

## Assignment 7: Automated plant watering

This lesson covered how to control a relay via sensor data, and that relay could in turn control a pump for an irrigation system. For a defined body of soil, running a pump for a fixed length of time should always have the same impact on the soil moisture. This means you can get an idea of how many seconds of irrigation correspond to a certain drop in soil moisture reading. Using this data you can build a more controlled irrigation system.

For this assignment you will calculate how long the pump should run for a particular rise in soil moisture.

### Answer:

1. First, I will create a Data-for-pump folder to store the data for calculation.

Name	Date modified	Type	Size
Today			
calculate anaverage_decrease_in_soil_moisture	4/4/2025 8:50 PM	Jupyter Source File	3 KB
soil_moisture_data_a7	4/4/2025 8:38 PM	Comma Separated V...	1 KB

2. The data in the soil\_moisture\_data\_a7.csv file is the data used for calculation.

C:\> Users > dell > Downloads > Data-for-pump > soil\_moisture\_data\_a7.csv

```
1  Total Pump time,Soil Moisture,Decrease
2  0,650,0
3  1,628,22
4  2,608,20
5  3,586,22
6  4,567,19
7  5,546,21
8  6,528,18
9
```

### 3. Start Jupyter notebook to perform calculations

```
C:\Users\dell>Jupyter notebook
[I 2025-04-04 20:41:53.332 ServerApp] jupyter_lsp | extension was successfully linked.
[I 2025-04-04 20:41:53.474 ServerApp] jupyter_server_terminals | extension was successfully linked.
[I 2025-04-04 20:41:53.526 ServerApp] jupyterlab | extension was successfully linked.
[I 2025-04-04 20:41:53.613 ServerApp] notebook | extension was successfully linked.
[I 2025-04-04 20:41:53.824 ServerApp] notebook_shim | extension was successfully linked.
[I 2025-04-04 20:41:53.994 ServerApp] notebook_shim | extension was successfully loaded.
[I 2025-04-04 20:41:54.004 ServerApp] jupyter_lsp | extension was successfully loaded.
[I 2025-04-04 20:41:54.037 ServerApp] jupyter_server_terminals | extension was successfully loaded.
```

### 4. Calculate average drop by getting data from soil\_moisture\_data\_a7.csv file.

#### ▼ Read data from CSV and calculate average drop

```
3]: import pandas as pd

# Read CSV file
df = pd.read_csv("soil_moisture_data_a7.csv")

# Skip the first line because it is a header
df = df.iloc[1:].astype(int)

# Calculate average decrease
average_decrease = df["Decrease"].mean()

print(f"Average drop per second is: {average_decrease:.2f}")

Average drop per second is: 20.33
```

### 5. Finally, calculate the time required to perform the pumping.

## Calculate the required pumping time

```
4]: # Target humidity
target_moisture = 550 # I want to pump when the moisture reach to 550

# Get current humidity from last row of data
current_moisture = df["Soil Moisture"].iloc[-1]

# Calculate the required pumping time
moisture_to_decrease = current_moisture - target_moisture

if moisture_to_decrease > 0:
    time_needed = moisture_to_decrease / average_decrease
    print(f"Pumping time required: {time_needed:.2f} second")
else:
    print("Humidity is lower than desired, no need to pump more!")

Humidity is lower than desired, no need to pump more!
```