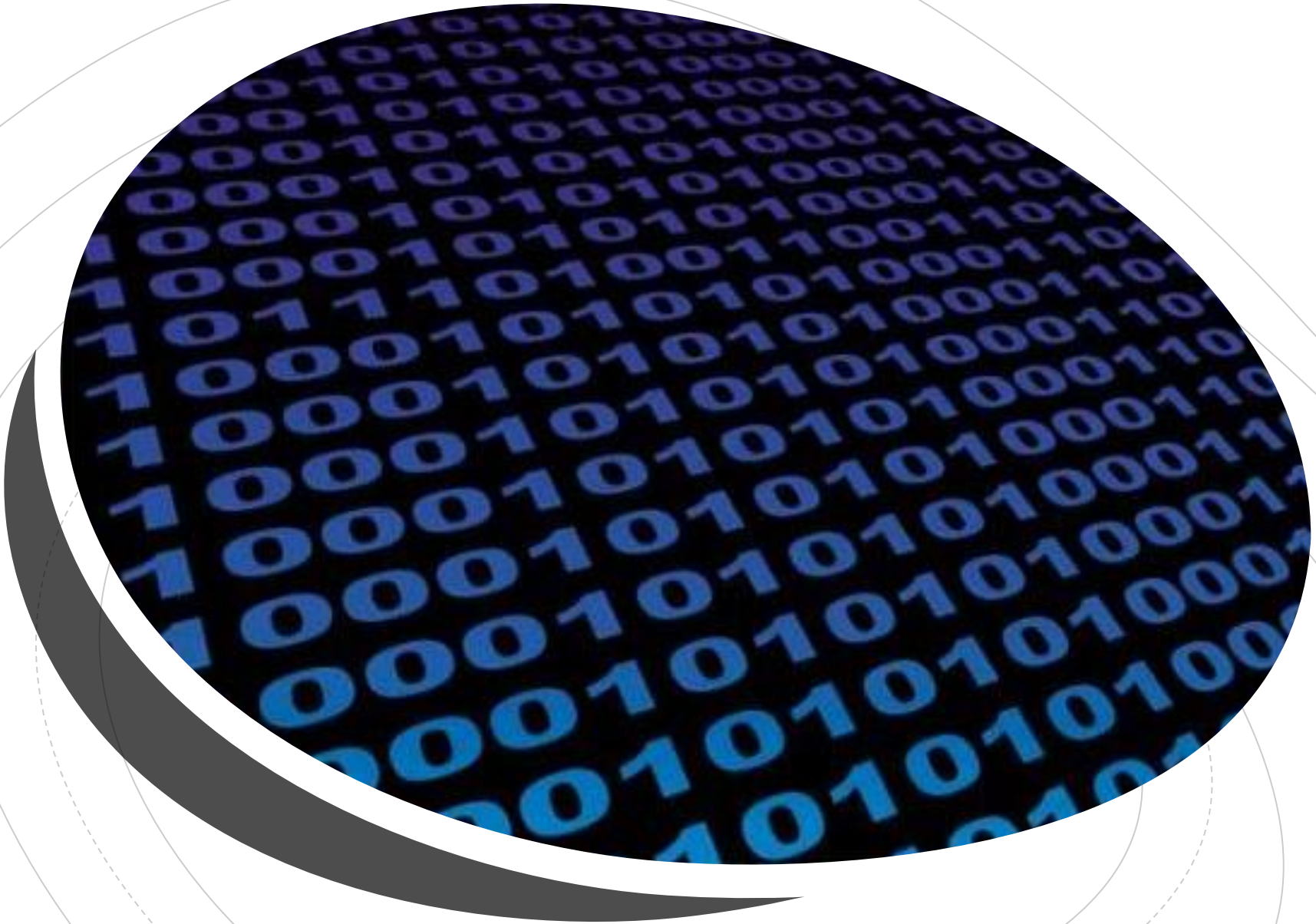


CEIS110 Programming in the IoT

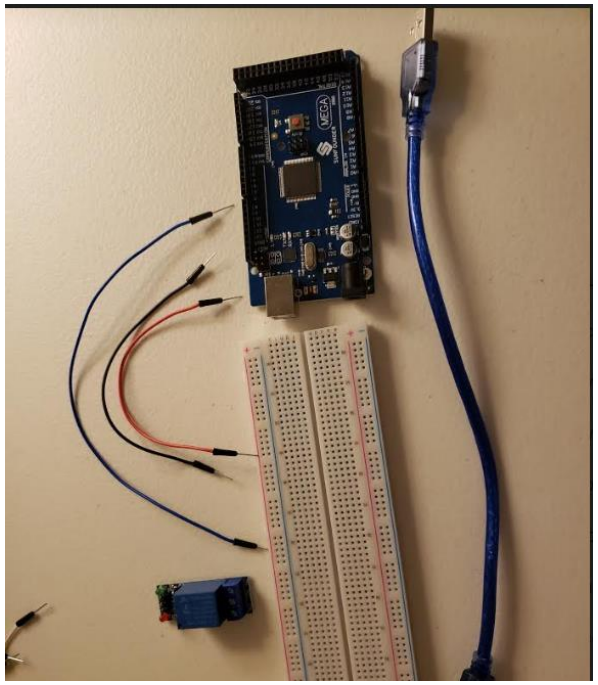
Roger Burns II

Introduction

- The Internet of Things is growing at an exponential rate.
- This project uses an IoT device to gather temperature data.
- The data is then analyzed using programming and data analytics.

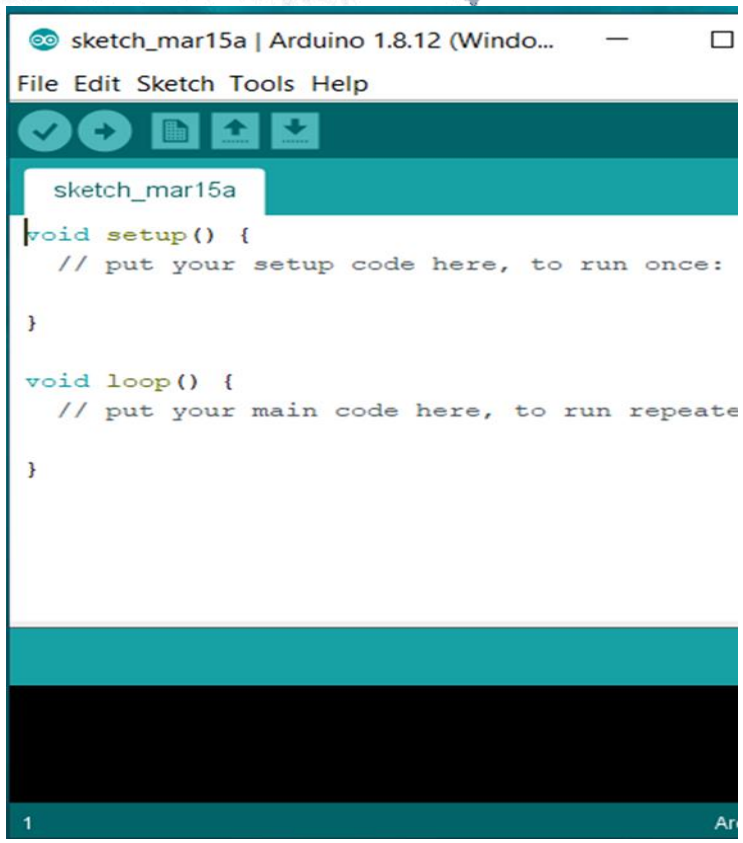
Hardware Inventory

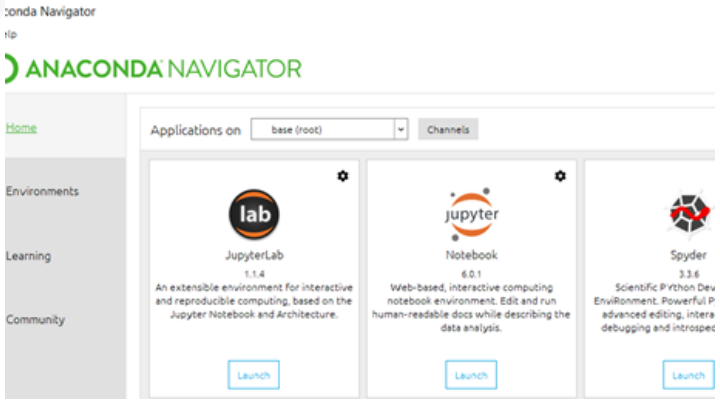
- Arduino Mega board
- Breadboard
- Wire(s)
- DHT11 Temperature and Humidity sensor
- Cable to connect Arduino to computer

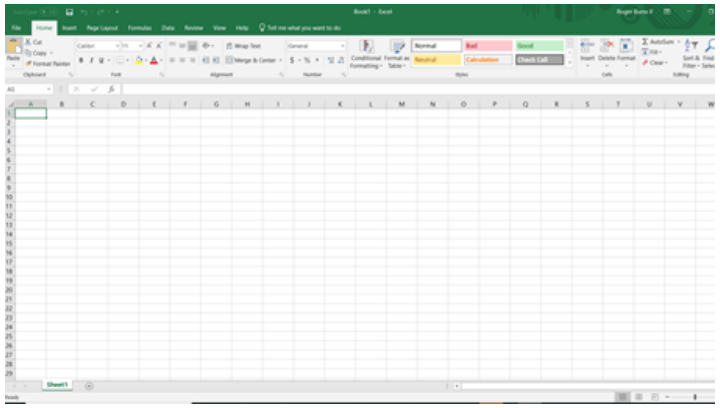


Software Inventory

Python IDE (Anaconda)
Arduino IDE
Microsoft Excel



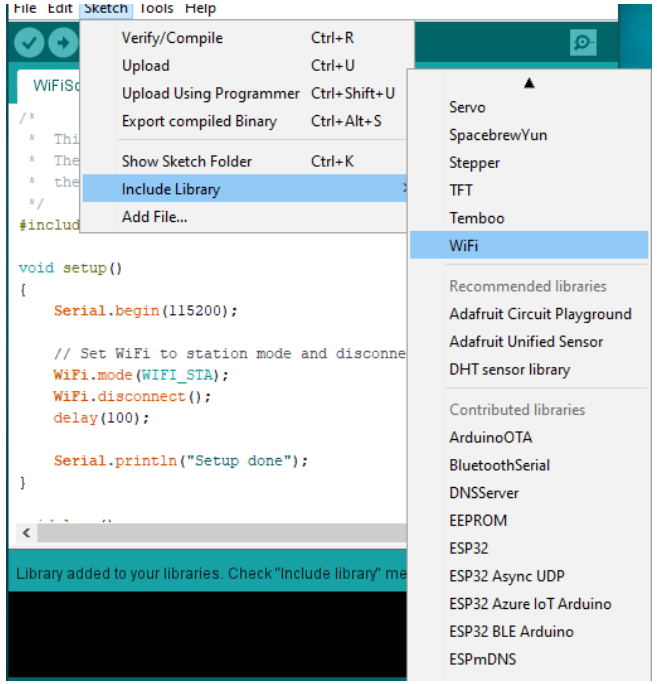




Adding Libraries

- In order for the DHT11 sensor to work, two libraries needed to be added as zip files to the Arduino IDE.

- DHT_sensor_library.zip
- Adafruit_Sensor_master.zip



Flowchart

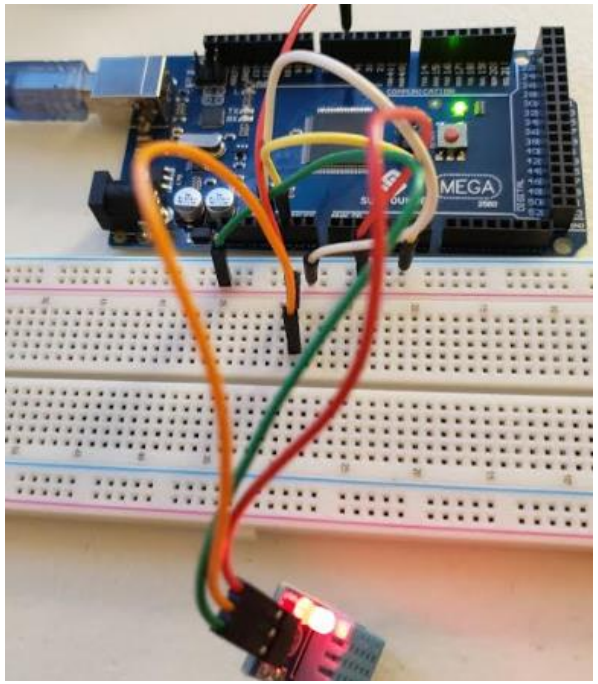
- Install python
- Use Temperature/Sensor on Arduino to monitor temperature and humidity
- Save serial data to a comma separated file with python
- Cleanse data from Arduino
- Use Excel to manipulate data
- Use python data analytics modules to develop graphical models

Gathering Temperature and Humidity Data

- After planning and design, the circuit was built connecting the DHT11 to the Arduino at pin 5.
- The Arduino was connected to the computer and the code was uploaded to gather temperature data.
- The data was shown on the serial monitor.
- The next 2 slides show the circuit and the Serial Monitor.

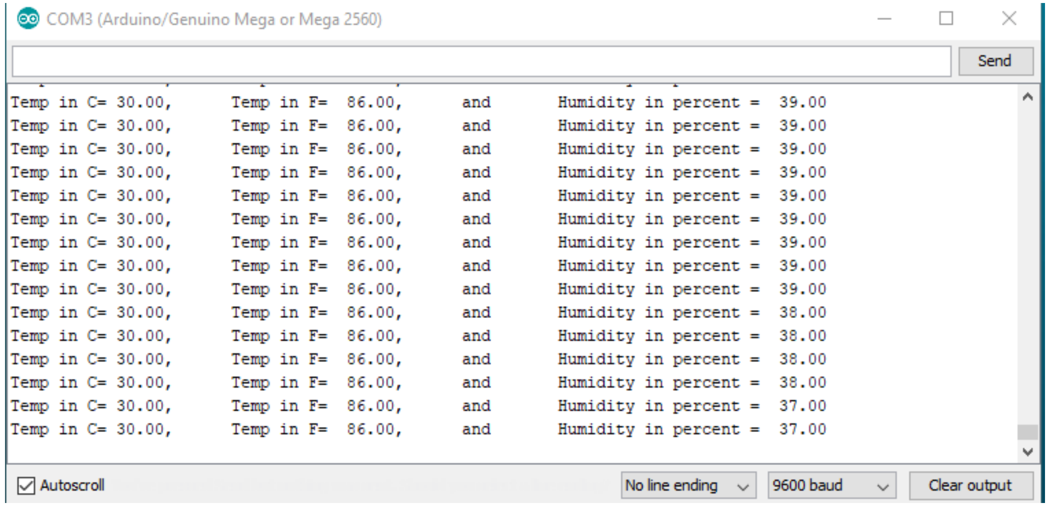
Circuit

- Arduino Mega board
- Breadboard
- Wire(s)
- DHT11 Temperature and Humidity sensor



Serial Monitor

- The Serial Monitor displayed the temperature in Celsius, Fahrenheit and the humidity percent.



SaveSerial.py code

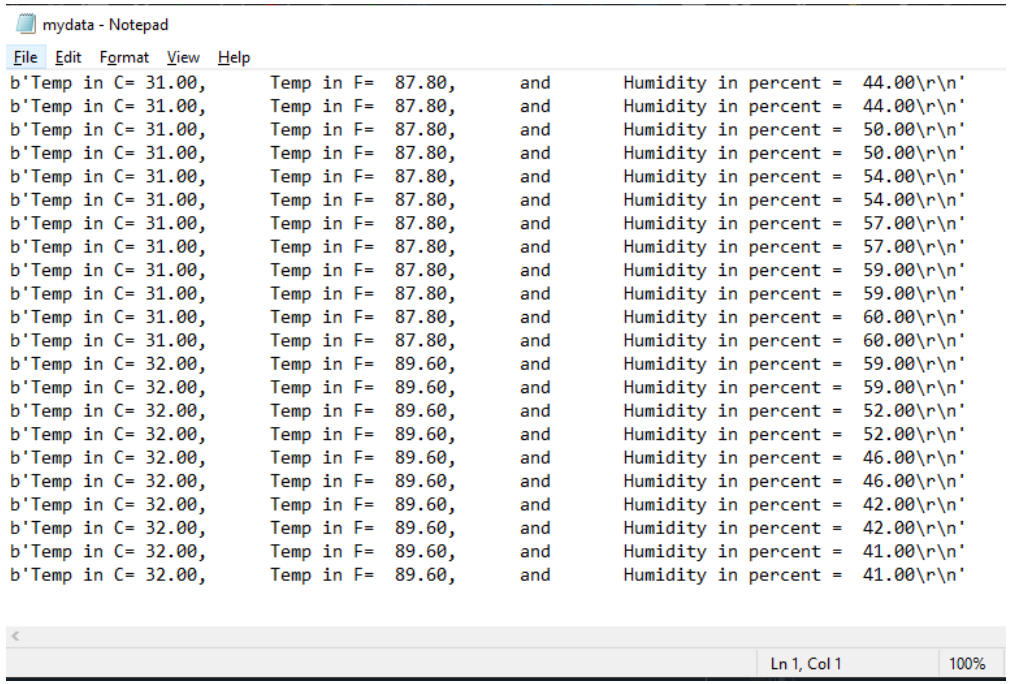
- Python Code showing the name of the text file that is generated containing the temperature sensor data.
- The data can be stored to a local machine using the Python code that reads from the com port.
- Pyserial is a module in python that must be added to Anaconda in order for Python to be able to read serial data.

```
#Purpose: Save data from an arduino into file using python
#Name: Roger Burns
#Date: 04.05.2020x
#filename = myfile.txt
import serial
port_addr='COM3' # com port of the arduino
baud='9600'
file_name='mydata.txt' # this file will be saved in the same location as the py file

with serial.Serial(port_addr,baud) as port, open(file_name,"w+", 256) as outf:
    for i in range(200): #read 200 lines into the file
        fullline = port.readline()
        line = str(fullline)
        outf.write(line)
        outf.write('\n')
        outf.flush()
```

Mydata.txt

Text file generated by Python code.



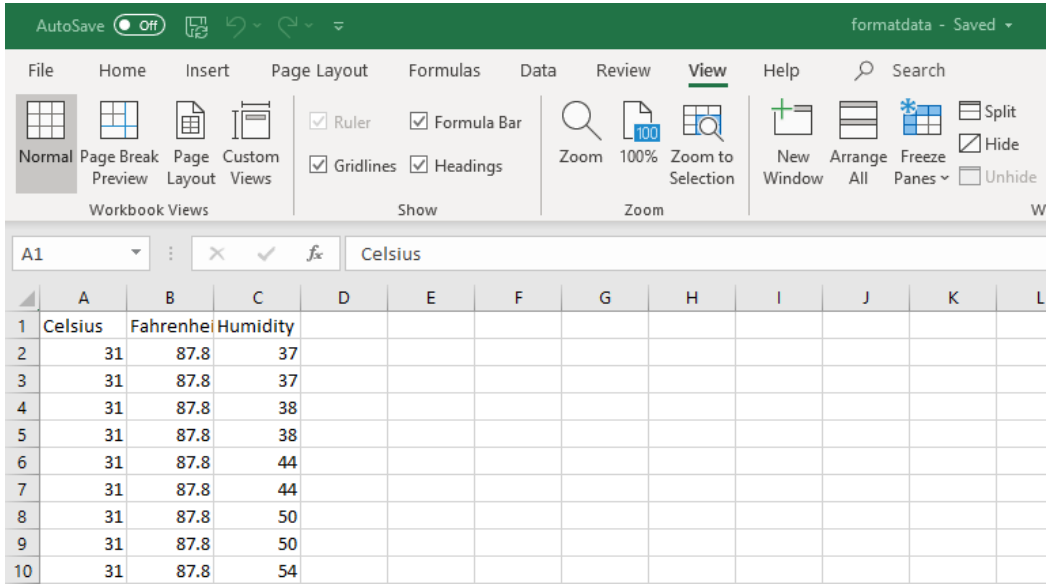
Python Code

Python Code showing the name of the csv file that is generated containing the temperature sensor data.

```
#Purpose: Cleanse data from Arduino and store in python list
#Name: Roger Burns
#Date: 4.12.19
#filename = formatdata.csv - can be opened in Excel
cList=[]
fList=[]
hList=[]
input_file_name='mydata.txt'
output_file_name='formatdata.csv' #will be created in the same directory
with open(input_file_name) as inf:
    for line in inf:
        s=line.split(',')
        cList.append(float(''.join(n for n in s[0] if n.isdigit() or n=='.'))) #extr
        fList.append(float(''.join(n for n in s[1] if n.isdigit() or n=='.'))) #only
        hList.append(float(''.join(n for n in s[2] if n.isdigit() or n=='.')))

with open(output_file_name,"w+") as outf:
    outf.write('Celsius,Fahrenheit,Humidity')
    outf.write('\n')
    for i in range(len(cList)):
        outf.write(str(cList[i])+',')
        outf.write(str(fList[i])+',')
        outf.write(str(hList[i])+'\n') #print data to file separated by commas
```

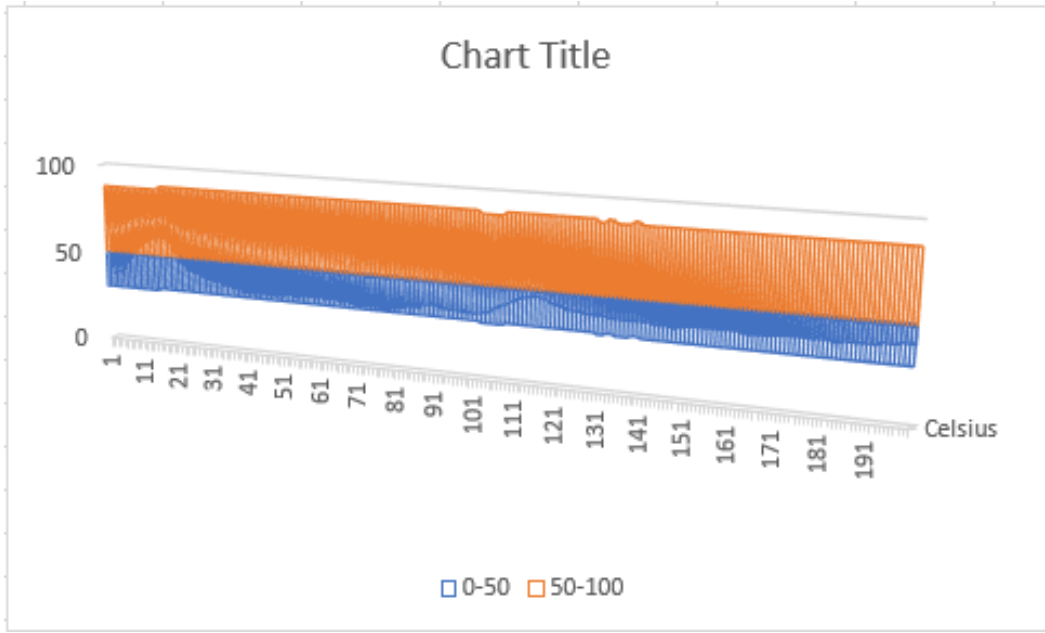
Read Data into csv format



	A	B	C	D	E	F	G	H	I	J	K	L
1	Celsius	Fahrenhei	Humidity									
2	31	87.8	37									
3	31	87.8	37									
4	31	87.8	38									
5	31	87.8	38									
6	31	87.8	44									
7	31	87.8	44									
8	31	87.8	50									
9	31	87.8	50									
10	31	87.8	54									

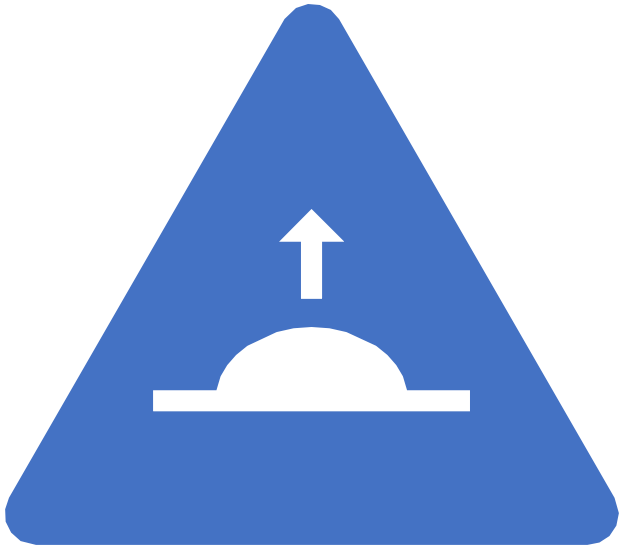
Temperature and Humidity Chart

- Excel chart based on data from Arduino from trial 1.



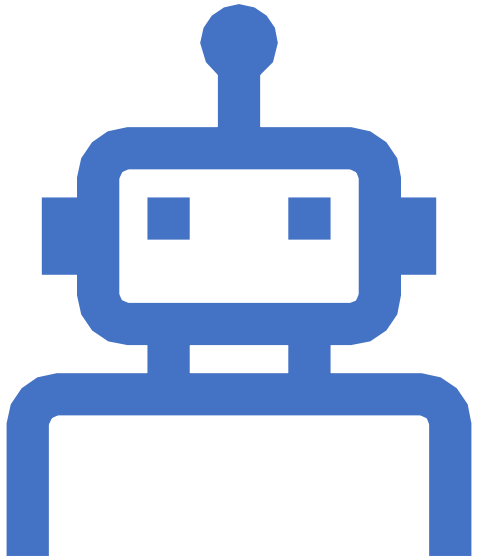
Prediction

- Based on the data, it appears the DHT11 temperature and humidity sensor displayed a greater susceptibility to humidity than temperature when an external stimulus (my finger) was pressing over the sensor while it was running. Due to this, I predict that on a any given day the humidity would change more than the temperature. More trials should be performed- blowing on the sensor may lead to a greater variant in the humidity as well.



Conclusion

- This project covered the fundamental topics of programming in the Internet of Things by using data gathered from an Io device to perform data analytics operations.
- Building the circuit and working with the Arduino provided a hands-on learning opportunity to put into practice the topics covered in the course.



Career Skills

Communication to depict using a flowchart to depict the plan of a project.
Electronics (voltage, current, current) and working with the Arduino.
Programming using the Arduino.
Programming using Python.
Troubleshooting errors in the code and data cleansing.