

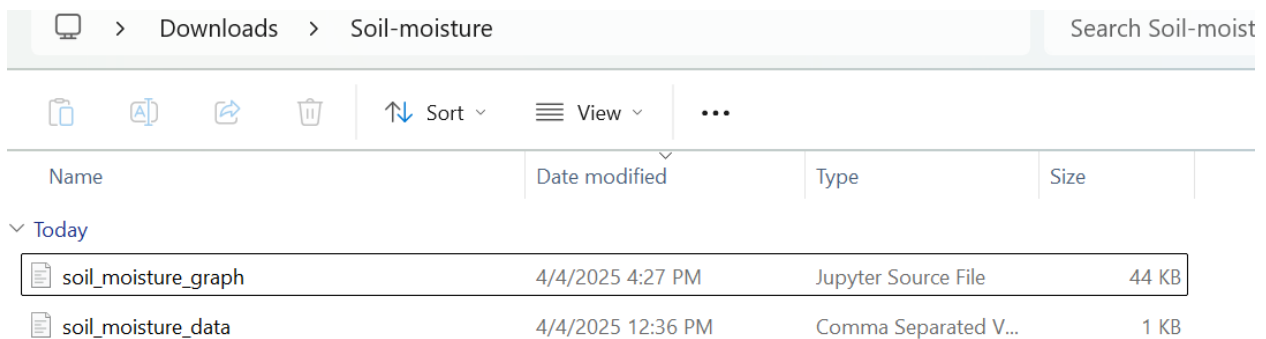
Assignment 6 Detect soil moisture

In this lesson you gathered soil moisture sensor readings, measured as values from 0-1023. To convert these into actual soil moisture readings, you need to calibrate your sensor. You can do this by taking readings from soil samples, then calculating the gravimetric soil moisture content from these samples.

You will need to repeat these steps multiple times to get the readings needed, with different wetness of soil each time.

Answer:

1. First, create a folder to contain the soil_moisture_graph.ipynb file and the soil_moisture_data.csv file.



Downloads > Soil-moisture		Search Soil-moist	
<div>Sort View ...</div>			
Name	Date modified	Type	Size
▼ Today			
soil_moisture_graph	4/4/2025 4:27 PM	Jupyter Source File	44 KB
soil_moisture_data	4/4/2025 12:36 PM	Comma Separated V...	1 KB

2. In the soil_moisture_data.csv file is the data needed to draw the graph.

∴ > Users > dell > Downloads > Soil-moisture > soil_moisture_data.csv

	W_dry (g)	W_wet (g)	Soil Moisture (%)	Sensor Value
1	194.65	250.65	28.77	298.98
2	220.61	249.58	13.13	651.26
3	164.45	202.36	23.06	414.06
4	224.26	280.8	25.22	492.3
5	154.86	189.7	22.5	311.62
6	240.21	308.91	28.6	629.09
7	210.7	239.64	13.74	577.95
8	167.78	203.79	21.46	723.31
9	212.94	269.42	26.52	721.98
10	239.14	251.33	5.1	764.82
11				
12				

3. Start Jupyter notebook and open the soil_moisture_graph.ipynb file.

```
MICROSOFT WINDOWS [VERSION 10.0.22631.5039]
(c) Microsoft Corporation. All rights reserved.

C:\Users\dell>Jupyter notebook|
```

4. Use Python programming language. Import pandas, numpy and matplotlib.pyplot to draw charts.

```
[1]: # import the necessary libraries
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
```

5. Read data from CSV file and fit linear regression line.

```
] : # Read data from CSV file
df = pd.read_csv("soil_moisture_data.csv")

]: # Fit Linear regression line
coeffs = np.polyfit(df["Sensor Value"], df["Soil Moisture (%)"], 1)
linear_fit = np.poly1d(coeffs)
```

6. Draw the graph

```
[4]: # Draw a graph
plt.figure(figsize=(8, 5))
plt.scatter(df["Sensor Value"], df["Soil Moisture (%)"], color='blue', label="Data from CSV file")
plt.plot(df["Sensor Value"], linear_fit(df["Sensor Value"]), color='red', linestyle='--',
         label=f"Linear Regression: y = {coeffs[0]:.4f}x + {coeffs[1]:.2f}")
plt.xlabel("Humidity sensor value (0-1023)")
plt.ylabel("Actual humidity (%)")
plt.title("Soil moisture sensor calibration graph")
plt.legend()
plt.grid(True)
plt.show()
```

7. Finally, the result is:

