

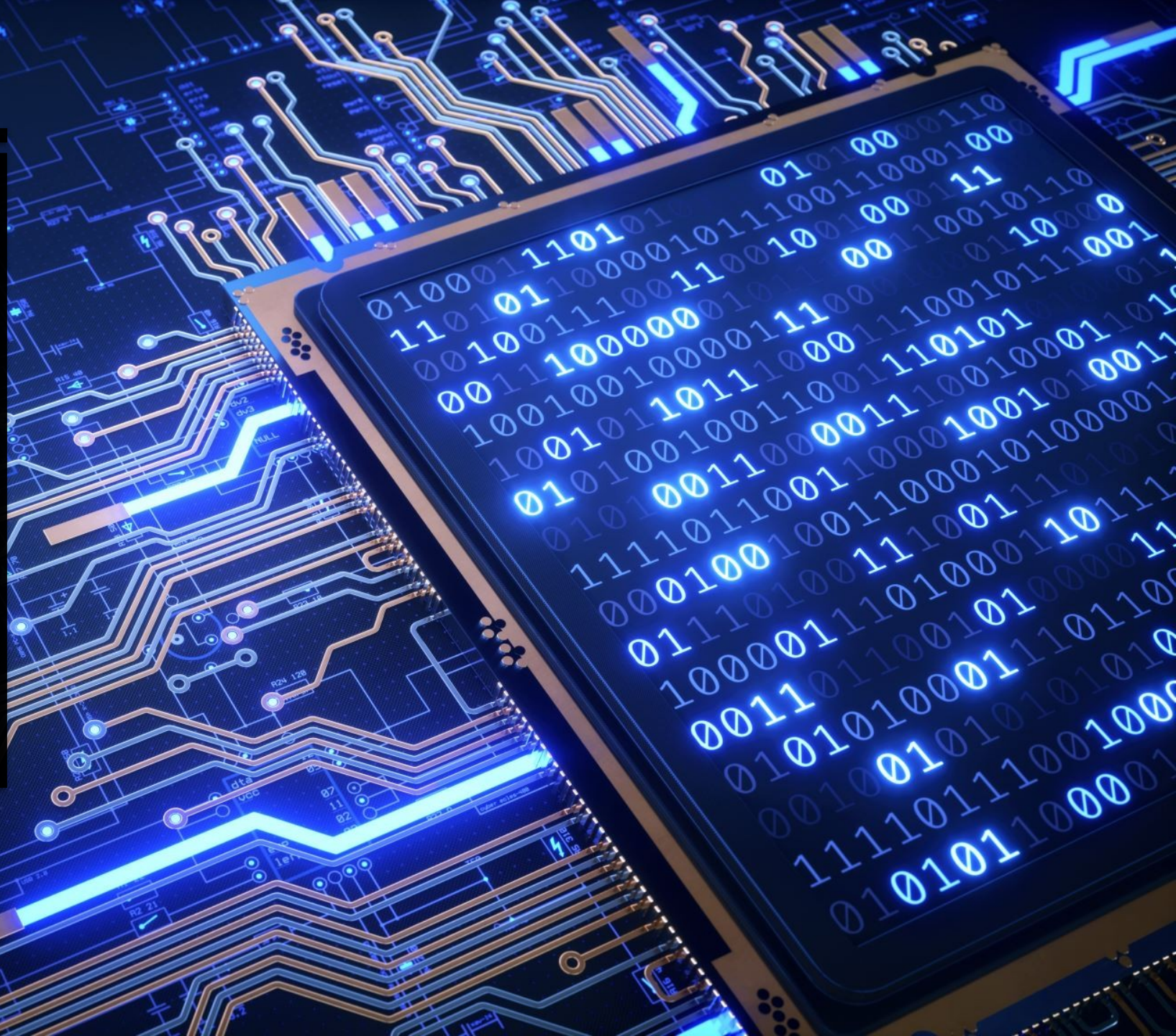


CEIS 110 PROGRAMMING IN IT

BY: LOUIE VENEGAS

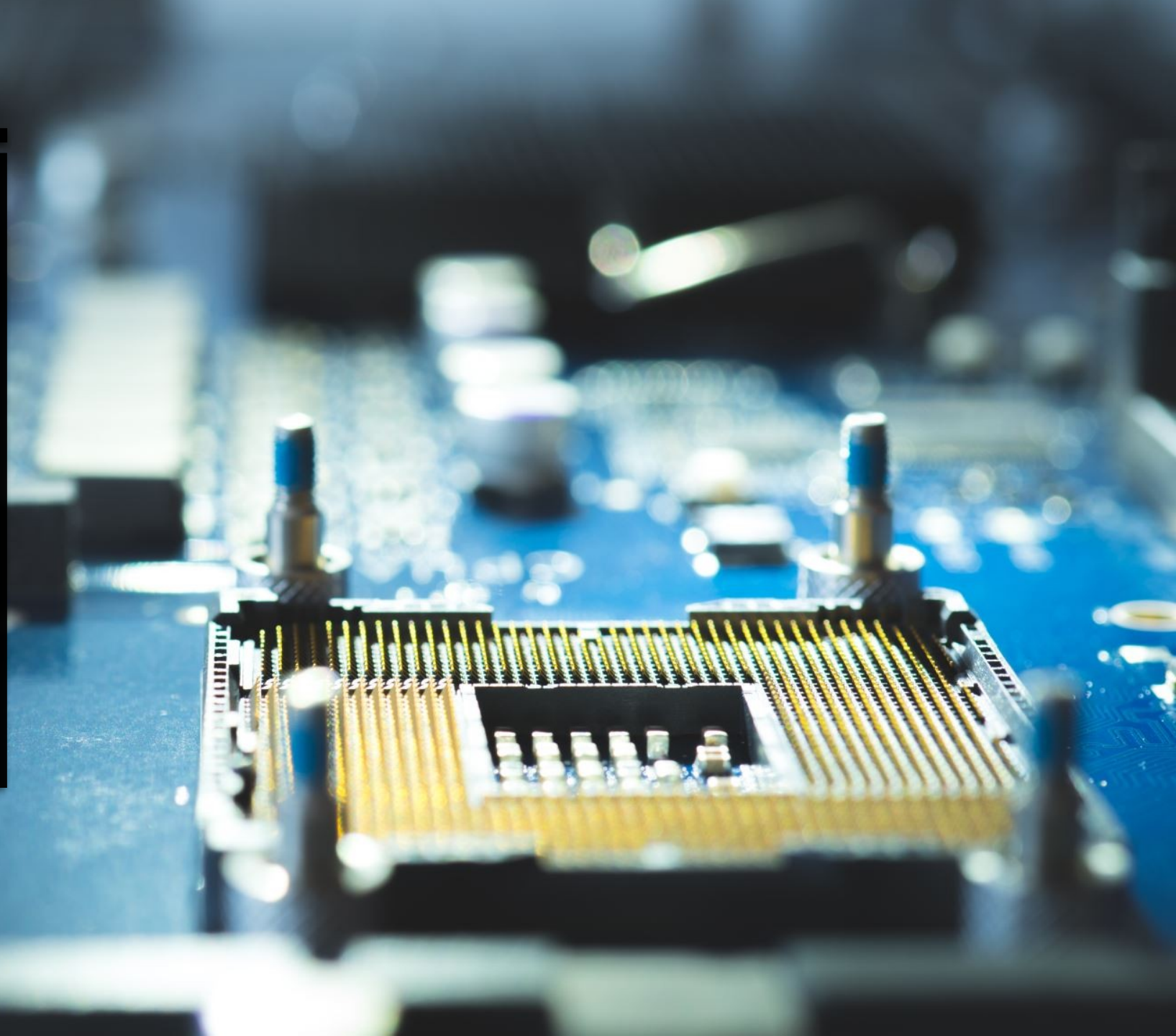
INTRODUCTION

- This project uses Arduino boards and sensors.
- I use the Arduino equipment to build an IoT device to collect temperature and humidity data.
- Then I analyze the data using programming and data analytics.



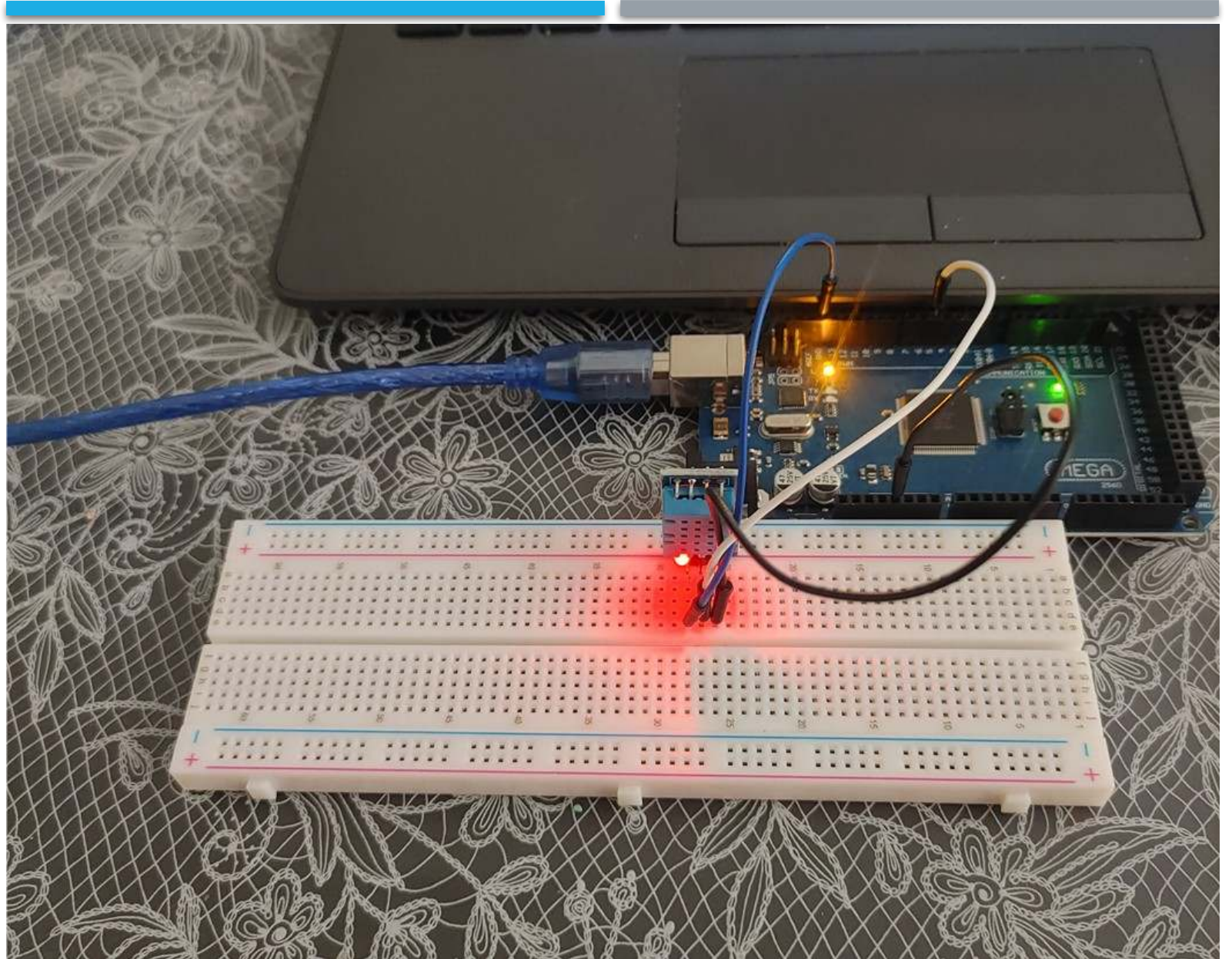
HARDWARE AND SOFTWARE INVENTORY

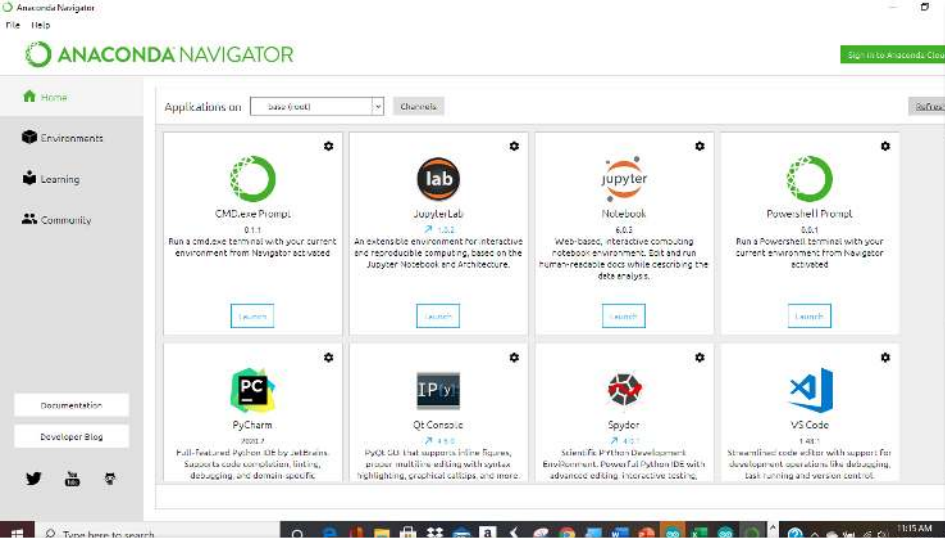
- Before I was able to begin the project I had to gather the hardware for IoT project and software needed for the project.
- For hardware I used an Arduino mega board, DHT11 sensor, bread board and cables.
- For software I used Arduino IDE, python IDE-anaconda, and excel.



INVENTORY

- PC running Arduino IDE
- Arduino Mega Board
- DHT11 Sensor
- Breadboard
- Wires





SOFTWARE INVENTORY

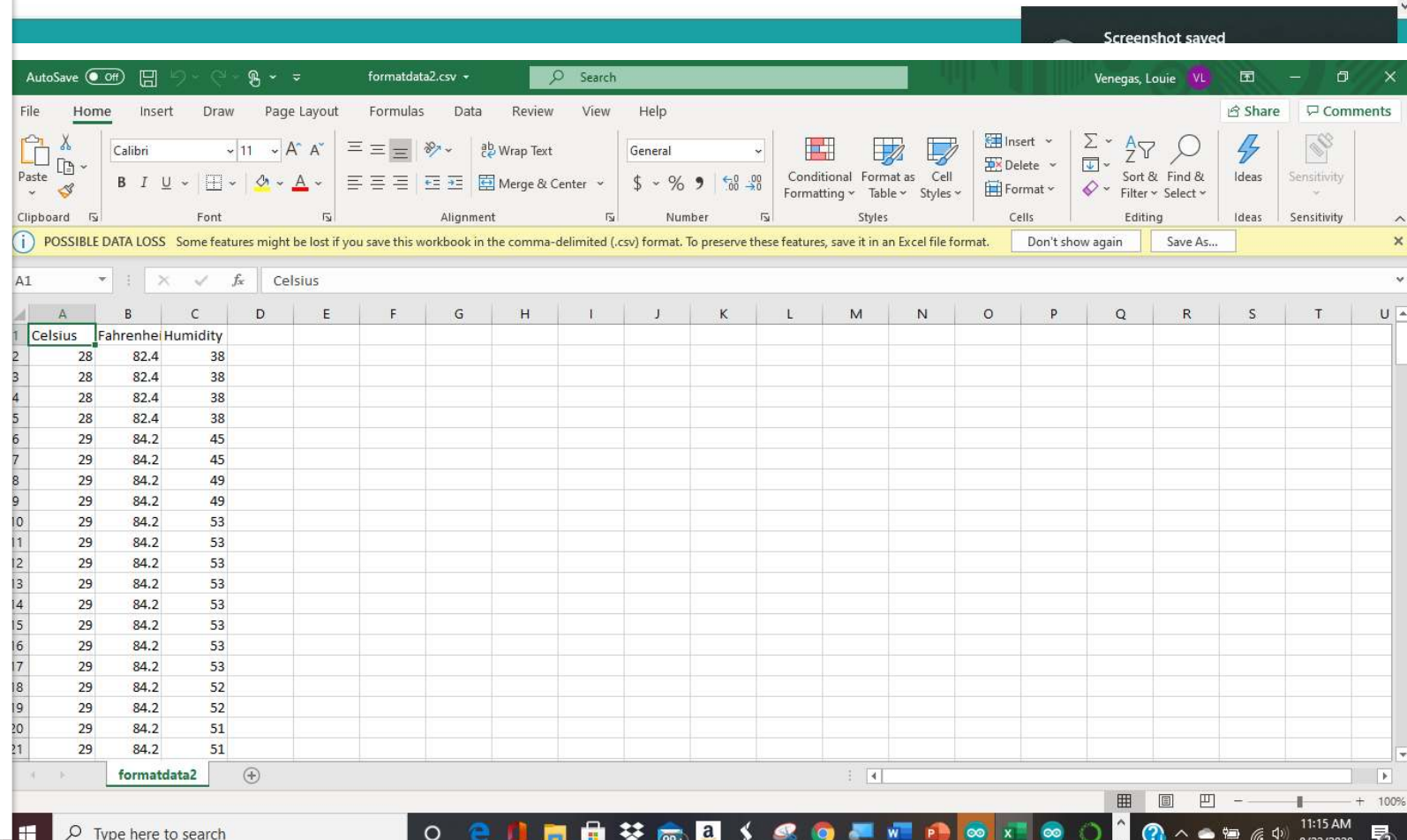
The software needed for this project.

- Arduino IDE
- Anaconda navigator with Spyder
- Microsoft Excel

```
// Initialize DHT sensor for normal room Arduino
DHT dht(DHTPIN, DHTTYPE);

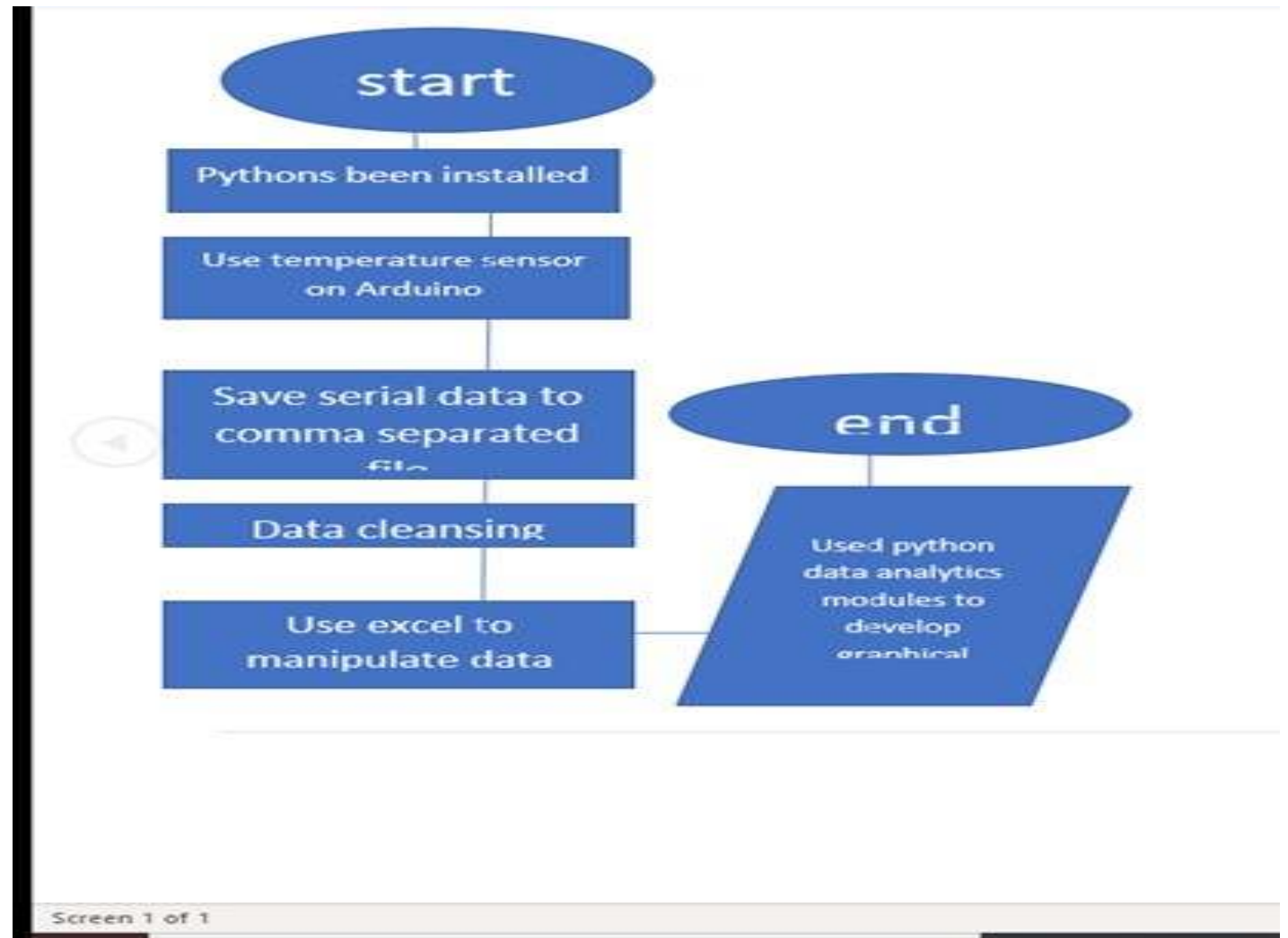
void setup() {
  Serial.begin(9600);
  dht.begin();
}

void loop() {
  float h = dht.readHumidity();
  // Read temperature as Celsius
  float t = dht.readTemperature();
  // Read temperature as Fahrenheit
  float f = dht.readTemperature(true);
  Serial.print("Temp in C = ");
  Serial.print(t);
  Serial.print(",      Temp in F = ");
  Serial.print(f);
  Serial.print(",      and      ");
  Serial.print("Humidity in percent = ");
  Serial.println(h);
  delay(1000);
}
```



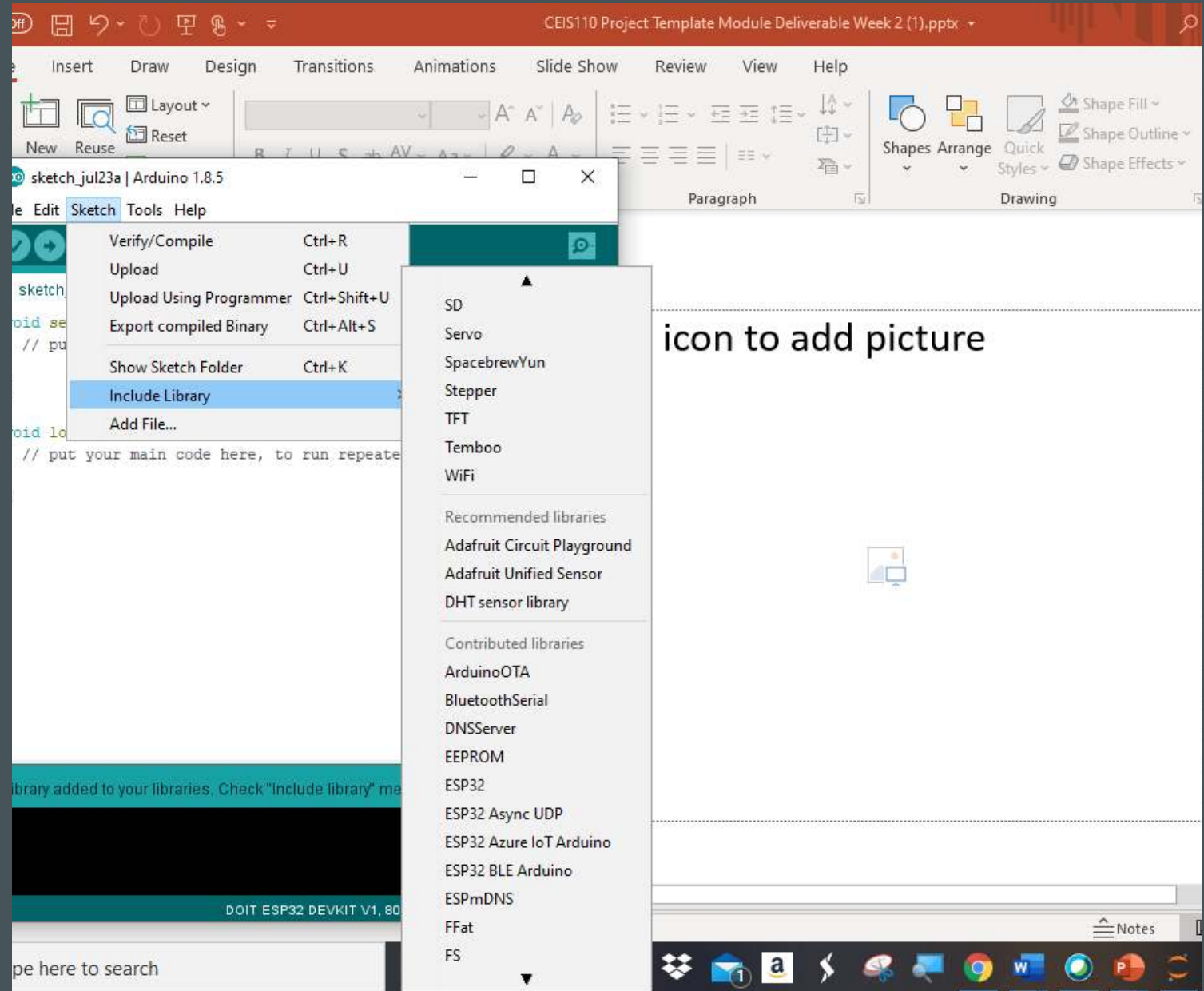
FLOW CHART

- Include the following processes:
 - Install python
 - Use Temperature/Sensor on Arduino to monitor temperature and humidity
 - Save serial data to a comma separated file with python
 - Cleanse data from Arduino
 - Use Excel to manipulate data
 - Use python data analytics modules to develop graphical models

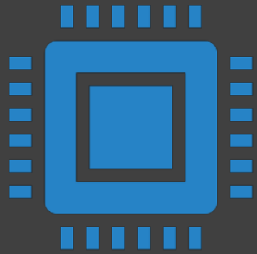


ADDING NECESSARY LIBRARIES TO ARDUINO IDE

- The DHT temperature sensor required additions to the Arduino IDE libraries
- Downloaded the two sensor libraries (**DHT_sensor_library.zip** , and **Adafruit_Sensor_master.zip**)



TEMPERATURE AND HUMIDITY DATA COLLECTION



The plan was established then the circuit built connecting the DHT11 sensor to the Arduino Mega Board.



Then the Arduino was connected to my lap top and the code was uploaded and my sensor began to gather data.



The data was shown on the serial monitor included with the Arduino IDE,

SERIAL MONITOR AND FUNCTIONING CIRCUIT

SAVING DATA USING PYSERIAL

The next step in my IoT temperature system project was saving the data from the Arduino in a comma separated file.

In order to save the data to my local machine I used a python code to read the data from the com port.

Pyserial is a python module that I had to add to anaconda in order for it to be able to read the data.

Python 3.7)

File Edit Shell Search Source Run Debug Consoles Projects Tools View Help

File Edit Shell Search Source Run Debug Consoles Projects Tools View Help

al.py x

```
#Purpose: Save data from an arduino into file using
#Name: Louie Venegas
#Date: 08/03/2020
#filename = myfile.txt
import serial
port_addr='COM5' # com port of the arduino
baud='9600'
file_name='mydata3.txt' # this file will be saved i

with serial.Serial(port_addr,baud) as port, open(fi
    for i in range(200): #read 200 lines into the f
        fullline = port.readline()
        line = str(fullline)
        outf.write(line)
        outf.write('\n')
        outf.flush()
```

object by pressing Ctrl+I in front of it, either on the Editor or the Console.

Help can also be shown automatically after writing a left parenthesis next to an object. You can activate this behavior in *Preferences > Help*.

New to Spyder? Read our [tutorial](#)

Variable explorer Help Plots Files

Console 1/A x

KeyboardInterrupt

In [5]: runfile('C:/Users/serio/.spyder-py3/saveserial.py', wdir='C:/Users/serio/.spyder-py3')

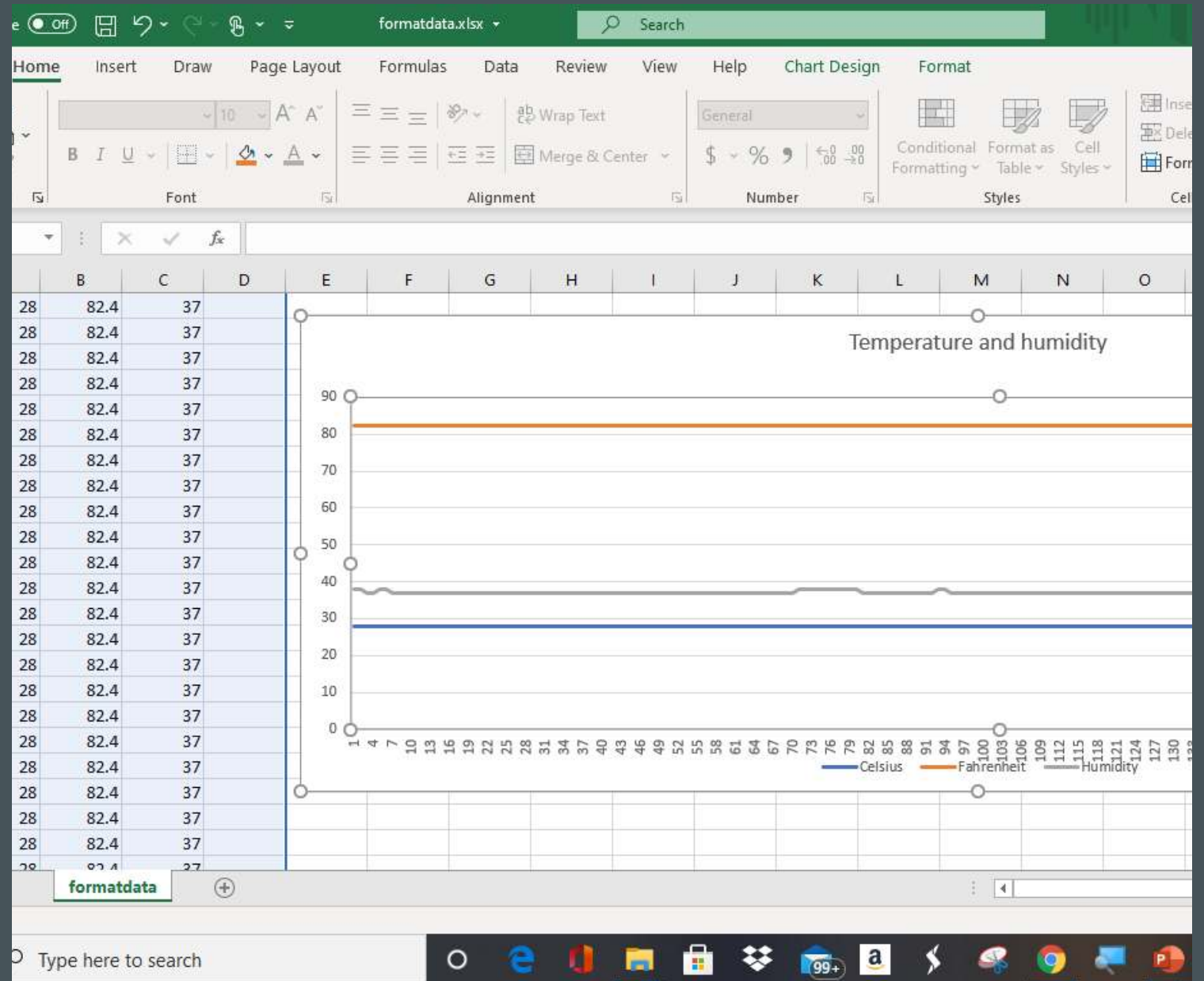
In [6]: runfile('C:/Users/serio/.spyder-py3/saveserial.py', wdir='C:/Users/serio/.spyder-py3')

THIS IS THE
CODE USED TO
SAVE THE DATA
WITH PYSERIAL

DATA SAVED FROM ARDUINO TO A NOTEPAD FILE USING PYSERIAL.

[illegible]

FORMATTED DATA USING EXCEL, INCLUDING A GRAPHICAL VIEW OF THE DATA FORMATTED IN EXCEL.



DATA ANALYTICS

Python allows users to develop charts and graphs with data

Using the Data analytic modules.

Manipulating data it can be saved in tabular format.

I used the Data analytics modules to make multiple graphs

With my collected data.



HISTOGRAM PLOT AND CODE

#Purpose: Create a histogram of
humidity data from both trials

#Name: Louie Venegas

#Date: 8/19/2020

```
import pandas as pd
```

```
import matplotlib.pyplot as plt
```

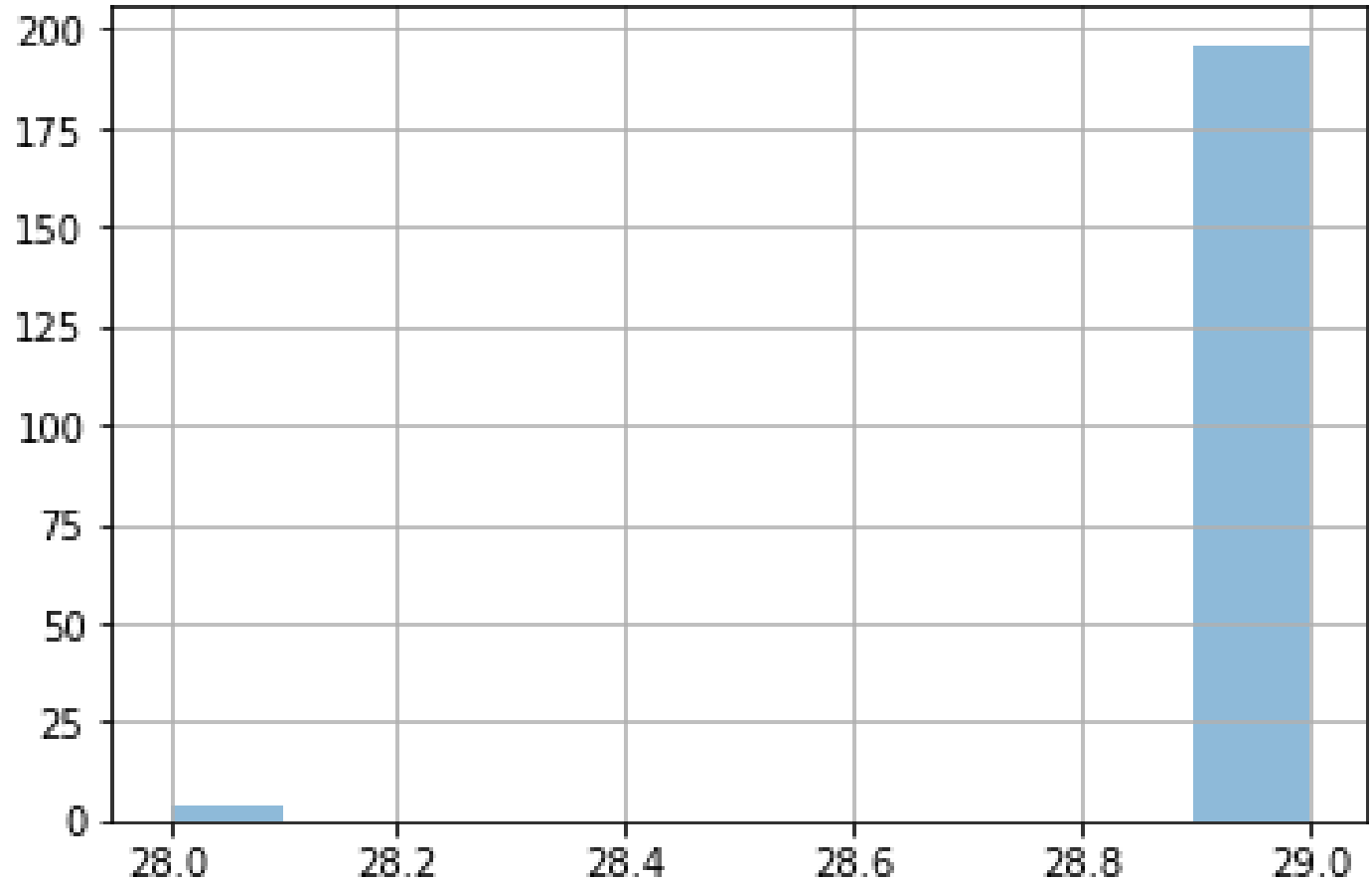
```
df1 = pd.read_csv(r"C:\Users\  
serio\spyder-py3\formatdata.csv")
```

```
df2 = pd.read_csv(r"C:\Users\  
serio\spyder-py3\formatdata2.csv")
```

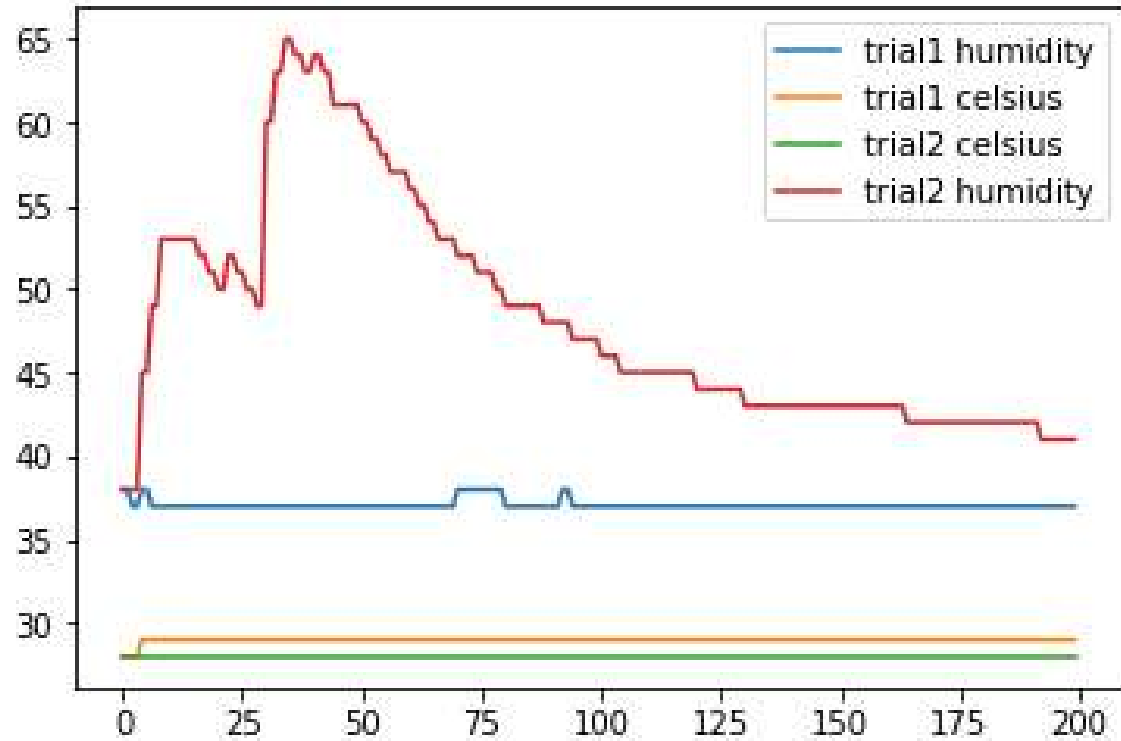
```
df2['Celsius'].hist(bins=10,  
alpha=0.5); plt.suptitle('Histogram of  
celsius')
```

```
plt.show()
```

Histogram of celsius



clesius effected by humididty



CELSIUS AFFECTED BY HUMIDITY PLOT INCLUDING CODE

#Purpose: Create Celsius plot comparing trial 1 and trial 2

#Name: Louie Venegas

#Date: 08/19/2020

import pandas as pd

import matplotlib.pyplot as plt

df1 = pd.read_csv(r"C:\Users\serio\spyder-py3\formatdata.csv") #baseline data is trial 1

df2 = pd.read_csv(r"C:\Users\serio\spyder-py3\formatdata2.csv") #data with variation such as finger over sensor and blowing on sensor is trial2

df3 = df1

df4 = df2

```
plt.figure(); df1.Humidity.plot(label = 'trial1 humidity'); df2.Celsius.plot(label = 'trial1 celsius'); df3.Celsius.plot(label = 'trial2 celsius'); df4.Humidity.plot(label = 'trial2 humidity'); plt.legend(loc='best'); plt.suptitle('celsius affected by humidity')
```

plt.show()

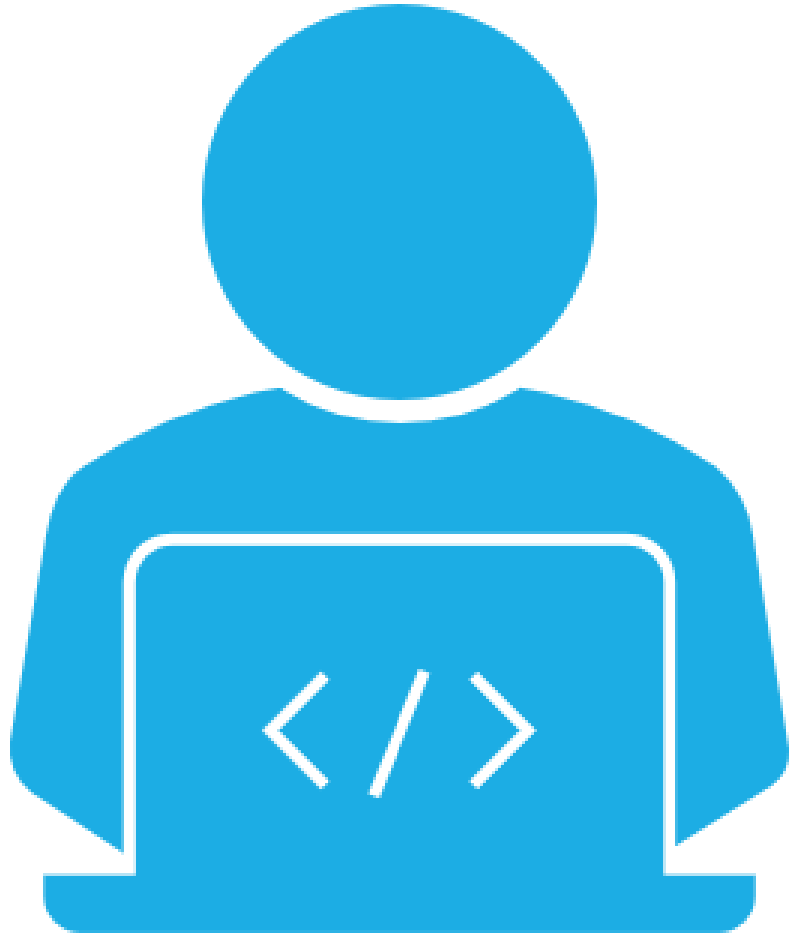
ANALYSIS

The point of analysis is to answer a question or format a prediction. So my question was does humidity immediately affect temperature. The question seemed relevant to me because when it is humid it feels hotter. Based on the graph I created comparing both test runs including both temperature and humidity I didn't see any change in temperature when humidity spiked. My prediction is that humidity may affect temperature after long period of exposure but immediately has no effect.



CHALLENGES

I ran into one big challenge while working on this project. The problem I had with running the data analytics and processing the data into excel was that python couldn't call the notebook file. First, I relocated the files into the spyder.py directory which is the working directory for the python IDE that I'm using. Still couldn't find it. So I had to include a file path name for it to locate it. Now python could find the file but not process it. I had to place a "r" before the path name to get python to process the data.



CAREER SKILLS

During this project I learned several career skills...

- Communicated project plans using flowcharts.
- Built a functioning circuit to create an IoT device.
- Programmed a microprocessor (Arduino Mega board).
- Programmed in Python.
- Troubleshoot my code, corrected errors, and cleansed data.
- Analyzed my charts to make a prediction from the data.