for output. while soil moisture is used to get the moisture content of the soil. If the soil has no water content when sensor senses, it says that there is no moisture/water in the soil. Similarly, whenever there is increases in temperature and less in humidity automatically water motor should be on. For water supply they have used relay, it is used as the switch to on and of the motor whenever required

3.5 Flow chart



3.6 Algorithm

1. Collection of data
2. Data per-processing Step
3. Fitting a training dataset to algorithm
4. Predicting test result
5. Testing accuracy outcome
6. Visualizing the result

3.7 Applications

- The algorithm helps to get the correct predicated crop
- Here they can use large some of data set which help to segregate the data into training and testing dataset.
- They can get predicated crop type which can be grown in their land.
- main application in the algorithm used is to get the production details of the crop.
- The growth of the plant can also have been observed

3.8 Conclusion and Result

The proposed system gets hold of soil values, such as soil ph., moisture consideration which helps to get the high productivity of the crop that are grown with their suitable conditions. This system helps the farmer to get the list of details of the crop which can be grown in their land.so by using this farmer have the advantage of get huge profit and can predict the new crop which can be grown in their land that are not yet grown till this time they can be predict that these type of crops can be grown in this conditions. To do this work easy Iot is the one of the easiest way that works properly to get good production and profit in financial. In future we can work using iot platform where they get the time to time information of the field here we can also get the visualization of the graph. We can clearly observer the fluctuating value. By inserting the sensors in the field and get the current soil moisture sensor, ph sensor, flame sensor values so that we can get the most accurate value to the outcome.

CHAPTER-4

PROJECT REQUIREMENT SPECIFICATION

4.1 Introduction

In this content we are explaining the specific requirements need to execute our project, here we have used the raspberry pi. Our whole project is controlled by raspberry in which all the sensors used are connected to raspberry pi. We can also observer the process of algorithm.

4.2 Scope

Our main aim in the project that to reduce the problems faced by the farmers and get an easy way out of it so that they will be human effort. So the farmer can get the accurate value of the parameters using sensors such as soil moisture sensor, temperature and humidity, ph. Sensor, flame sensor. The farmers collect the reading from the cloud that is live data from things speak in the CSV format so that he can get the visualization graph. He can get the assumption on the previous year's data. Algorithm is used to predict the crop such as the large set of dataset is taken in the algorithm that data contains of many years' data of grown crops. Based on that data prediction can be done.

4.3 Advantages

- Algorithm is to predict the accurate outcome
- Based on the parameters details algorithm may predict the outcome
- The main advantage is there will be less human effort in this process
- New technology helps the farmers most in growing the crop with high production
- It also helps the farmers to be well aware of their field activities now and then easily
- Farmers can water fields periodically, based on the soil moisture level by soil moisture sensor. By this sensor it waters to the field only when and where it is needed.
- It reduces the cost like labour costs.

4.4 Disadvantages

- Algorithm may effect if there are missing data in dataset, it will affect the accuracy value
- In this out main idea is to predict the crop name using algorithm and get the accuracy value by that method.
- There will be network issues in rural areas so there should be a proper network.
- Algorithm may effect if there are missing data in dataset, it will affect the accuracy value
- Farmer should get to know about the usage of technology.
- There will be sudden fluctuating in climate changes or weather conditions it may effect to get exact humidity and temperature value.
- We should be aware of the working of sensor like is it working correctly or not.

4.5 Functional Requirements

The main functional are:

- When the water content decreases in the soil the system should automatically ON the pump for the flow of water.
- If detected water level is less than the predefined value then the system continuous the cycle of notifying the user, turning on the pump, then if it reaches its level the pump automatically turns off and same is notified to user.
- The temperature, humidity values are taken from the sensor which may be exact so that the farmer can get good yield by using this method.

4.6 Non Functional Requirements

- **Maintainability:**

  If the water level reduces to less than the minimum level, then the soil losses its moisture level the sensor notifies the user through GSM so user can maintain the moisture level.

- **Reusability:**

  The previous dataset can be reused for the improvement of the yield. The dataset will be stored in the cloud by this we can collect the dataset.

- **Portability:**

  Here the things like sensors are fixed we cannot carry the sensors from one place to another place.

- **Performance:**

  We have a two parameters called Temperature and Humidity then we will get a values of these parameters based on this farmer will grow the crop and the dataset will be stored in cloud we can fetch the data from the cloud by using Thing speak.

CHAPTER-5

SYSTEM REQUIREMENTS SPECIFICATIONS

5.1 Introduction

Our project is about precision agriculture monitoring system using raspberry pi and machine learning algorithm is used to predict the crop, so here as we mentioned above monitoring is to keep track of the farmers field using modern technologies so that there will be less of human effort. Here we have used raspberry pi B+ model, it is the same as the functional computer & low cost. Raspberry pi well known as single board computer where we can install all the packages which are needed for project. It has 32 GPIO pins (general purpose input output pins). totally we have used 4 sensors that are soil moisture sensor, flame sensor, ph. sensor, DHT 11 sensor (temperature & humidity). Flame sensor is used to detect if in case the fire is detected in the field, soil moisture sensor is used to detect the moisture content of the soil which is suitable to the crop, temperature and humidity sensor(DHT11) is used to detected the surrounding humidity and temp value, ph. is used to know the acidic content of the water present the crop. This is because to know at what value the crop can be grown healthy. By using these new technology, farmers may get the help of in terms of cost as well as in the terms of production may be if possible.

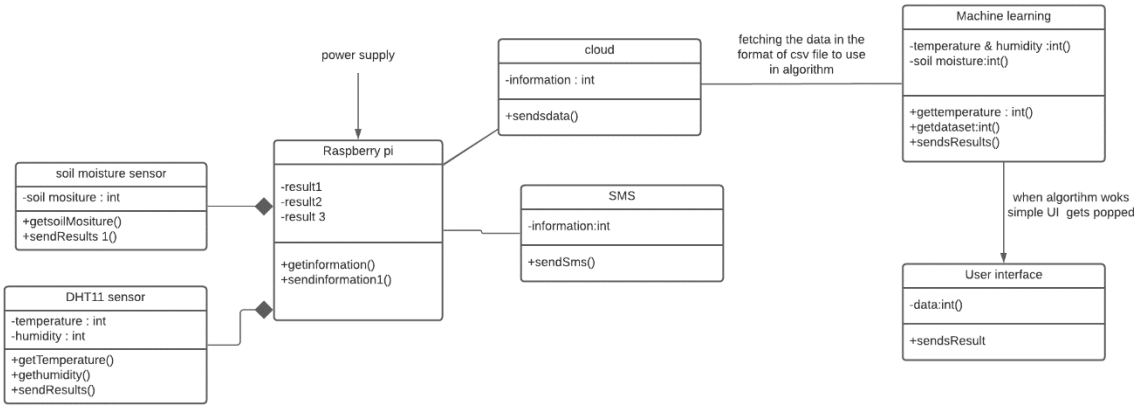
Here we are using the decision algorithm, which is used for regression and classification of the dataset. The first step in the algorithm is to collect the data from the day to day update, so that while predicting the outcome we should have a proper dataset which have all the parameters value properly without having any missing data, if there are some missing value in dataset then the accuracy may be less with expected accuracy value. So by having the proper & verified dataset then the next will be very easy way to cultivate the crop based on the data collected and can be used in the future to predict the new type of crop to suitable parameters.

In dataset there some dependent and independent columns which are segregated into training and testing dataset in the ratio of 20:80. First 20% is used to for testing the dataset and 80% is used to training the machine such that to get the accurate accuracy value. Here first the data set is pre-processed as per to the machine. So that the machine should be trained.

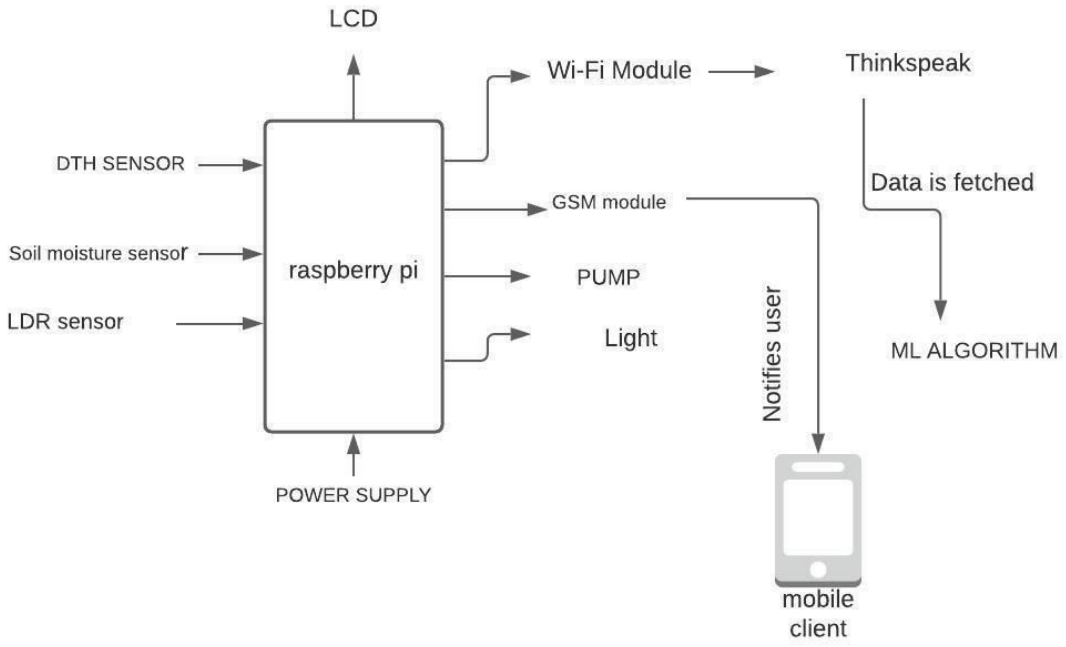
The block diagram explains the brief model of the system in which the raspberry pi is the main processor further connected with some sensors that are temperature, humidity, soil moisture sensor etc. The external power supply of 5V, and key board, mouse is also connected with pi. Whenever the temperature increases automatically motor turns on to control the temperature. Similarly, when the soil loss its moisture level it notifies the farmer through SMS. If the moisture level is below the minimum level, then pump will be turned on.

The data which is fetched from the system is stored in the cloud using IOT that is thing speak. Which helps the farmer to get the details of the field easily and also the visualization graph of the data is given in IOT. We convert the soil moisture readings to digital values such as 0's and 1's, using ADC (analogy to digital convert). With those values graph can be plotted that is visualization graph.

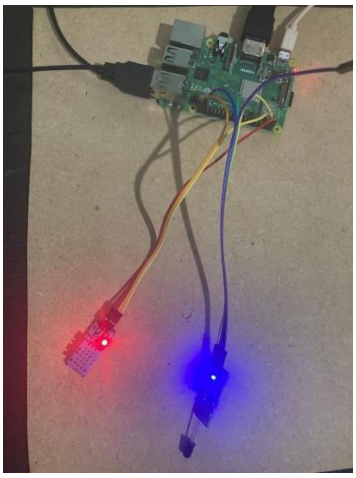
5.2 Class Diagram



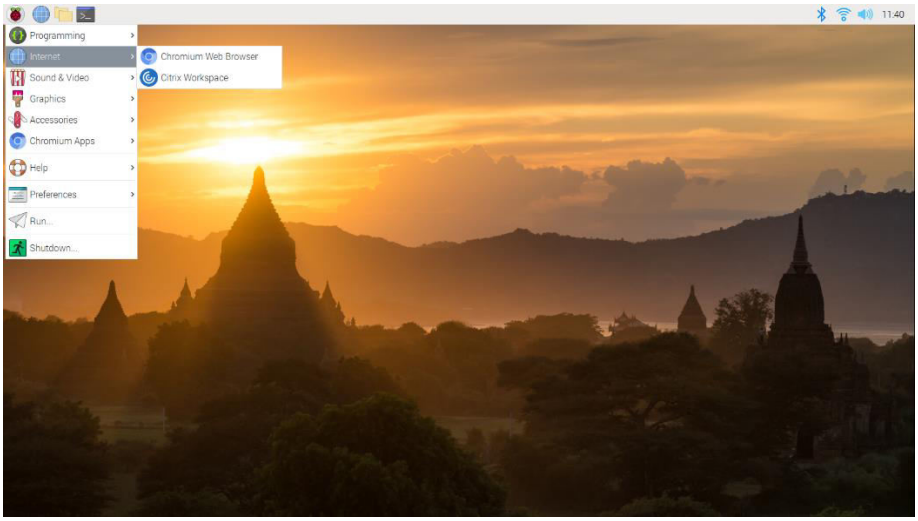
5.3 Block Diagram



We have used Raspberry Pi B+ model, which fully functional computer and also low cost. The raspberry pi board has 5V of two pins,3V3 of two pins & total of 9 ground/0V pins, 5V of power supply is directly supplied from main adaptor. So while the sensor connected to the raspberry pi as to receptivity pin connections. Soil moisture & DHT 11 connected to raspberry pi

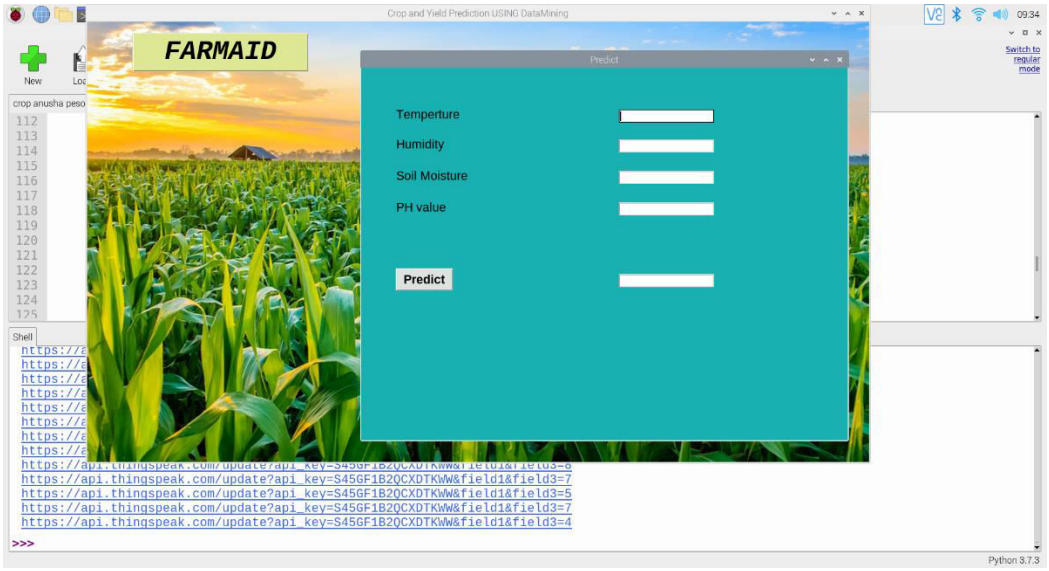


Setting up of raspberry pi, we have to install the operating system (OS) into it SD card so that SD card can be inserted in to the raspberry pi. In that SD card we have installed the raspbian os and also used as storage. After operating the raspberry pi the setup starts and takes some time to do that process complete. Reaming setup of the raspberry pi is done referring the below link. https://www.raspberrypi.org/magpi-issues/Beginners_Guide_v1.pdf



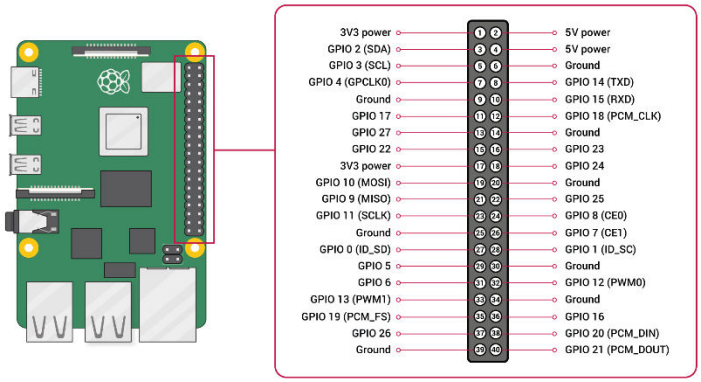
5.4 Software Requirements

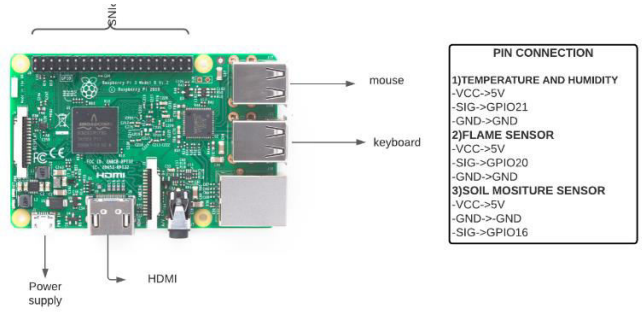
- Here we have used raspbian os for the project
- We have installed all the requirements which were need for project
- We have used Anaconda python for the execution of the machine learning code to cross check the program written
- We have used thing speak for storing the live data of the farm
- Simple GUI (User interface) is done using Tkinter



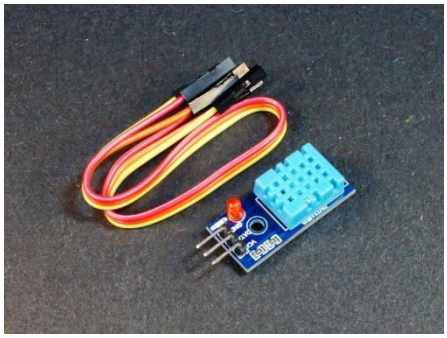
5.5 Hardware Requirements

- ✓ **Raspberry pi:** this is the main processor which is used in this project.

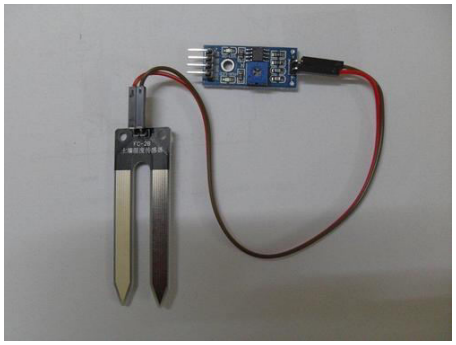




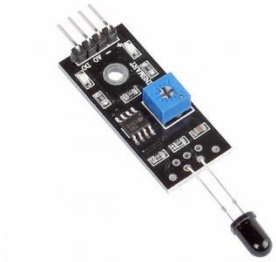
- ✓ **DHT 11:** This sensor is used to fetch surrounding temperature and humidity values precisely



- ✓ **Soil Moisture:** This is used to fetch the moisture content in the soil



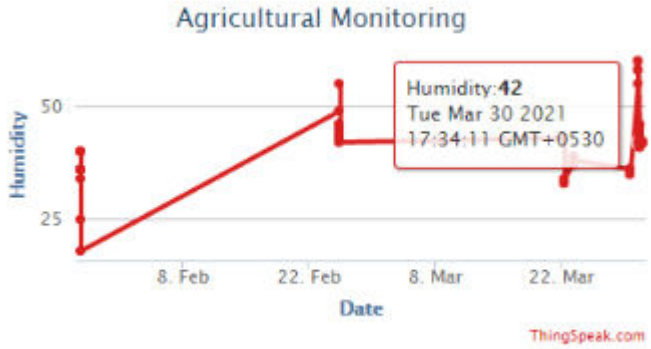
- ✓ **Flame Senor:** This sensor is used to detect the fire in case their fire is detected



Visualization:

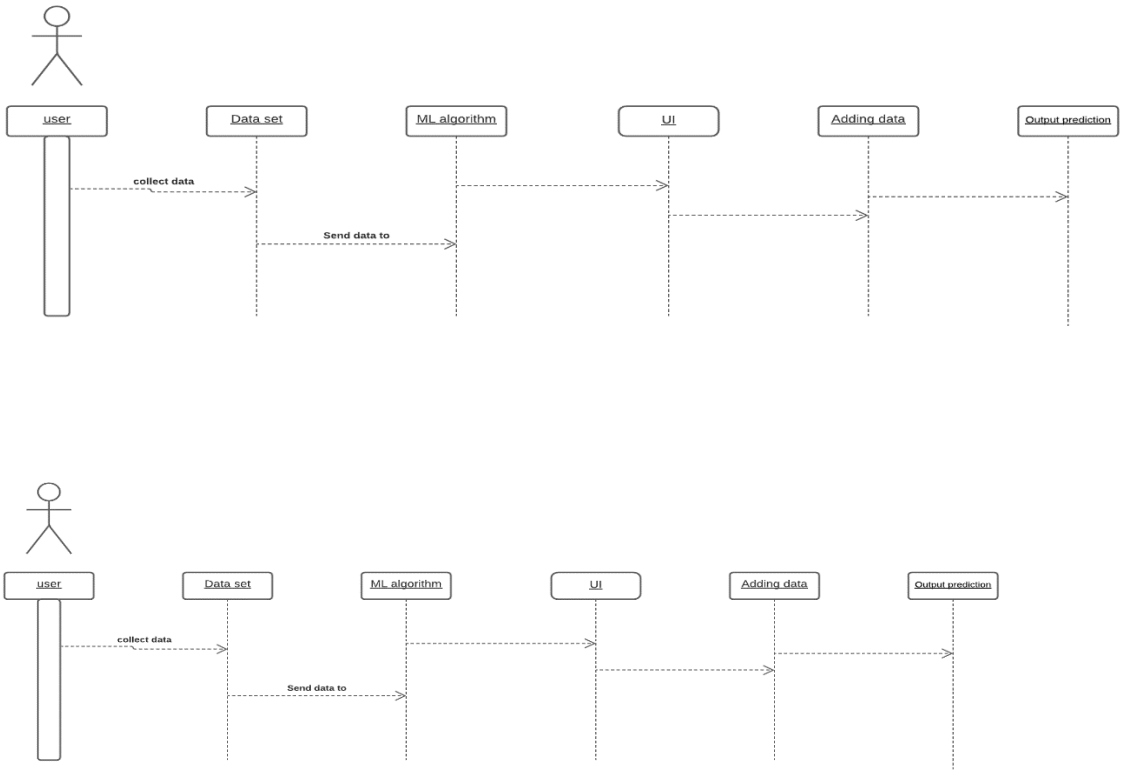
Temperature

Humidity



Ph.

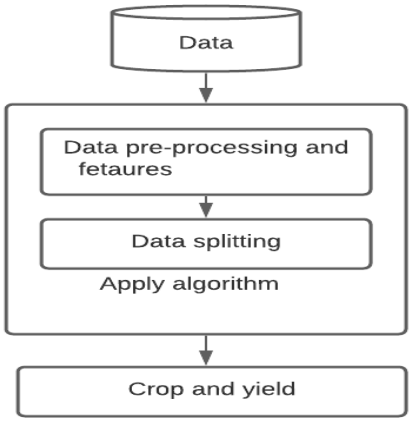
Sequence Diagram

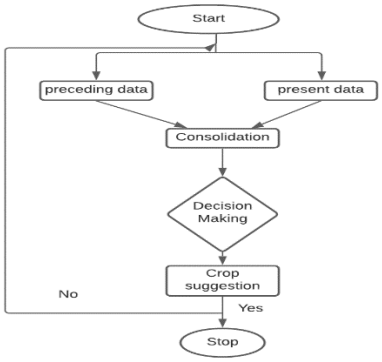


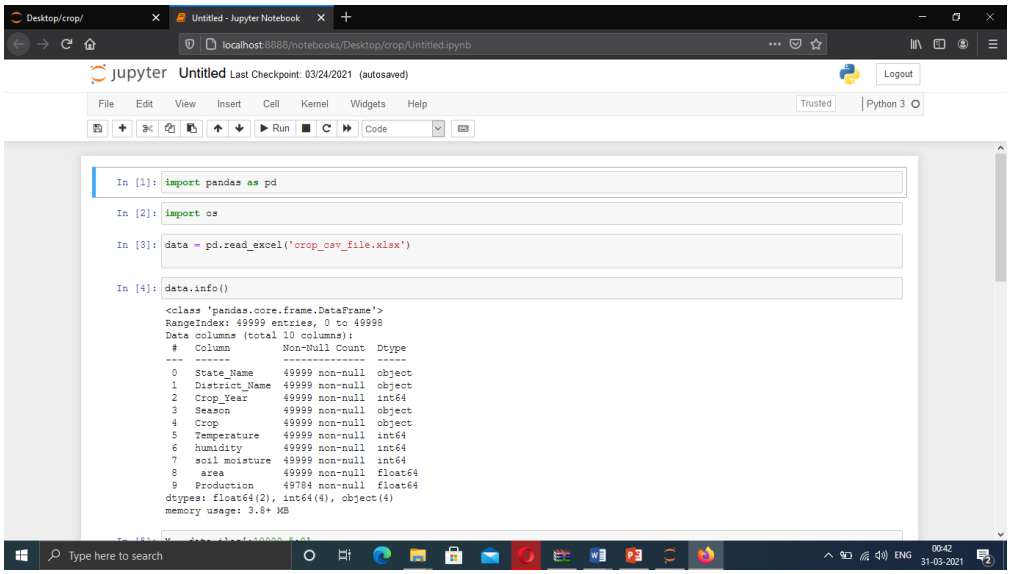
Here above figure is about step to step execution of the project sequence, it explains the brief how the project flow one after the other. First user sets up the hardware and then collects the data from the field if required the live data from the field and it will be stored in the things speak. Then this dataset is taken to algorithm step by step. Data pre-processing the data set by identifying the dependent and independent column in the dataset. In the data set the temperature & humidity, Moisture, ph., are independent and crop name column is dependent on these remaining 3column. If there is any missing data found in the dataset that may affect the accuracy value with expected value, so to solve this problem we go with mean of the column and filling the column with that value. Then machine is trained as per the dataset to get the predicted value, first 20% of dataset is tested and remaining 80% dataset is trained. The algorithm used is decision tree algorithm because, we were getting the highest

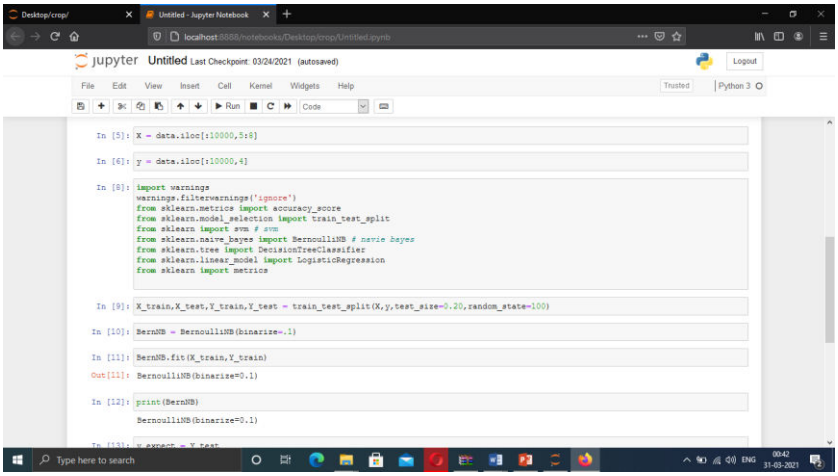
accuracy value compared to the other algorithm, this algorithm helps to get the highest value in predicating the accuracy value.

Algorithm & Pseudocode








Desktop/crop/
Untitled - Jupyter Notebook
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jupyter Untitled Last Checkpoint: 03/24/2021 (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3
Run
Code
In [5]: X = data.iloc[:10000,5:8]
In [6]: y = data.iloc[:10000,4]
In [8]: import warnings
warnings.filterwarnings('ignore')
from sklearn.metrics import accuracy_score
from sklearn.model_selection import train_test_split
from sklearn import svm # svm
from sklearn.naive_bayes import BernoulliNB # navie bayes
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear_model import LogisticRegression
from sklearn import metrics
In [9]: X_train,X_test,Y_train,Y_test = train_test_split(X,y,test_size=0.20,random_state=100)
In [10]: BernNB = BernoulliNB(binarize=.1)
In [11]: BernNB.fit(X_train,Y_train)
Out[11]: BernoulliNB(binarize=0.1)
In [12]: print(BernNB)
BernoulliNB(binarize=0.1)
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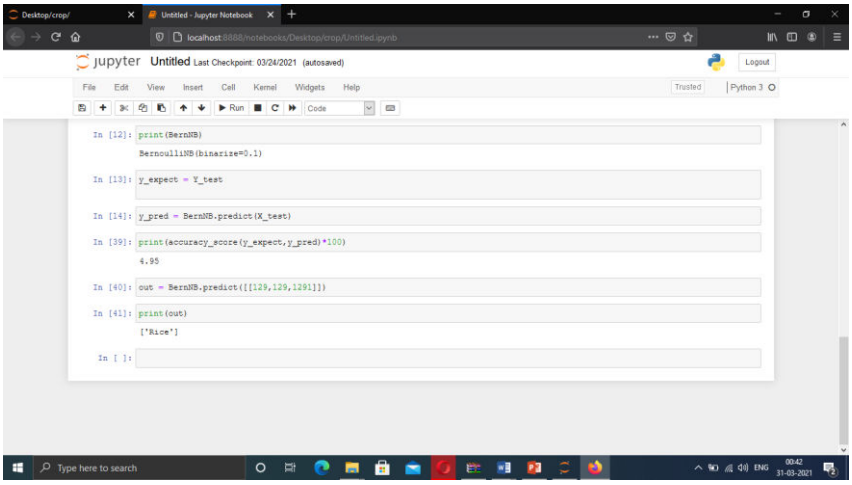
ENG
00:42
31-03-2021


Desktop/crop/
Untitled - Jupyter Notebook
localhost:8888/notebooks/Desktop/crop/Untitled.ipynb
jupyter Untitled Last Checkpoint: 03/24/2021 (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3
Run
Code
In [12]: print(BernNB)
BernoulliNB(binarize=0.1)
In [13]: y_expect = Y_test
In [14]: y_pred = BernNB.predict(X_test)
In [39]: print(accuracy_score(y_expect,y_pred)*100)
4.95
In [40]: out = BernNB.predict([[129,129,1291]])
In [41]: print(out)
['Rice']
In [ ]:
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ENG
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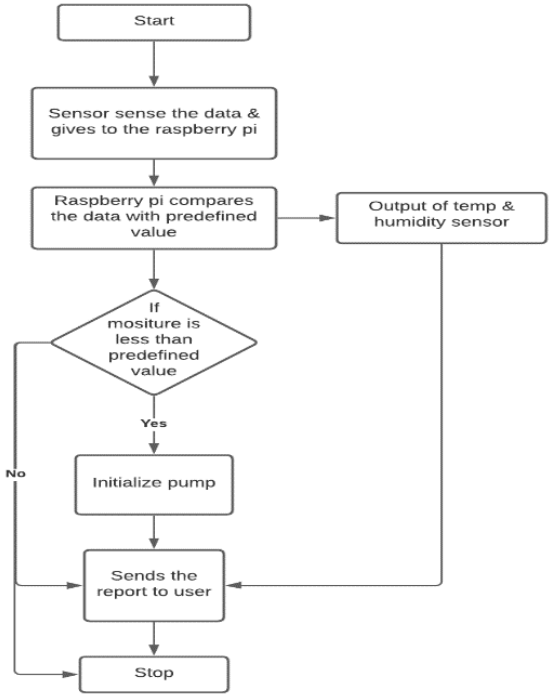
31-03-2021

CHAPTER-6

SYSTEM DESIGN



Here our project flow is represented in the above diagram, raspberry pi B+ model is used for this project, and four sensors are used to fetch parameters value from the farm. The live data is take and stored things speak. We have taken the dataset from the kaggle website for now as well the live data is also in process to collect the data, decision algorithm is for regression and classification purpose. The data set is sub divided into class form. The main node is the root node and sub nodes are leaf node as per the decision algorithm. When have tried doing with other algorithm such as SVM, Logistic Regression, Naïve Bayes algorithm, Decision algorithm. We were getting the highest accuracy value from this algorithm compared to other algorithm.

In process of algorithm the first process is pre-processing dataset means cleaning the dataset, if there are any missing data found then to get the predicted value as per the expected value we go for filling the missing value by doing the mean of the entire column we can fill the column by that value then dividing the data set like dependent variable and independent variables. That is divide into ratio of 20:80 which is used as training and testing purpose. 20 is for testing and 80 is for training.

The sensors used for this project are soil moisture sensor and flame sensor, ph. sensor, DHT 11(temperature & humidity) sensor. When the soil moisture sensor senses the moisture content and detects as less moisture content in soil and automatically motor is on so similarly when temperature is increased then also water motor is on same to humidity also. While this process ph. value is also collected and stored in the cloud. If in case the fire detected in the field it notifies the user through the SMS. Also the user gets the notification whenever there is change in the field it notifies the user of the temperature & humidity change as per the pre-condition given. For example, if the temperature is set to 35c then if temperature is greater than this per mentioned condition then user get notifies with the message saying that temperature is more automatically motor will be on. Similarly, whenever the temperature is less than the mentioned value also user will be getting the SMS. Similarly, with humidity we have taken condition value as if humidity value is less than 35c user get notification.

CHAPTER-7

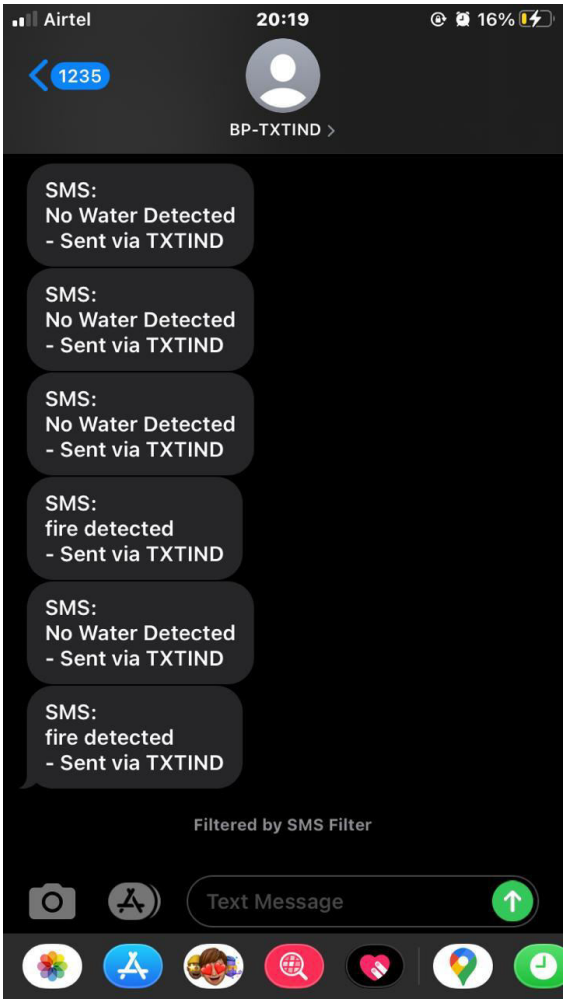
CONCLUSION OF CAPSTONE PROJECT PHASE – 2

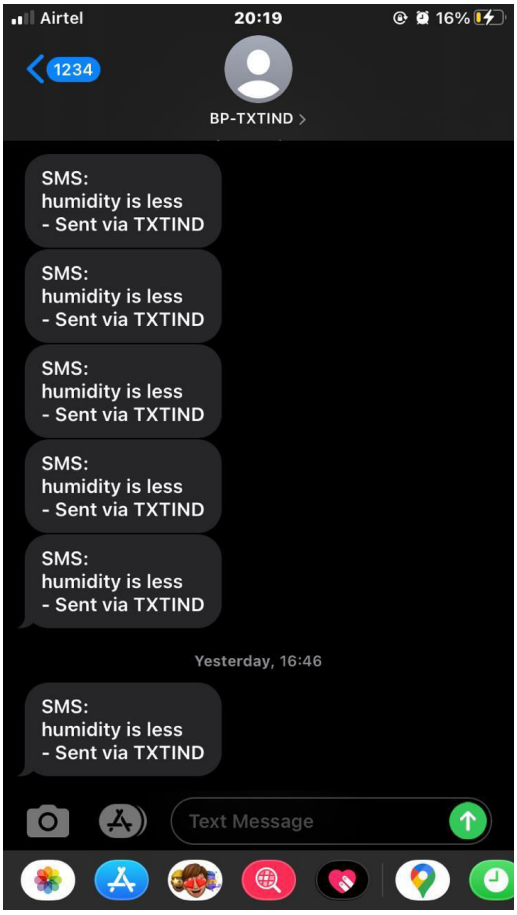
Basically our project is precision agriculture monitoring system using raspberry pi and machine learning algorithm. Our project plan, monitoring system and use those data for future use to predict the which all type of crop can be grown in their field to those particular conditions. In phase-1 we have worked on the installation of the raspberry pi os and its working, then first started working on the sensors connection with raspberry pi and then connecting it with things speak to store the live data from the field. So that there will be less of human effort in the field. Farmers used to do a lot of manual effort to get the productivity high and profits, so overviewing this farmer can use this new technology so solve their problem and work easily without any mistake.so that was working properly as thought of doing it.

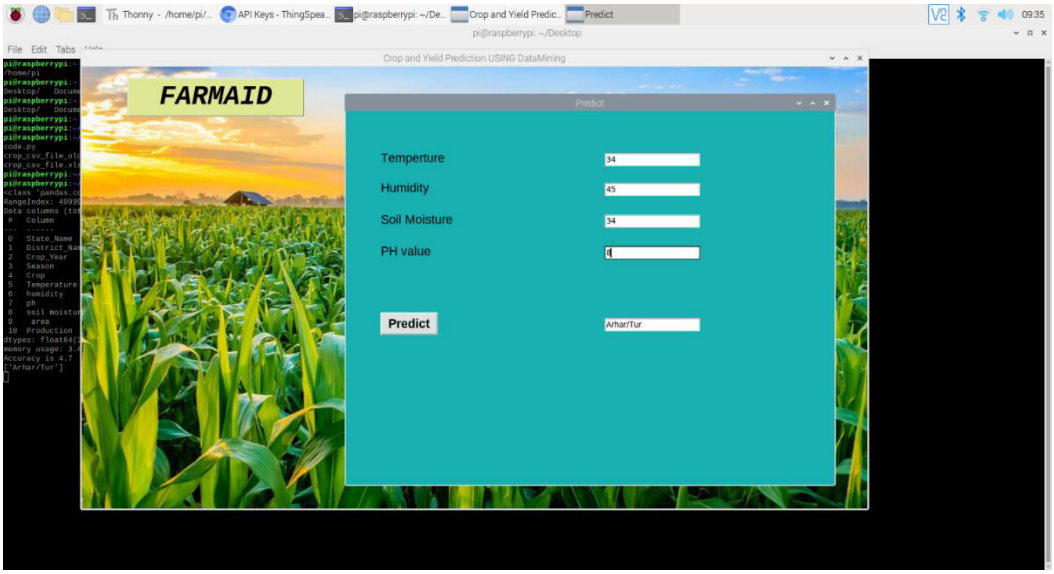
In Phase 2 we worked on machine learning algorithm so taking dataset from the things speak or from kaggle website, first we worked on the process of the algorithm those are per-processing the dataset, then choosing the dependent and independent column of the dataset, then testing and training the dataset in the ratio of 20:80. This is categorical data handling slitting the data into test data and train data. The machine should be trained as per the algorithm, we have tried on 4 different types of algorithm such as SVM, logistic Regression, Naïve Bayes, Decision tree. The most accurate value we got for decision tree algorithm so we thought of going with that algorithm. We also used a simple GUI to display the output.

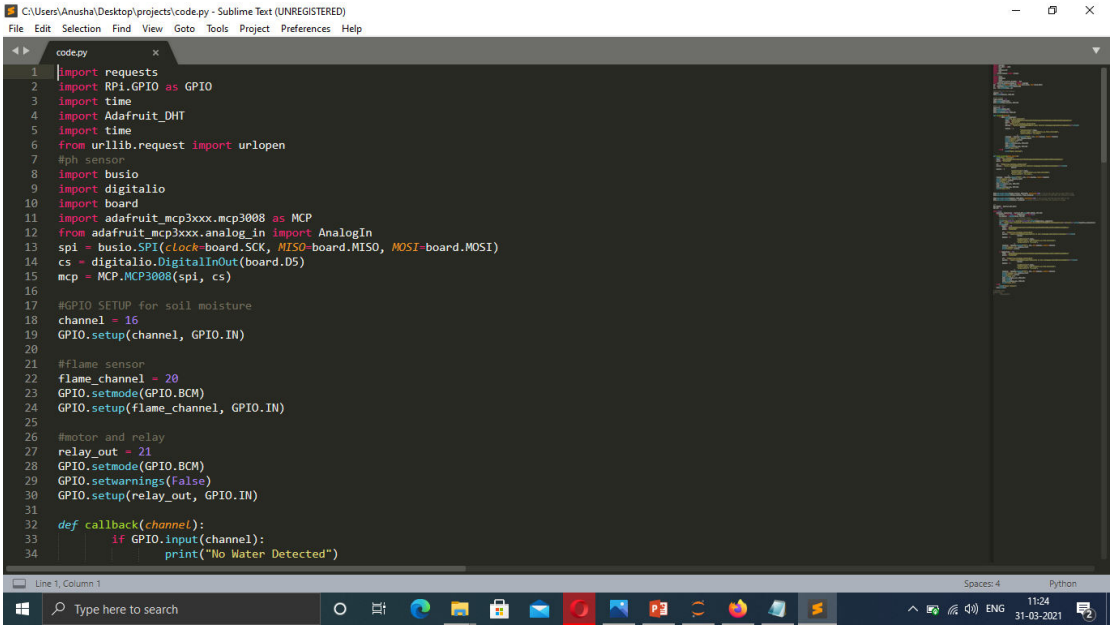
Future work:

This project can be used for trace grading and this can be improvising this project by adding extra component to the project that is weed detection by taking a particular crop and working on that particular crop. This be one of the future work that can be done.


Airtel
20:19
16%
1235
BP-TXTIND
SMS:
No Water Detected
- Sent via TXTIND
SMS:
No Water Detected
- Sent via TXTIND
SMS:
No Water Detected
- Sent via TXTIND
SMS:
fire detected
- Sent via TXTIND
SMS:
No Water Detected
- Sent via TXTIND
SMS:
fire detected
- Sent via TXTIND
Filtered by SMS Filter
Text Message


Airtel
20:19
16%
1234
BP-TXTIND
SMS:
humidity is less
- Sent via TXTIND
SMS:
humidity is less
- Sent via TXTIND
SMS:
humidity is less
- Sent via TXTIND
SMS:
humidity is less
- Sent via TXTIND
SMS:
humidity is less
- Sent via TXTIND
Yesterday, 16:46
SMS:
humidity is less
- Sent via TXTIND
Text Message


FARMAID
Crop and Yield Prediction USING DataMining
Predict
Temperture
34
Humidity
45
Soil Moisture
34
PH value
Predict
Arhar/Tur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File Edit Selection Find View Goto Tools Project Preferences Help
code.py
import requests
import RPi.GPIO as GPIO
import time
import Adafruit_DHT
import time
from urllib.request import urlopen
#ph sensor
import busio
import digitalio
import board
import adafruit_mcp3xxx.mcp3008 as MCP
from adafruit_mcp3xxx.analog_in import AnalogIn
spi = busio.SPI(clock=board.SCK, MISO=board.MISO, MOSI=board.MOSI)
cs = digitalio.DigitalInOut(board.D5)
mcp = MCP.MCP3008(spi, cs)
#GPIO SETUP for soil moisture
channel = 16
GPIO.setup(channel, GPIO.IN)
#flame sensor
flame_channel = 20
GPIO.setmode(GPIO.BCM)
GPIO.setup(flame_channel, GPIO.IN)
#motor and relay
relay_out = 21
GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)
GPIO.setup(relay_out, GPIO.IN)
def callback(channel):
if GPIO.input(channel):
print("No Water Detected")
Line 1, Column 1
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Python
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ENG
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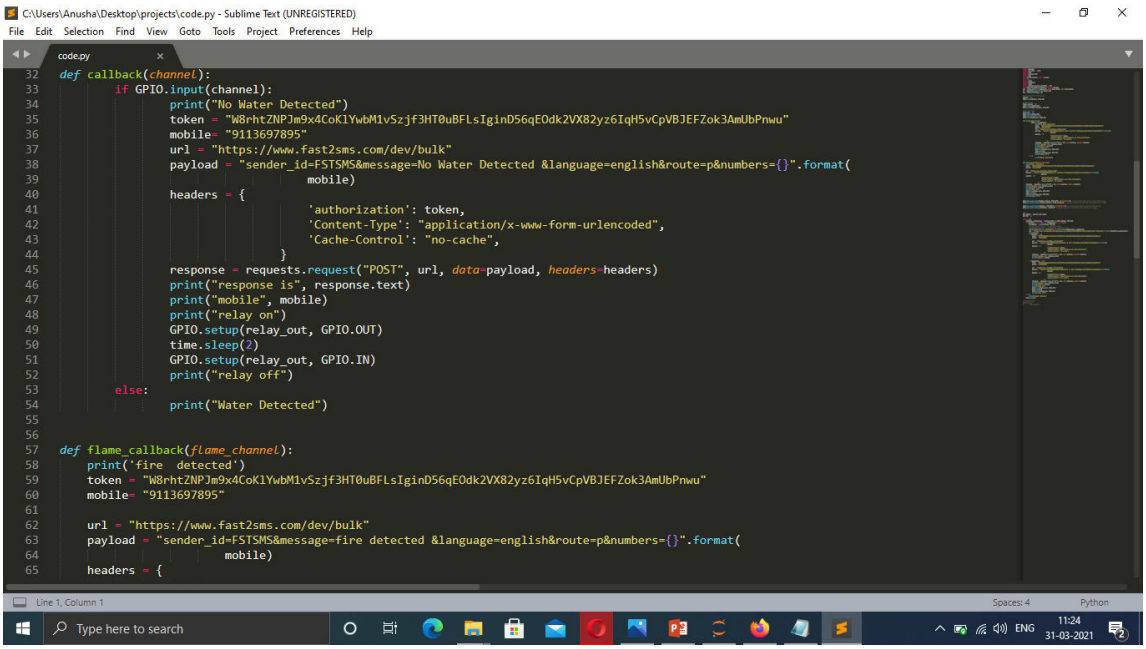
31-03-2021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code.py
def callback(channel):
if GPIO.input(channel):
print("No Water Detected")
token = "W8rhtZNPJm9x4CoKlYwbM1vSzjf3HT0uBFLsIginD56qEOdk2VX82yz6IqH5vCpVBJEFZok3AmUbPnwu"
mobile= "9113697895"
url = "https://www.fast2sms.com/dev/bulk"
payload = "sender_id=FSTSMS&message=No Water Detected &language=english&route=p&numbers={}".format(
mobile)
headers = {
'authorization': token,
'Content-Type': "application/x-www-form-urlencoded",
'Cache-Control': "no-cache",
}
response = requests.request("POST", url, data=payload, headers=headers)
print("response is", response.text)
print("mobile", mobile)
print("relay on")
GPIO.setup(relay_out, GPIO.OUT)
time.sleep(2)
GPIO.setup(relay_out, GPIO.IN)
print("relay off")
else:
print("Water Detected")
def flame_callback(flame_channel):
print('fire detected')
token = "W8rhtZNPJm9x4CoKlYwbM1vSzjf3HT0uBFLsIginD56qEOdk2VX82yz6IqH5vCpVBJEFZok3AmUbPnwu"
mobile= "9113697895"
url = "https://www.fast2sms.com/dev/bulk"
payload = "sender_id=FSTSMS&message=fire detected &language=english&route=p&numbers={}".format(
mobile)
headers = {
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Python
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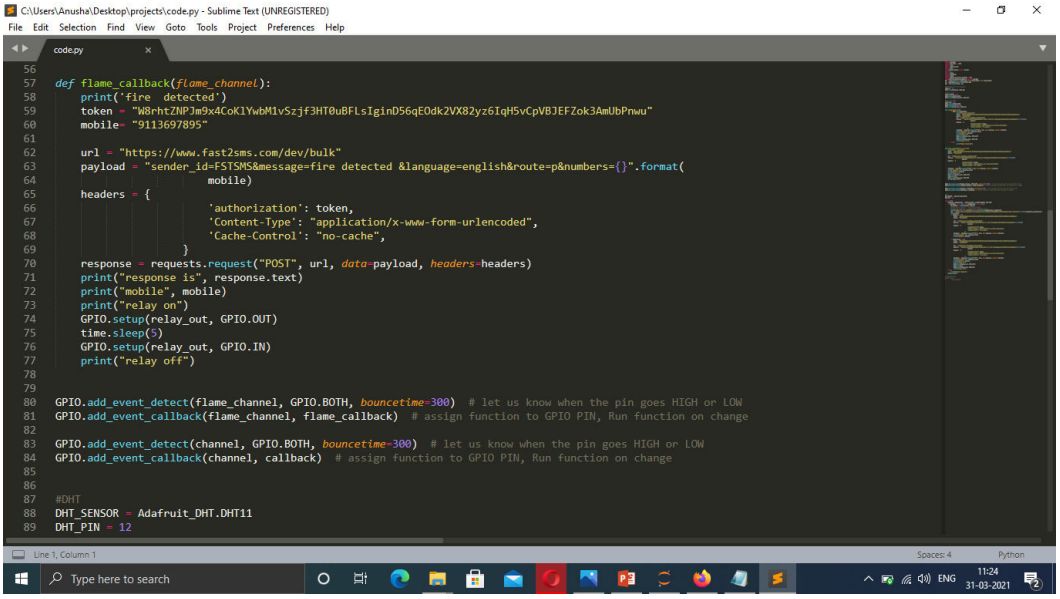
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code.py
def flame_callback(flame_channel):
print('fire detected')
token = "W8rhtZNPJm9x4CoKlYwbM1vSzjf3HT0uBFLsIginD56qEOdk2VX82yz6IqH5vCpVBJEFZok3AmUbPnwu"
mobile= "9113697895"
url = "https://www.fast2sms.com/dev/bulk"
payload = "sender_id=FSTSMS&message=fire detected &language=english&route=p&numbers={}".format(
mobile)
headers = {
'authorization': token,
'Content-Type': "application/x-www-form-urlencoded",
'Cache-Control': "no-cache",
}
response = requests.request("POST", url, data=payload, headers=headers)
print("response is", response.text)
print("mobile", mobile)
print("relay on")
GPIO.setup(relay_out, GPIO.OUT)
time.sleep(5)
GPIO.setup(relay_out, GPIO.IN)
print("relay off")
GPIO.add_event_detect(flame_channel, GPIO.BOTH, bouncetime=300) # let us know when the pin goes HIGH or LOW
GPIO.add_event_callback(flame_channel, flame_callback) # assign function to GPIO PIN, Run function on change
GPIO.add_event_detect(channel, GPIO.BOTH, bouncetime=300) # let us know when the pin goes HIGH or LOW
GPIO.add_event_callback(channel, callback) # assign function to GPIO PIN, Run function on change
#DHT
DHT_SENSOR = Adafruit_DHT.DHT11
DHT_PIN = 12
Line 1, Column 1
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Python
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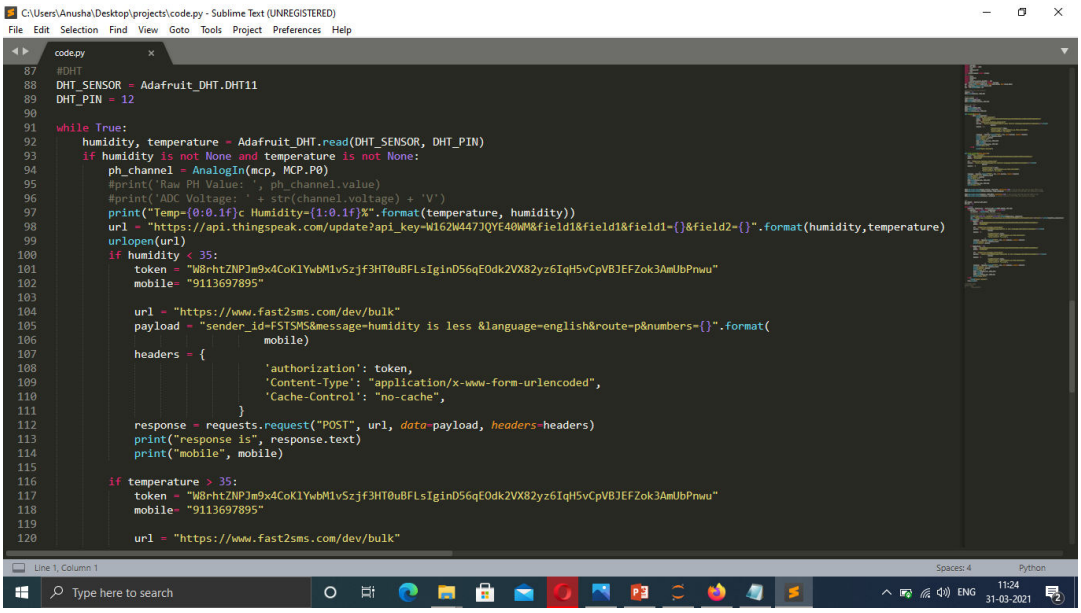
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code.py
#DHT
DHT_SENSOR = Adafruit_DHT.DHT11
DHT_PIN = 12
while True:
humidity, temperature = Adafruit_DHT.read(DHT_SENSOR, DHT_PIN)
if humidity is not None and temperature is not None:
ph_channel = AnalogIn(mcp, MCP.P0)
#print('Raw PH Value: ', ph_channel.value)
#print('ADC Voltage: ' + str(channel.voltage) + 'V')
print("Temp={0:0.1f}c Humidity={1:0.1f}%".format(temperature, humidity))
url = "https://api.thingspeak.com/update?api_key=W162W447JQYE40WM&field1&field1={}&field2={}".format(humidity,temperature)
urlopen(url)
if humidity < 35:
token = "W8rhtZNPJm9x4CoK1YwbM1vSzjf3HT0uBFLsIginD56qEOdk2VX82yz6IqH5vCpVBJEFZok3AmUbPnwu"
mobile= "9113697895"
url = "https://www.fast2sms.com/dev/bulk"
payload = "sender_id=FSTSMS&message=humidity is less &language=english&route=p&numbers={}".format(
mobile)
headers = {
'authorization': token,
'Content-Type': "application/x-www-form-urlencoded",
'Cache-Control': "no-cache",
}
response = requests.request("POST", url, data=payload, headers=headers)
print("response is", response.text)
print("mobile", mobile)
if temperature > 35:
token = "W8rhtZNPJm9x4CoK1YwbM1vSzjf3HT0uBFLsIginD56qEOdk2VX82yz6IqH5vCpVBJEFZok3AmUbPnwu"
mobile= "9113697895"
url = "https://www.fast2sms.com/dev/bulk"
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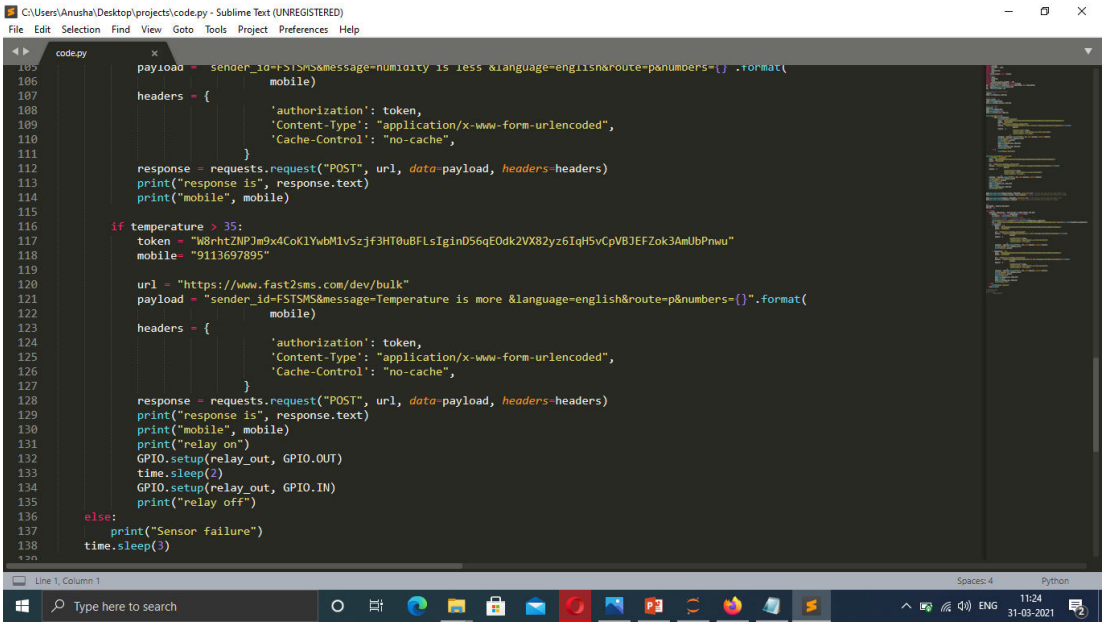
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code.py
payload = "sender_id=FSTSMS&message=humidity is less &language=english&route=p&numbers={}".format(
mobile)
headers = {
'authorization': token,
'Content-Type': "application/x-www-form-urlencoded",
'Cache-Control': "no-cache",
}
response = requests.request("POST", url, data=payload, headers=headers)
print("response is", response.text)
print("mobile", mobile)
if temperature > 35:
token = "W8rhtZNPJm9x4CoK1YwbM1vSzjf3HT0uBFLsIginD56qEOdk2VX82yz6IqH5vCpVBJEFZok3AmUbPnwu"
mobile= "9113697895"
url = "https://www.fast2sms.com/dev/bulk"
payload = "sender_id=FSTSMS&message=Temperature is more &language=english&route=p&numbers={}".format(
mobile)
headers = {
'authorization': token,
'Content-Type': "application/x-www-form-urlencoded",
'Cache-Control': "no-cache",
}
response = requests.request("POST", url, data=payload, headers=headers)
print("response is", response.text)
print("mobile", mobile)
print("relay on")
GPIO.setup(relay_out, GPIO.OUT)
time.sleep(2)
GPIO.setup(relay_out, GPIO.IN)
print("relay off")
else:
print("Sensor failure")
time.sleep(3)
Line 1, Column 1
Spaces: 4
Python
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ENG
11:24
31-03-2021

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- S.Sivachandran, K.Balakrishnan, K.Navin, "Real Time Embedded Based Soil Analyser", International Research Journal of Engineering and Technology(IRJET). Volume:3Issue3| March2014
- https://www.ijert.org/agricultural-crop-monitoring-sensors-using-iot-a-study
- Crop Prediction using Machine Learning Proceedings of the Third International Conference on Smart Systems and Inventive Technology (ICSSIT 2020) IEEE Xplore Part Number: CFP20P17-ART; ISBN: 978-1-7281-5821-1
- Crop Prediction Using Machine Learning Kevin Tom Thomas1 , Varsha S2 , Merin Mary Saji3 , Lisha Varghese4 , Er. Jinu Thomas5 1,2,3,4 UG students Department Computer Engineering, SAINTGITS College of Engineering, APJ ABDUL KALAM TECHNOLOGICAL University, Kerala, India 5Asst. Prof. Department Computer Engineering, SAINTGITS College of Engineering, APJ ABDUL KALAM TECHNOLOGICAL University, Kerala, India
- Wireless Agriculture Monitoring using Raspberry Pi International Journal of Engineering Research & Technology (IJERT) http://www.ijert.org ISSN: 2278-0181 IJERTV6IS050217 (This work is licensed under a Creative Commons Attribution 4.0 International License.) Published by : www.ijert.org Vol. 6 Issue 05, May – 2017
- Raspberry pi based real time monitoring of Agriculture & Irrigation Using IOT Athira P. Shaji MTech Student Computer Science and Engineering, School Of Computer Sciences, MG University , Kottayam , india© IJEDR 2018 | Volume 6, Issue 2 | ISSN: 2321-9939
- Internet of Things for Precision Agriculture Applications 2019 Fifth International Conference on Image Information Processing (ICIIP)
- IOT BASED SMART CROP-FIELD MONITORING AND AUTOMATION IRRIGATION SYSTEM Proceedings of the Second International Conference on Inventive Systems and Control (ICISC 2018) IEEE Xplore Compliant - Part Number:CFP18J06-ART, ISBN:978-1-5386-0807-4; DVD Part Number:CFP18J06DVD, ISBN:978-1-5386-0806-7