IoT Based Intelligent Farming

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ABSTRACT

Internet of Things (IoT) is a technology that allows things to communicate and connect with eachother. Change the patterns and processes in both industry and agriculture towards higher efficiency. An intelligent farming system (IF) helps to improve the growth in farming. IF composesof two main parts which are a sensor system and a control system. The control part which wateringand roofing systems of an outdoor farm based on the statistical data sensed from the sensor systems. A set of decision rules based on the sensed data is developed to automatically decide onwhether the watering and roofing system should be on or off. As the energy demand and the environmental problems increase, natural energy sources have become very important as an alternative to conventional energy sources. The renewable energy sector is fast gaining ground asa new growth area for numerous countries.

The latest generation of convolutional neural networks (CNNs) has achieved impressive results inthe field of image classification. This project is concerned with a new approach to developing a plant disease recognition model, based on leaf image classification, by the use of deep convolutional networks. A novel way of training and the methodology used to facilitate a quick and easy system implementation in practice. The developed model can recognize three types of diseases of one plant and pesticides and/or fertilizers are advised according to the severity of the diseases. The type of green leaf disease is recognized by CNN. After recognition, the predictive remedy is suggested to help agriculture-related people and organizations to take appropriate actions against these diseases.

1.INTRODUCTION

Agriculture is one of the most important businesses that mainly affects mankind from the ancient to the agricultural revolution in Great Britain England, farming is the way that humans used to harvest plants and consumed them in their daily life. Farming has been improved by many technologies. The supporting cropping system. In addition to the technologies in the agricultural revolution era, there have been many technologies that have impacts on agriculture such as harvestmachine, seed drill machine, reaper machine, and the others that can reduce manpower and wastetime. Recently Internet has been involved in people's daily activities.
The Internet has been widely used to connect people together, people with devices, or devices withdevices. In an electronics device, it is embedded with software and sensors for use to commutate and to exchange data with other devices and people. When millions of devices are connected together through the Internet, this is called the Internet of Things (loT). It encompasses many newintelligent concepts for use in the near future such as smart home, smart city, smart transportation,and smart farming

2. RELATED WORK

Image acquisition, preprocessing of images, extraction of features, recognition, and order of plantinfection are the essential strides for ailment discovery utilizing image Processing. High quality and clarity of enhanced images compared to the original image The created handling plan comprises four primary stages as in the accompanying two stages are included progressively afterthe division stage. In the initial step, we recognize the mostly green-hued pixels. Next, these pixelsare concealed dependent on explicit limit esteems that are processed utilizing Otsu's technique, atthat point those for the most part green pixels are veiled. The other extra advance is that the pixels with zeros red, green, and blue qualities and the pixels on the limits of the tainted group (object) were expelled. The trial results exhibit that the proposed strategy is a powerful procedure for the location of plant leaves infections. They created algorithms proficiency can effectively recognizeand arrange the inspected illnesses [1].

The primary colors of the color image are red, green, and blue. Because of its range, it is hard to implement the application using RGB. They, therefore, convert RGB to gray pictures. Detection of plant disease by some automatic technique is beneficialas it reduces extensive monitoring work in large crop farms and distinguishes the side effects of the illness itself at very early stages, they presented a survey on different techniques of classification [2].

Abdul Bari et al used MATLAB in their paper to extract and recover images. The digital camera is used to capture images here [3].

Prashant and Mrunalini.R. Deshmukh compares the threshold of Otsu and the K is the clustering algorithm for the analysis of infected leaves. K's clarity means clustering is more precise than any other method[4].

In his paper, J.K. Patil describes how low-level image features such as color and texture can be extracted [5].

In his paper, Anand Kulkarni discusses the Gabor filter and ANN respectively for feature extraction and classification [6].

An Overview of the Research on Plant Leaves Disease location utilizing Image Processing Techniques by Kiran R. Gavhale, and U. Gawande, Gavhale and Gawande (2014) introduced audits and outlines picture preparing procedures for a few plant animal groups that havebeen utilized for perceiving plant illnesses.The real systems for identification of plant infections are the back proliferation neural system (BPNN), Support Vector Machine (SVM), K-closest neighbor (KNN), and Spatial Gray-level Dependency Matrices (SGDM). These strategies are utilized to investigate the solid and ailing plant’s leaves [7].

Astute Diagnose System of Wheat Diseases Based on Android Phone by Y. Q. Xia, Y. Li, and C. Li, in 2015, Xia and Li have proposed the android structure of shrewd wheat ailments analysis framework. In this procedure, clients gather pictures of wheat maladies utilizing Android telephones and send the pictures over the system International Journal of Pure and Applied Mathematics Volume 119 No. 14 2018, 879-884 ISSN: 1314-3395 (on-line adaptation) URL: http://www.ijpam.eu Special Issue ijpam.EU 879to the server for sickness determination. Subsequent to accepting illness pictures, the server performs picture division by changing over the pictures from RGB shading space to HSI shadingspace. The shading and surface highlights

of the sicknesses are to be controlled by utilizing the shading minute framework and the dark dimension co-event grid. The favored highlights are a contribution to the help vector machine for acknowledgment and the recognizable proof outcomesare encouraged back to the customer [8].

Usage of RGB and Grayscale pictures in plant leaves malady discovery – a similar investigationby Padmavathi and Thangadurai (2016) has given the near consequences of RGB and Grayscalepictures in the leaf ailment discovering process. In recognizing the contaminated leaves, shadingturns into a vital component to discovering the malady power. They have considered Grayscaleand RGB pictures and utilized the middle channel for picture improvement and division forextraction of the sick bit which is utilized to recognize the sickness level. The plant ailmentacknowledgment display, in view of leaf picture order, by the utilization of profound convolutionsystems has created. 13 sorts of infections are distinguished from the solid leaves with the abilityto separate leaves from their environment [9].

Khirade et al. have examined some divisionsand highlighted extraction calculations that can be utilized for the recognition of plant maladiesby utilizing the picture of their leaves. It is hard to recognize plant infections physically becauseof the prerequisite of unreasonable time, learning of plant illnesses, and many measures of work.The creator has separated the whole procedure of plant leaf infection's location into five stages:Image securing, Preprocessing, Segmentation, Feature extraction, and Final arrangement of maladies. Picture procurement utilized the changing structure for the RGB leaf pictures. At thatpoint, the picture is pre-prepared to evacuate the commotion and upgrade the picture differentiates.The division is accomplished for the parceling of pictures into different component parts utilizing k-implies grouping, Otsu channels, and so forth. This fragmented picture is additionally utilized for highlight extraction and after that last order is performed utilizing different arrangementprocedures. Along these lines, plant infections can be proficiently distinguished [10].

Sannakki et al.have utilized a feed-forward back engendering Neural Network-based method for the determination and order of sicknesses in grape leaves. Creator has utilized the pictures of the grapeleaf with a complex foundation for the finding as info. Further anisotropic dissemination is utilizedto expel the clamor of the picture which is additionally divided utilizing k-implies grouping. At long last outcomes are watched utilizing a neural system. Results are investigated wool mold andfine buildup pictures with reproduction in MATLAB. the array network is considered with thegenuinely positive and false-positive parameters for
the approval of results. The creator professedto have the preparation exactness of 100% whenever utilized tint includes alone [11].

Kutty et al. have utilized the neural system-based framework to order the watermelon leaf illnesses of Downey Mildew and Anthracnose. Creator has determined the genuine positive rate, genuine negative rate,and in general exactness for the proficiency of the proposed idea This arrangement depends on theshading highlight extraction from the RGB shading model which is acquired from the recognizedpixels in the district of intrigue.

The general execution is portrayed with ROC bend having an AUCestimation of 0.5. The genuine

characterization result likewise delineates the estimation of 75.9%.[12]

Rothe et al. have proposed design acknowledgment strategies for the discovery and order ofcotton leaf illnesses of Alternaria, Myrothecium, and Bacterial Blight. The dataset pictures aretaken from the field of Central Institute of Cotton Research Nagpur. Dynamic form-based divisioncalculation is utilized for the violation of unhealthy spots. Creator has likewise recommended somecomponent bearings to the comparable idea for the harvests of wheat, orange, citrus and maize,and so on. [13]

Pearson, Roger C et al Among all plant leaf sicknesses, those brought about byinfections are the hardest to analyze, infections produce no indications that can promptly bewatched and regularly effectively mistook for supplement lacks and herbicide injury[14].

3. SYSTEM ANALYSIS WITH BLOCK DIAGRAM

In System analysis, firstly concentrated on recognizing the green leaf diseases which assist the farmersto take proper measurements and increase the production of plants. So, It will start the analysis by collecting a Leaf dataset where the processing is also done on the test image. Secondly, It trains the Leaf dataset, Training the Leaf dataset is used to train the model (CNN) so that it can identify the testimage and the disease it has. Where CNN has different layers that are Dense, Dropout, Activation, Flatten, Convolution2D, and MaxPooling2D. After the model is trained successfully, the software canidentify the disease if the plant species is contained in the database. After successful training and preprocessing, a comparison of the test image and trained model takes place to predict the disease. And the automated system is proposed for the diagnosis of three common green leaf diseases (Brownspot, Leaf blast, and Bacterial blight) and pesticides and/or fertilizers are advised according to the severity of the diseases. The type of green leaf disease is recognized by CNN. After recognition, the predictive remedy is suggested to help agriculture-related people and organizations to take appropriateactions against these diseases. Successful training and preprocessing, a comparison of the test image and trained model takes place to predict the disease. The analyzed result is transmitted to the microcontroller for uploading to the IoT cloud and further measurements. A moisture sensor is used to detect soil dry and wet states. DHT11 sensor will measure temperature and humidity on the farm. Then from the IoT cloud after analyzing the leaf disease we are given the respective remedy.

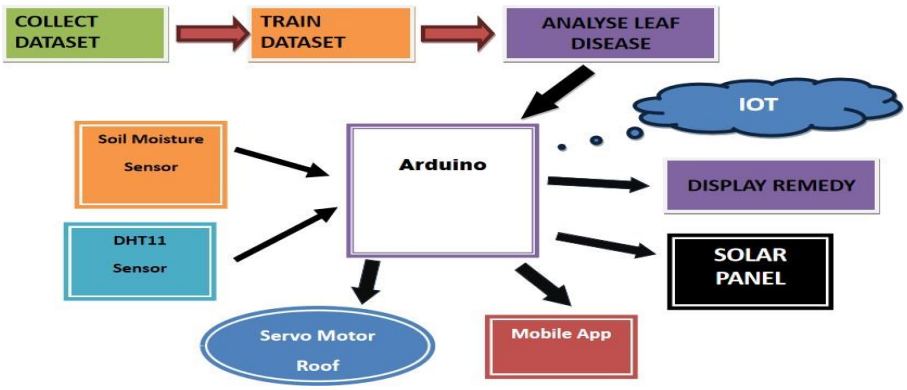


Fig:1- A working model

4. IMPLEMENTATION

A. Image Acquisition: - In acquisition process, disease images of the plants are capture through the high-resolution camera. This image is in RGB (Red, Green and Blue) form. Color conversionstructure for the RGB leaf image created and a device independent color space conversion for thecolor variation manufacture applied such as HIS model.

B. Image Pre-processing: - To remove noise in image or other object removal, image clipping i.e.cropping of the leaf image to get the interested image region. Image smoothing done using the smoothing filter. Image enhancement carried out for increasing the contrast. The nature of the image is definitive for the outcomes of examination, influencing the capacity to recognize quality under examination and accuracy of consequent estimations. Therefore, the accompanying techniques connected to obtain error free picture.

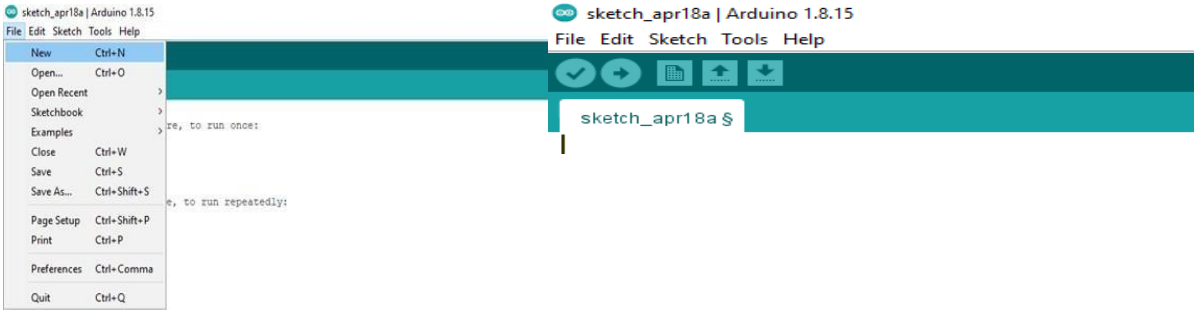
C. Feature Extraction: - The input image enhanced to protect information of the pretentious pixelsbefore color from the background. The color space equally is used to reduce effect of illuminationand distinguish between disease and non-disease leaf color inventively the resulting color pixels are clustered to acquire groups of colors in the image. The pattern is basic description of an articleor a quantitative or an element of enthusiasm for an image and one or more descriptors of an objector a substance of image from the pattern or pattern is an arrangement of descriptors. Features in pattern acknowledgment writing called descriptors. The feature is fundamental for separating a class of objects from another class. A strategy utilized to depicting the objects and the objects features highlighted. Extraction of features from the article or element of an image produces description of image.

Soil monitoring with IoT uses technology to empower farmers and producers to maximize yield, reduce disease and optimize resources. The sensors that can measure soil temperature, volumetricwater content and display the real time values to computer graphical user interface (GUI) are used. Input given through wired medium to ESP8266 NodeMCU microcontroller from sensors and output sent from microcontroller wirelessly through Blynk application integrating with Representational state transfer (REST) application program interface (API). Soil temperature sensor DS18B20 is a waterproof sensor probe that has a built in 12-bit analog to digital converter (ADC). It works on the principle of direct conversion of temperature into a digital value and storingthis value in 2-byte scratchpad memory. The scratchpad memory then read via the One-wire bus (via data line) by the Dallas library in the program. DS18B20 has three pins in total, which are Pin1 (Vcc), Pin2 (Data Pin) and Pin3 (Gnd). Soil Moisture Sensor (SMS) is an analog type interface sensor using capacitance to measure dielectric permittivity of the surrounding medium. In soil, dielectric permittivity is a function of the water content. The sensor module consists of twoprobes that use to measure the volumetric content of water. When there is more water, soil conduct electricity, which means there will be less resistance therefore moisture

value will be high and vice versa. The two probes act as a potentiometer that use threshold value. This threshold value compared with the sensor output value using the LM393 comparator on the sensor module.

STEPS TO IMPLEMENT THE PROJECT

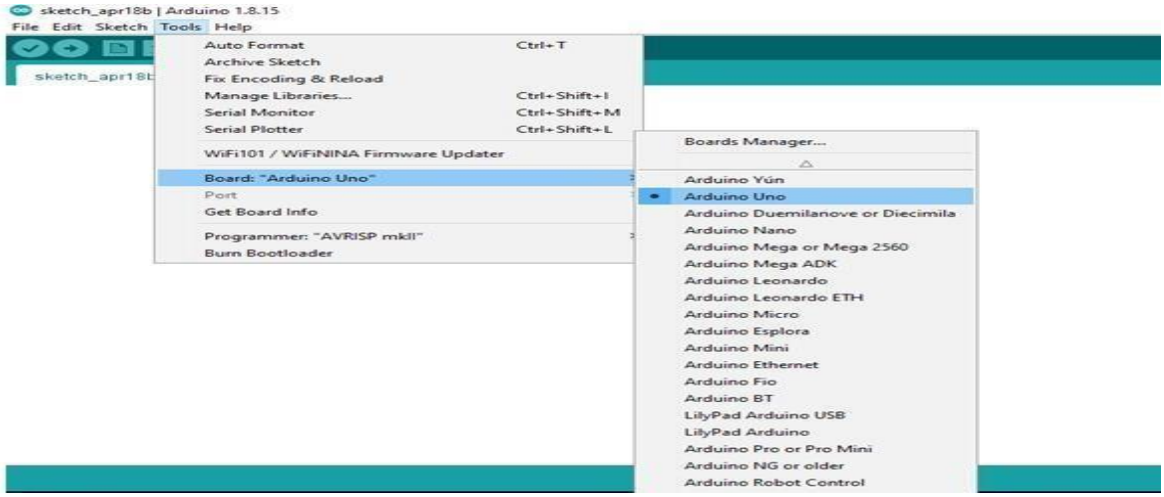
Step – 1: To create a new project, select **-> New**

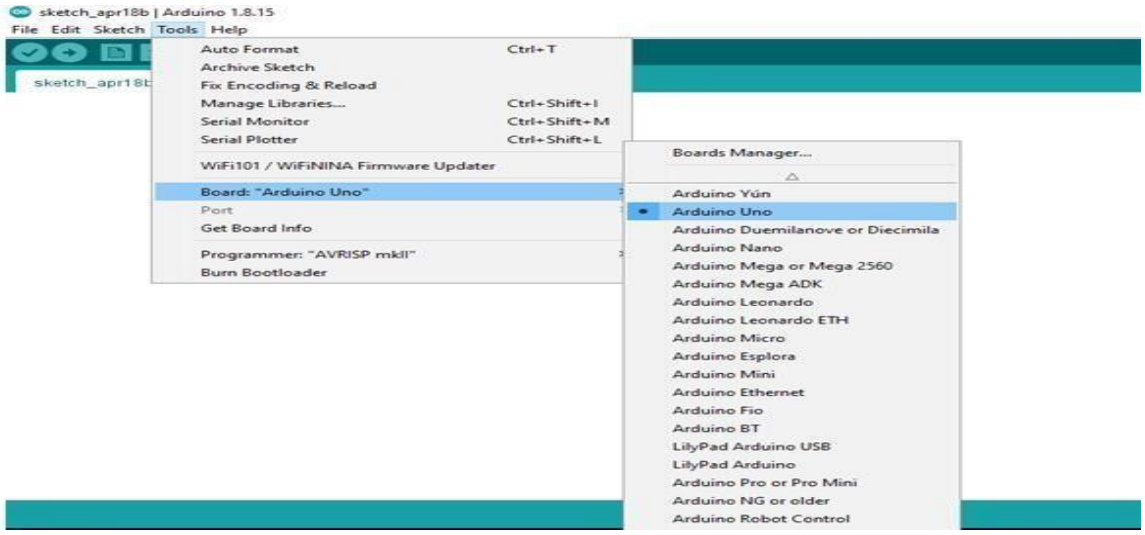


Step – 2: To open an existing project example, select File-> Example ->Basics->blink

Step- 3 : Select your Arduino Uno

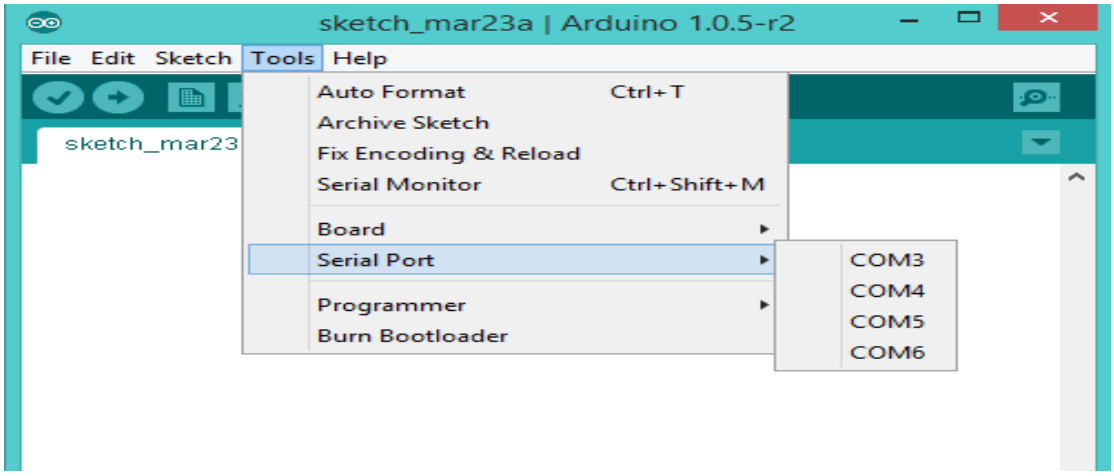
Go to **Tools ->Board** and select your board



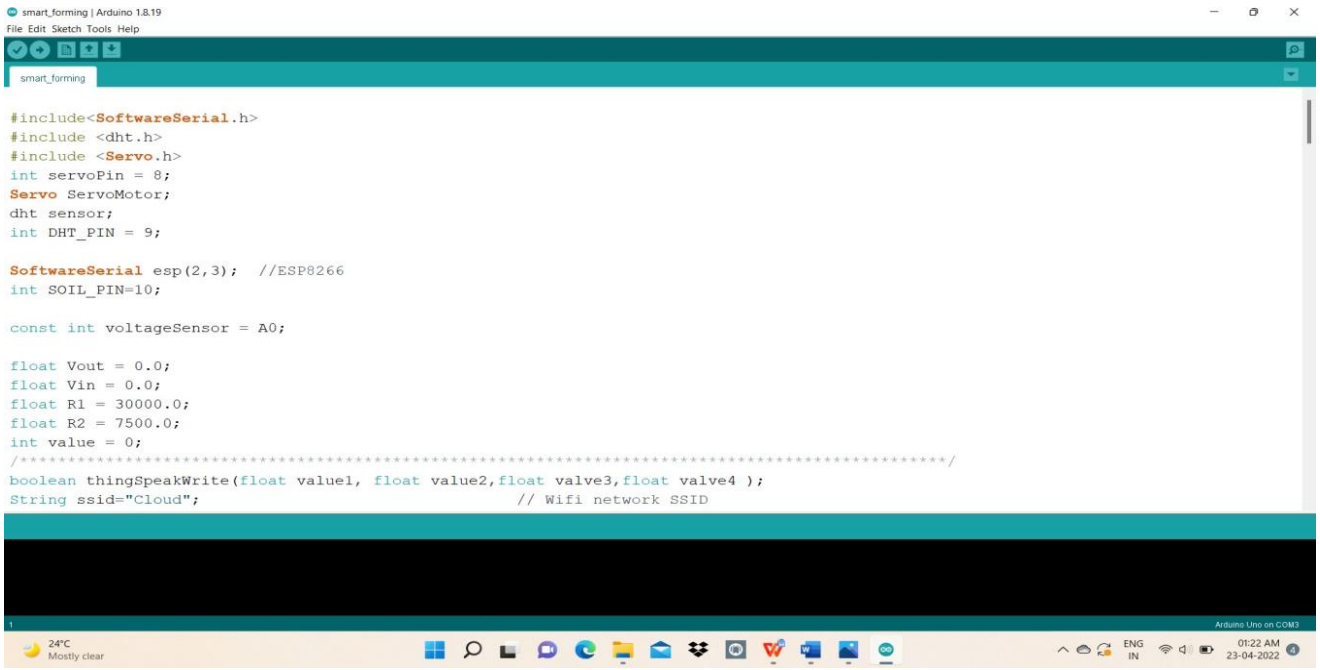


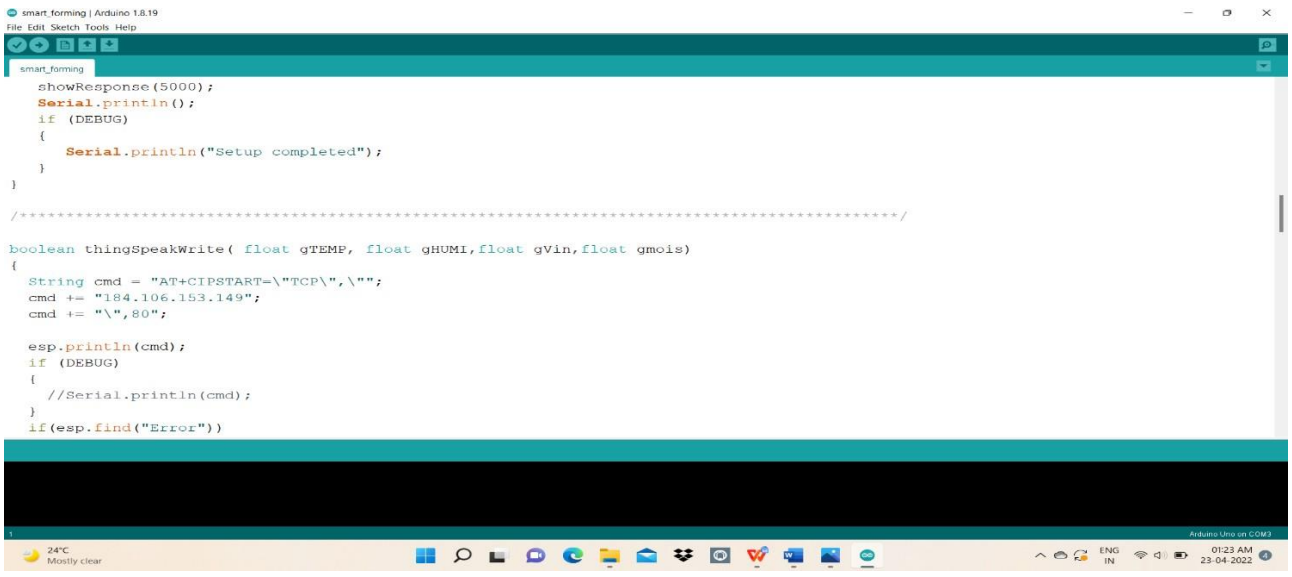
Step- 4 : Select your serial port as COM 3

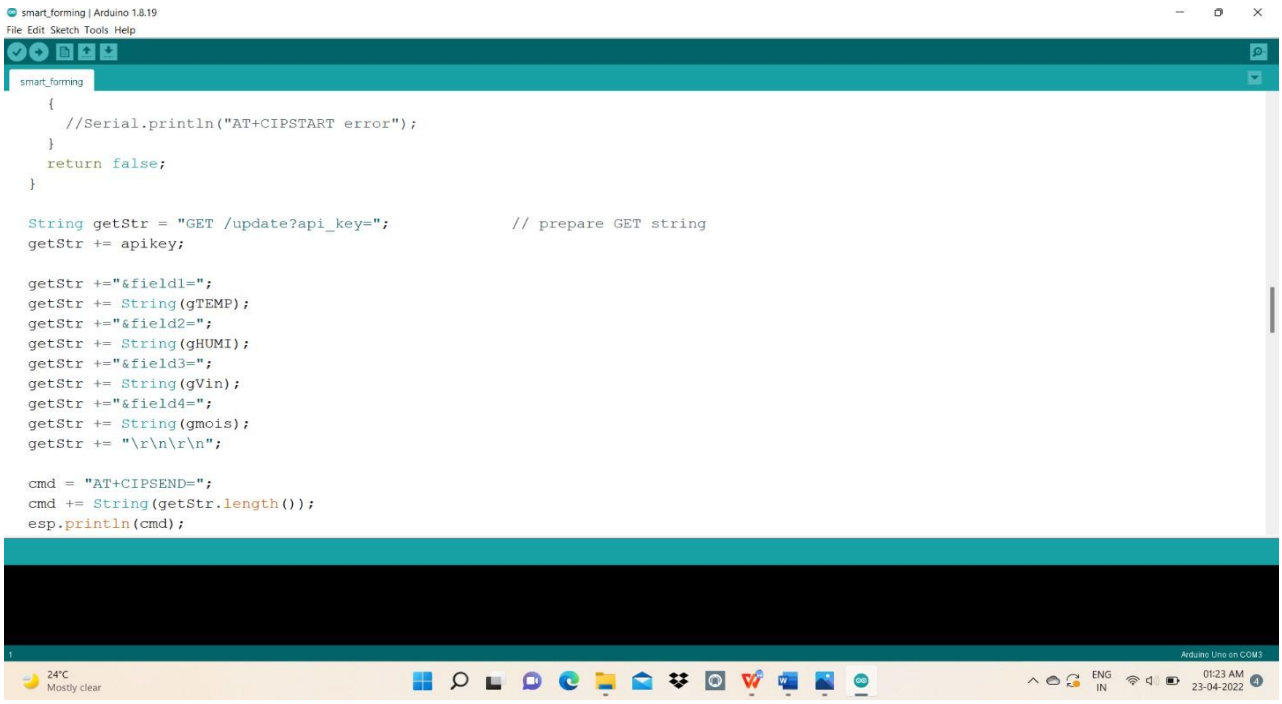
Tools->Serial port

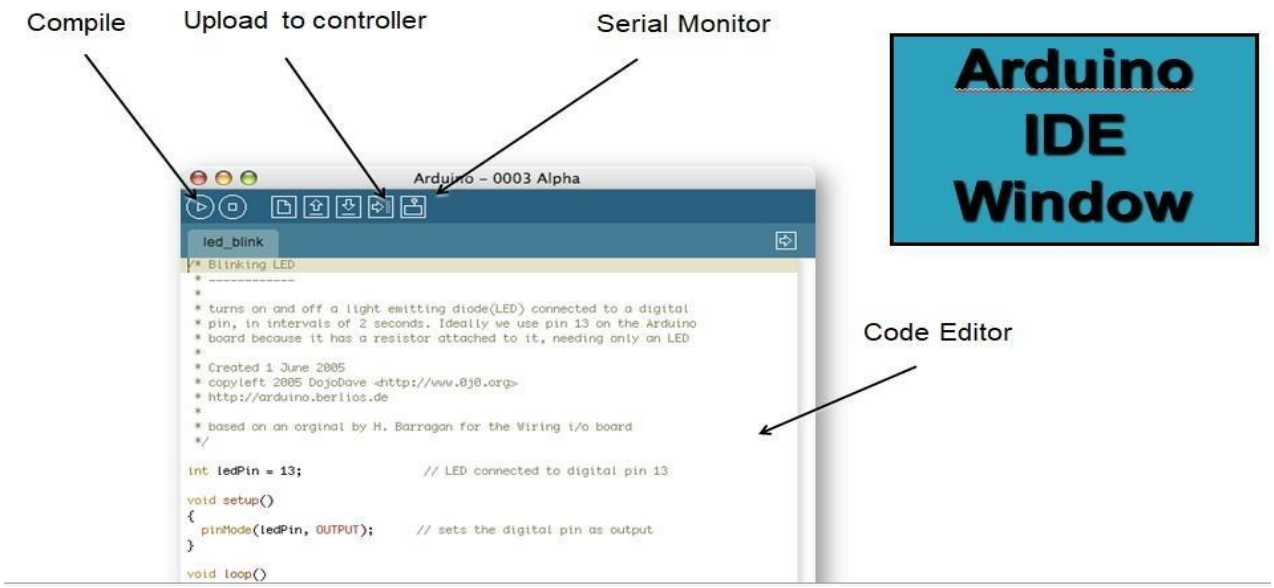


Step- 5 : Upload and Compile the program to your board

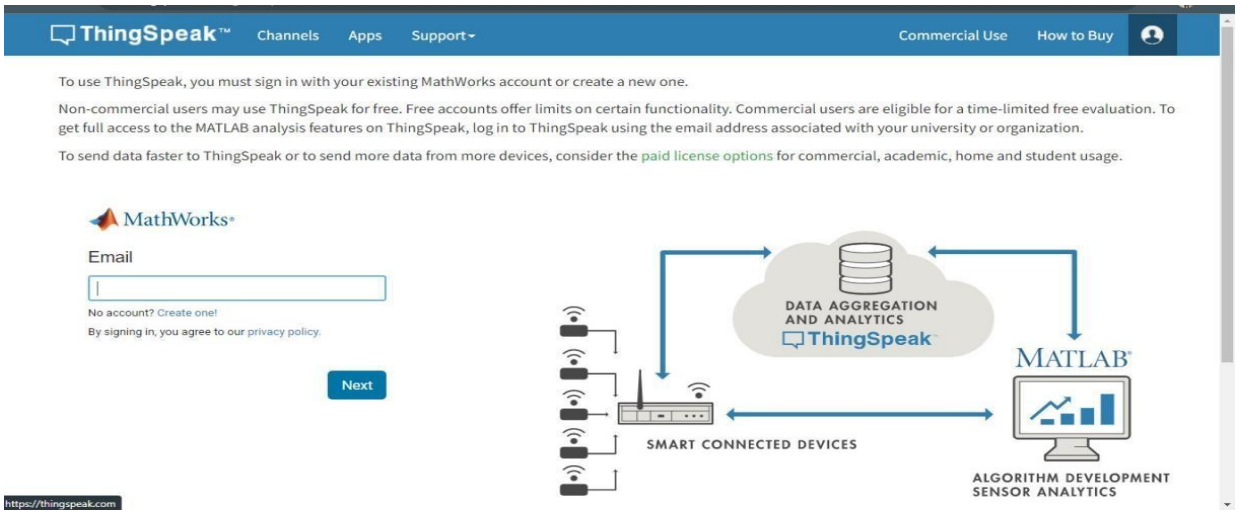




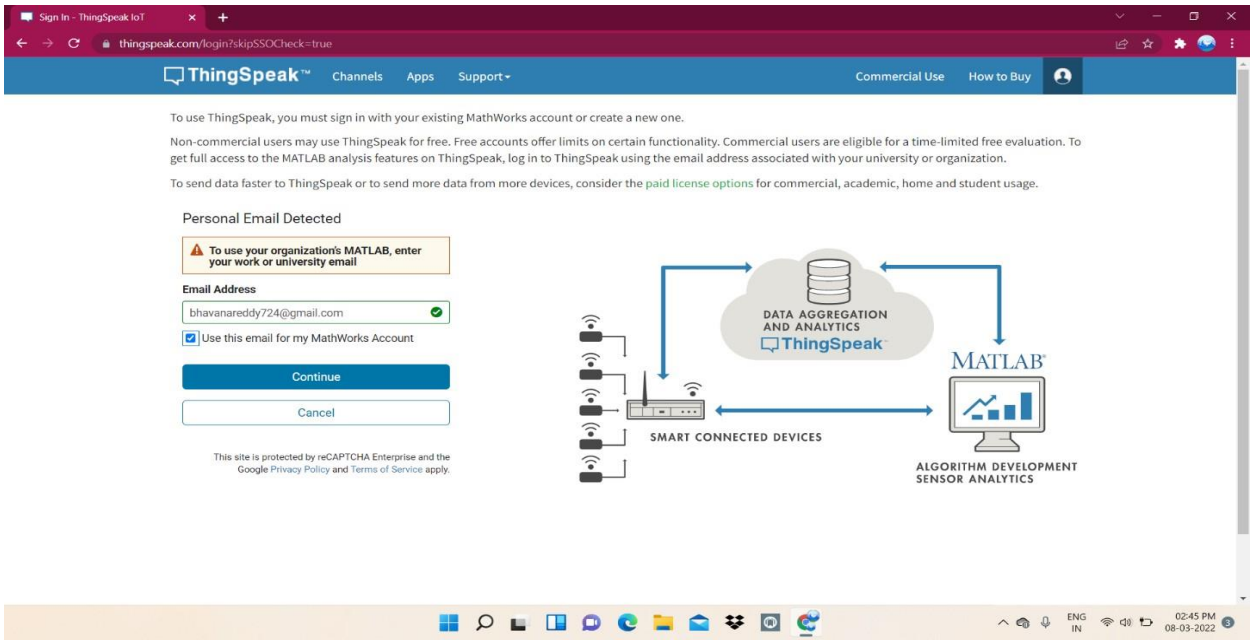

smart_forming | Arduino 1.8.19
File Edit Sketch Tools Help
smart_forming
{
//Serial.println("AT+CIPSTART error");
}
return false;
}
String getStr = "GET /update?api_key=";
// prepare GET string
getStr += apikey;
getStr +="&field1=";
getStr += String(gTEMP);
getStr +="&field2=";
getStr += String(gHUMI);
getStr +="&field3=";
getStr += String(gVin);
getStr +="&field4=";
getStr += String(gmois);
getStr += "\r\n\r\n";
cmd = "AT+CIPSEND=";
cmd += String(getStr.length());
esp.println(cmd);
Arduino Uno on COM3
24°C
Mostly clear
ENG
IN
01:23 AM
23-04-2022


Compile
Upload to controller
Serial Monitor
Arduino
IDE
Window
Arduino – 0003 Alpha
led_blink
/* Blinking LED
* turns on and off a light emitting diode(LED) connected to a digital
* pin, in intervals of 2 seconds. Ideally we use pin 13 on the Arduino
* board because it has a resistor attached to it, needing only an LED
* Created 1 June 2005
* copyleft 2005 DojoDave <http://www.0j0.org>
* http://arduino.berlios.de
* based on an orginal by H. Barragan for the Wiring i/o board
*/
int ledPin = 13;
// LED connected to digital pin 13
void setup()
{
pinMode(ledPin, OUTPUT);
// sets the digital pin as output
}
void loop()
Code Editor

Step- 6 Go to things speak (Cloud Backend)



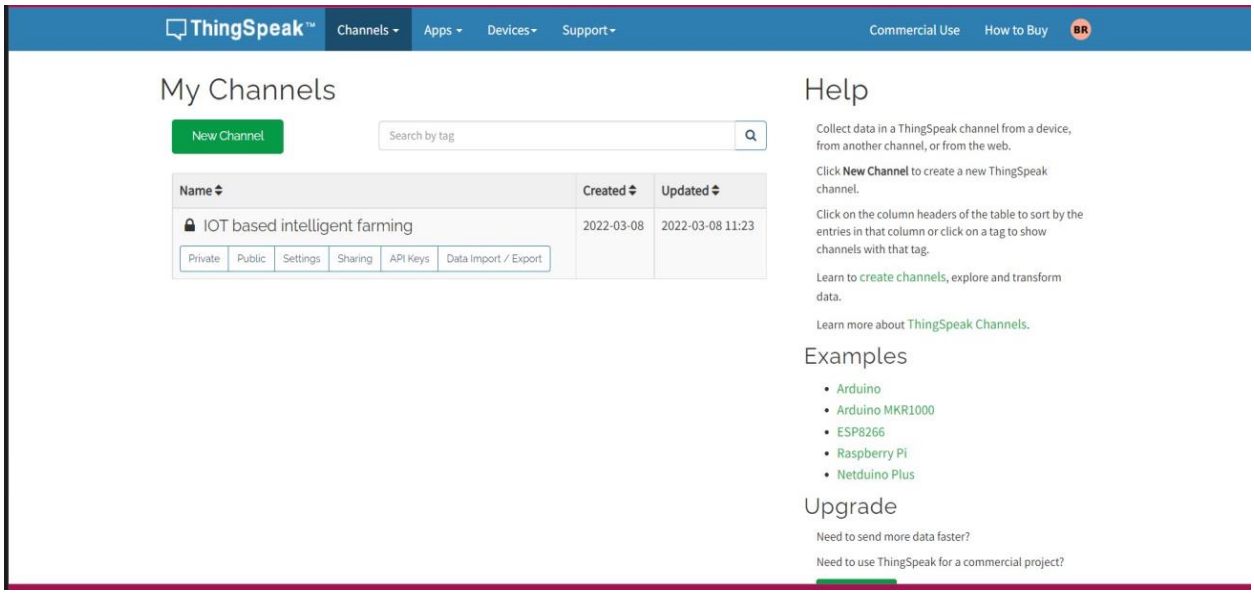
Step- 7 Give your credentials



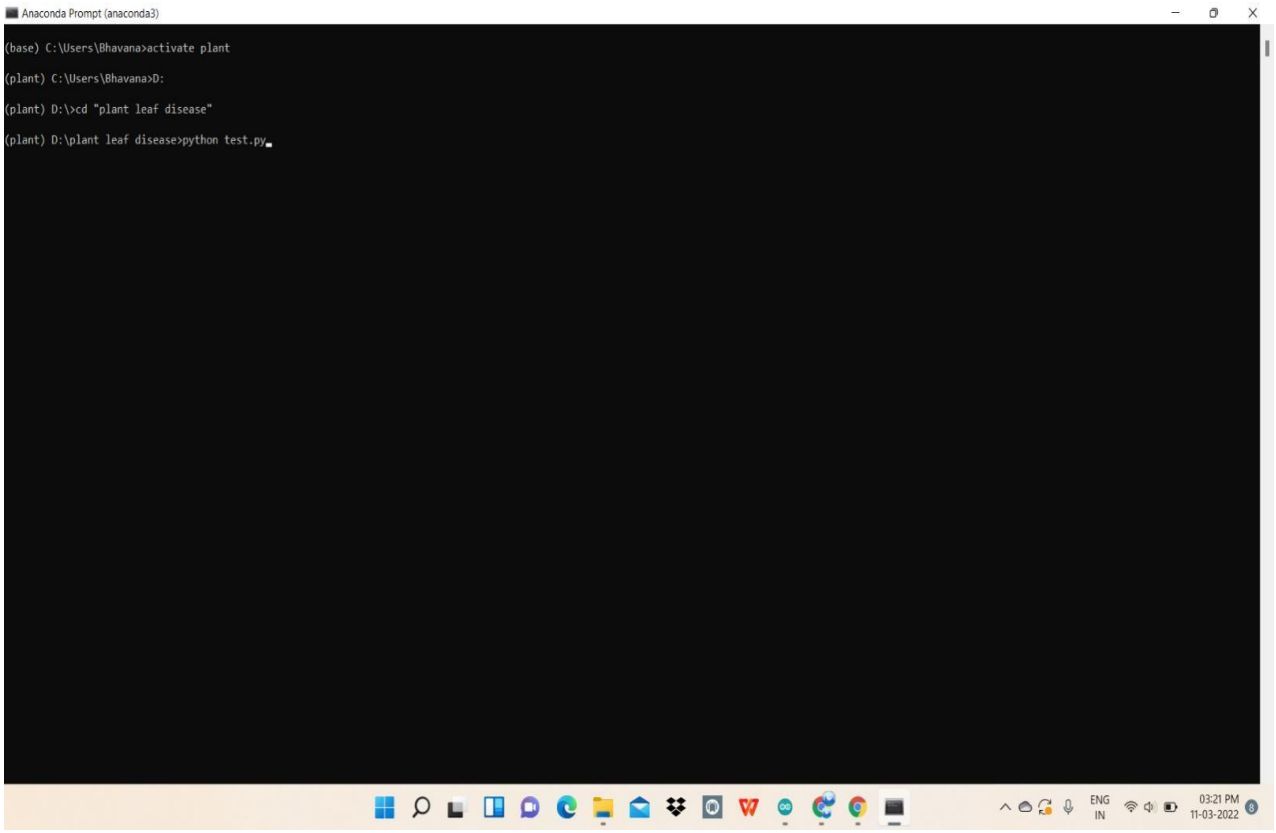
Step- 7 Give your password

Step- 8 Create a Channel

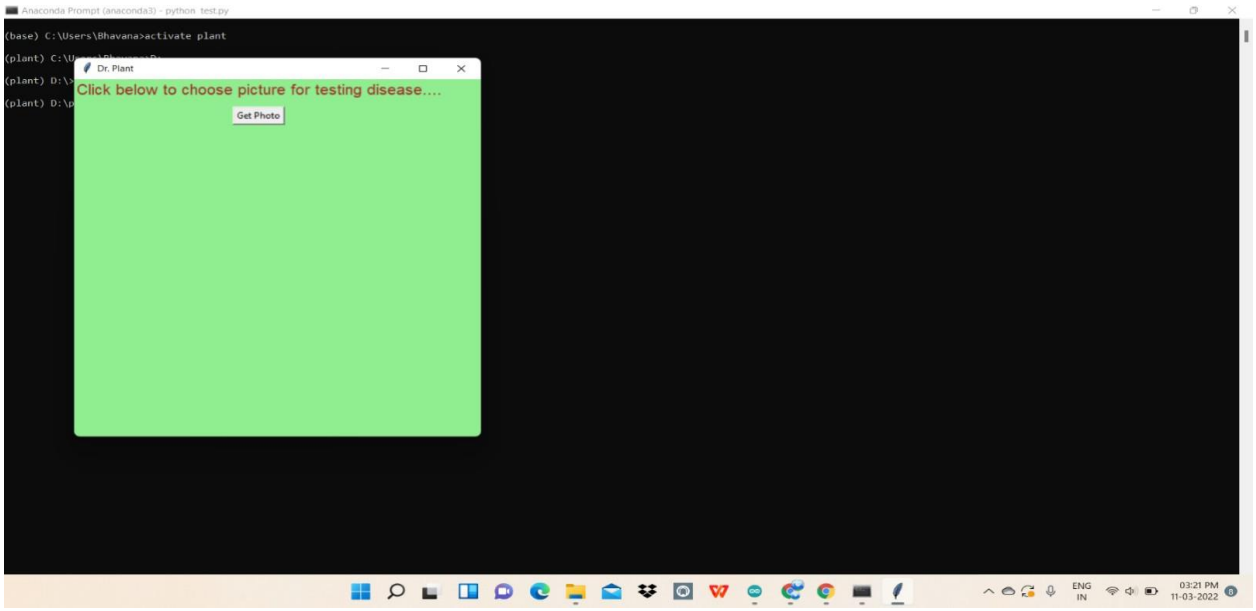
Step- 9 Channel has been created



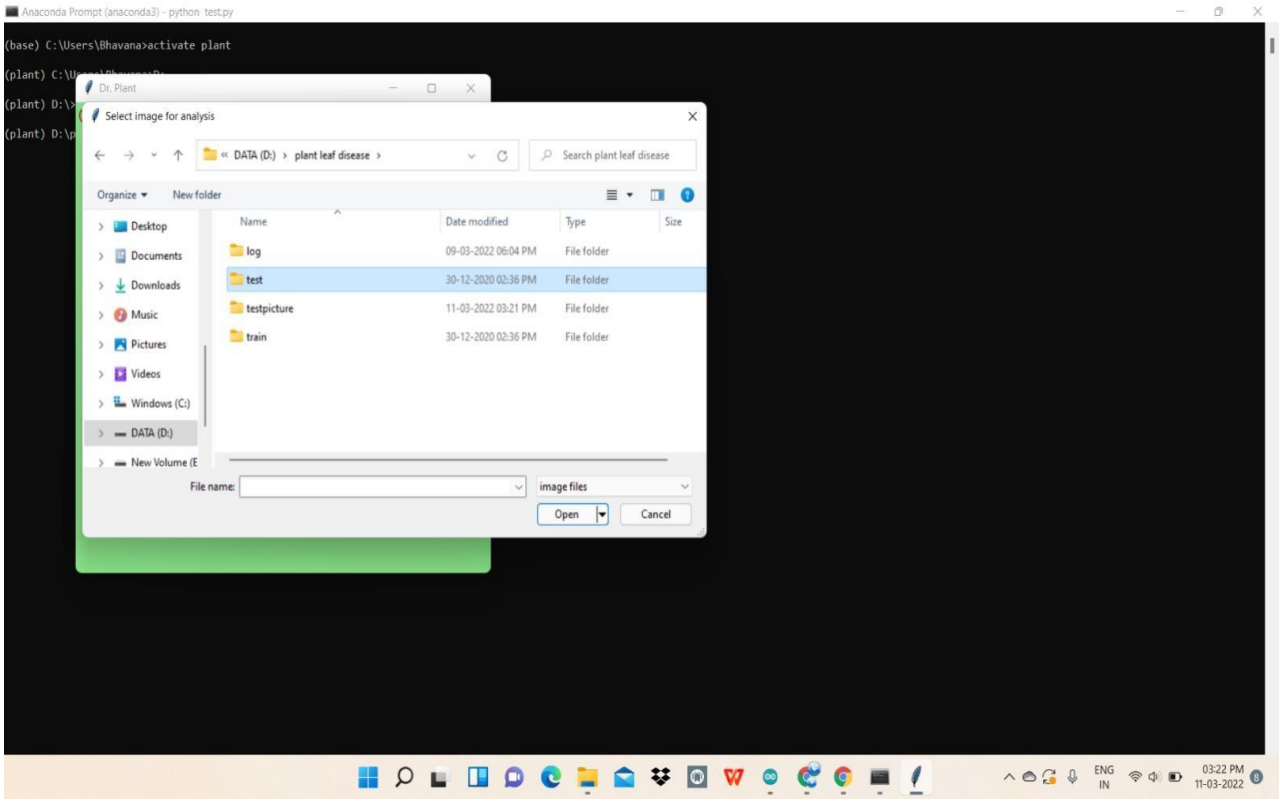
Step 10: Open Anaconda prompt, after Installing packages then enter the command



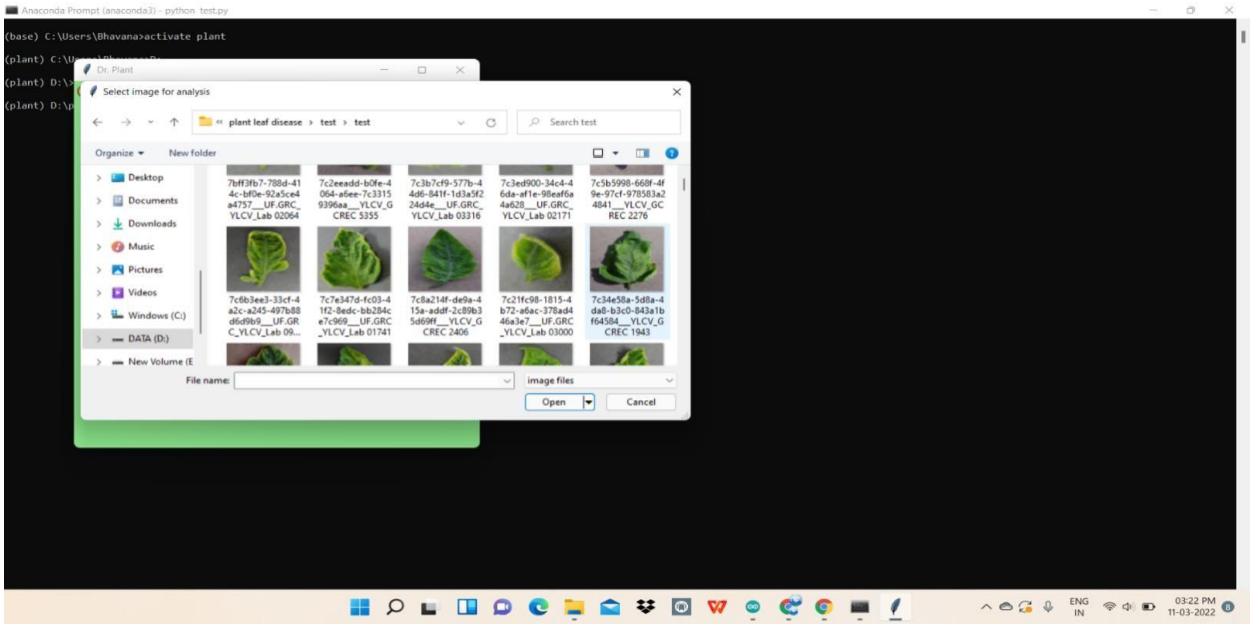
Step 11: In Anaconda prompt, click on get photo to choose leaf image



Step 12: click on test folder to select leaf image



Step 13: click on any leaf image and enter open ,and click on analyse image to get the result.



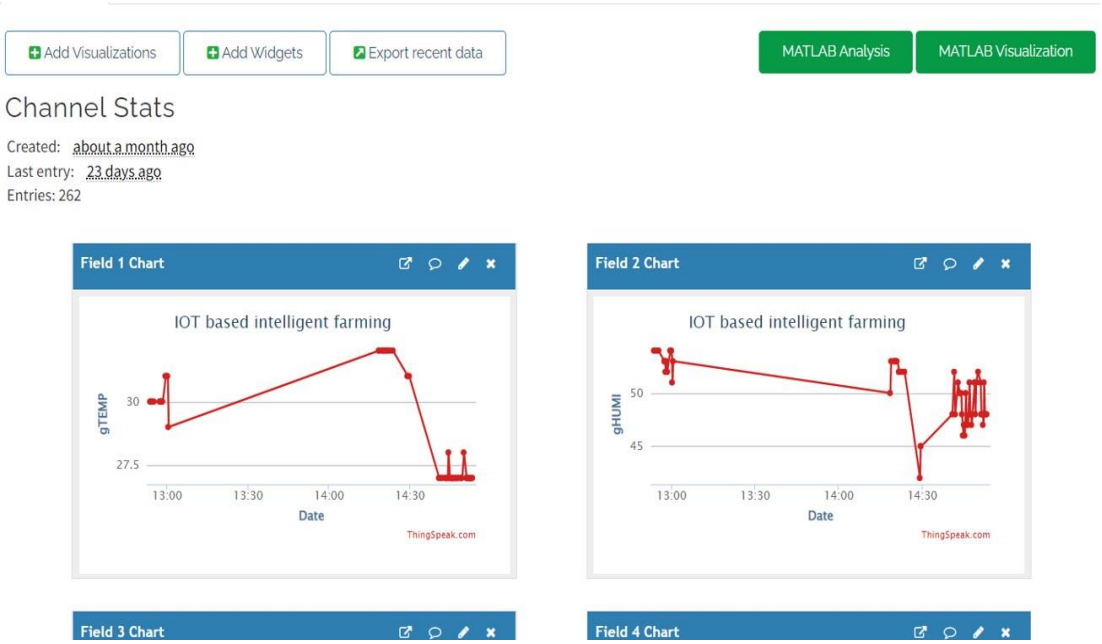
5. RESULTS AND SCREENSHOTS

These are the results obtained after following the implementations steps:

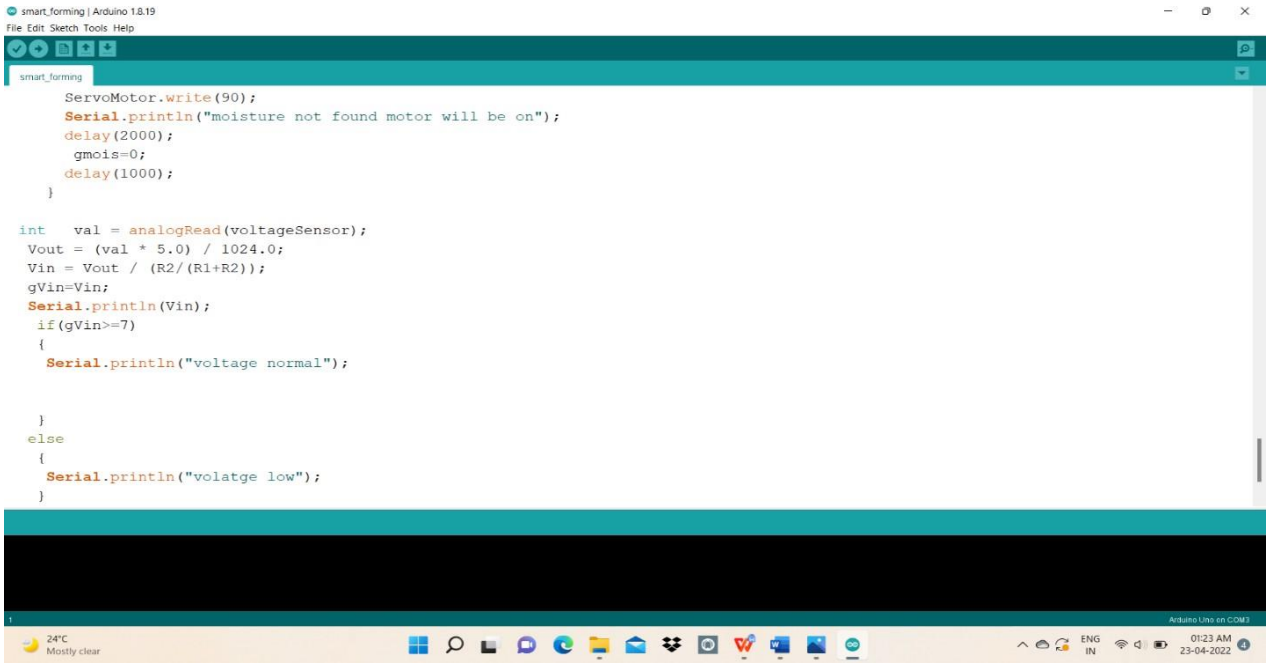
Data after connecting ESP Cable to the Arduino Uno:

Status of the Gtemperature, Ghumidity, Gvoltage, Gmoisture:

For IOT Based Intelligent Farming with IOT, the status of voltage sensors is obtained byplotting a graph with gv on Y-axis and date on X-axis.
The recorded Status of the Gtemperature, Ghumidity, GVoltage,
Gmoisture:status is highlighted in red marker in the above result.



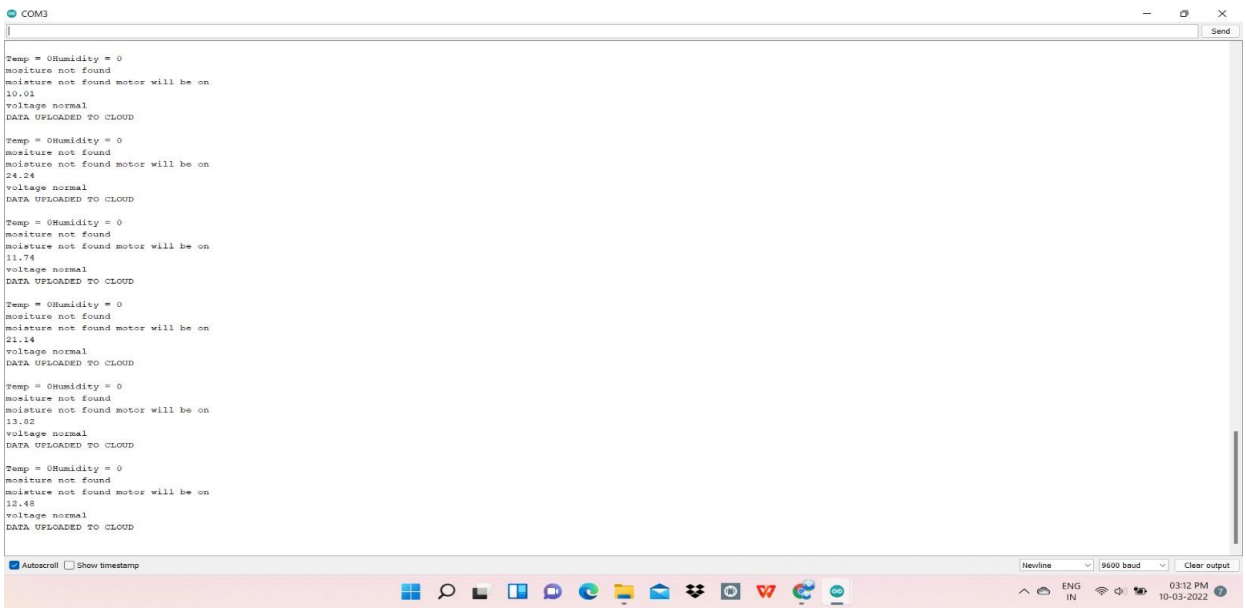
Compilation of the code before executing



Hardware Components (Arduino Uno)

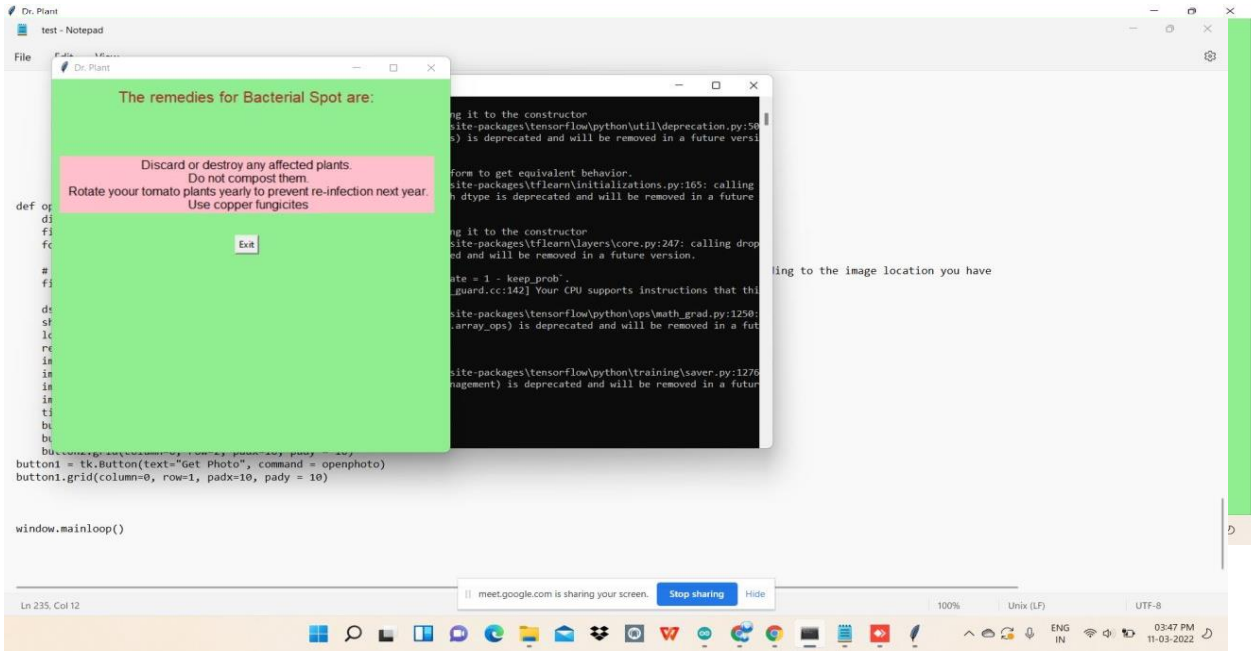
RESULT – After compilation of the code

which is connected to Arduino Uno



Result of Leaf Image process

-Status Of the leaf is shown where it is healthy or not ,name of disease.



Status for remedies given for bacterial spot & unhealthy leaf

6. CONCLUSION AND FUTURE ENHANCEMENTS

CONCLUSION

The proposed system was developed taking in mind the benefits of the farmers and agricultural sector. The developed system can detect disease in plants and also provide the remedy that can be taken against the disease. Proper knowledge of the disease and the remedy can be taken for improving the health of the plant. The proposed system is based on python and gives accuracy. To make a decision, the model requires an important information piece which is the sensed data from the sensors in the plot. Based on this information, we have set up rules for making a decision in our control system. Moreover, we have also provided functions for users to manually control the watering and roofing systems by monitoring the sensed data.

FUTURE ENHANCEMENT

A solution for tracing, tracking & managing your farming activities. Suitable smart agricultural technologies targeted for large-scale producers to double their efforts by increasing returns to investment and land.To analyze animals to predict disease and give remedy.

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