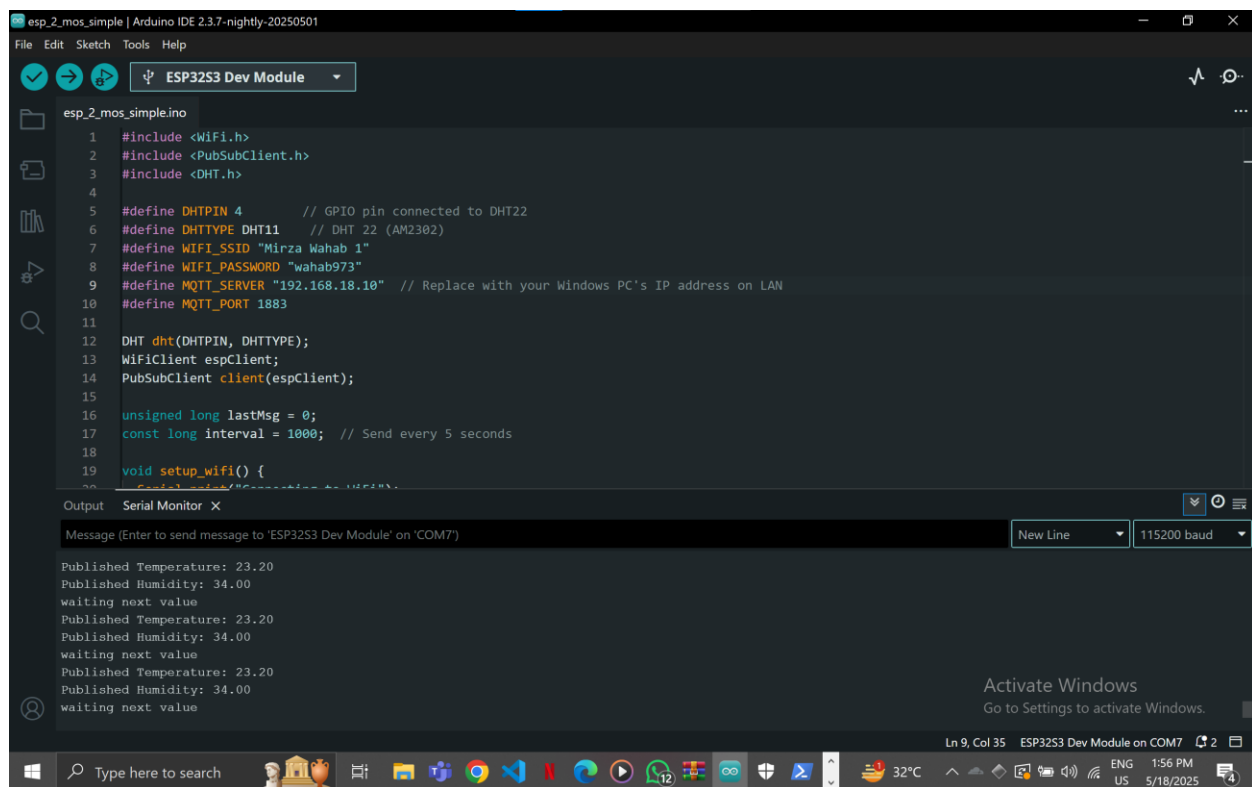


LAB:13 IOT

ABDUL WAHAB

22-NTU-CS-1337

1. Run the Arduino-based code to **publish DHT sensor data to the Mosquitto MQTT broker.**



```
esp_2_mos_simple | Arduino IDE 2.3.7-nightly-20250501
File Edit Sketch Tools Help

ESP32S3 Dev Module

esp_2_mos_simple.ino
1 #include <WiFi.h>
2 #include <PubSubClient.h>
3 #include <DHT.h>
4
5 #define DHTPIN 4 // GPIO pin connected to DHT22
6 #define DHTTYPE DHT11 // DHT 22 (AM2302)
7 #define WIFI_SSID "Mirza Wahab 1"
8 #define WIFI_PASSWORD "wahab973"
9 #define MQTT_SERVER "192.168.18.10" // Replace with your Windows PC's IP address on LAN
10 #define MQTT_PORT 1883
11
12 DHT dht(DHTPIN, DHTTYPE);
13 WiFiClient espClient;
14 PubSubClient client(espClient);
15
16 unsigned long lastMsg = 0;
17 const long interval = 1000; // Send every 5 seconds
18
19 void setup_wifi() {
20   // Connect to the WiFi network
21   WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
22   while (WiFi.status() != WL_CONNECTED) {
23     delay(1000);
24     Serial.println("Connecting to WiFi...");
25   }
26   Serial.println("Connected to WiFi");
27 }
28
29 void loop() {
30   if (client.connected() == false) {
31     client.connect("ESP32S3", MQTT_SERVER, MQTT_PORT, "Mirza Wahab 1", "wahab973");
32   }
33   if (!client.connected()) {
34     Serial.println("Reconnecting to MQTT broker...");
35     client.connect("ESP32S3", MQTT_SERVER, MQTT_PORT, "Mirza Wahab 1", "wahab973");
36   }
37   if (client.connected()) {
38     Serial.println("Connected to MQTT broker");
39     if (lastMsg == 0) {
40       Serial.println("Publishing DHT data");
41       float temp = dht.temperature();
42       float hum = dht.humidity();
43       client.publish("DHT22/Temperature", String(temp));
44       client.publish("DHT22/Humidity", String(hum));
45       lastMsg = millis();
46       Serial.println("Published Temperature: " + String(temp));
47       Serial.println("Published Humidity: " + String(hum));
48       Serial.println("waiting next value");
49     } else {
50       Serial.println("waiting next value");
51     }
52   }
53   delay(interval);
54 }
```

Output Serial Monitor X

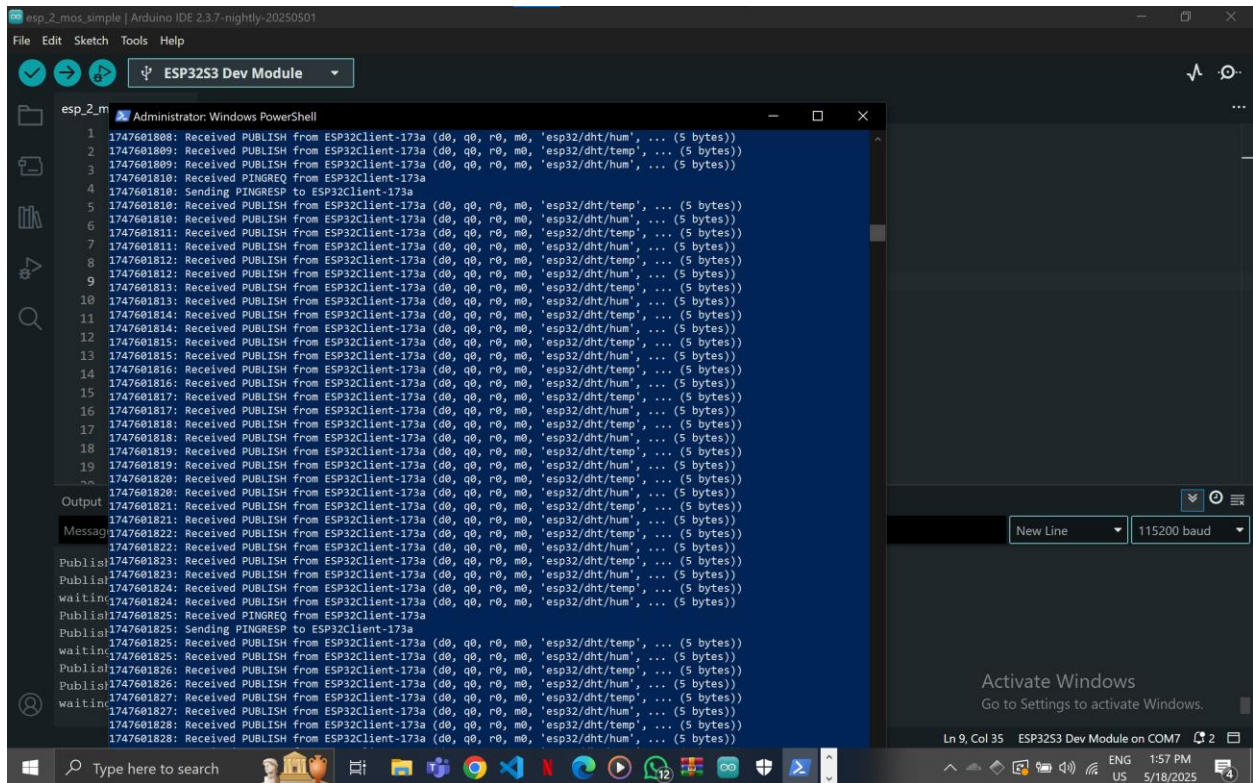
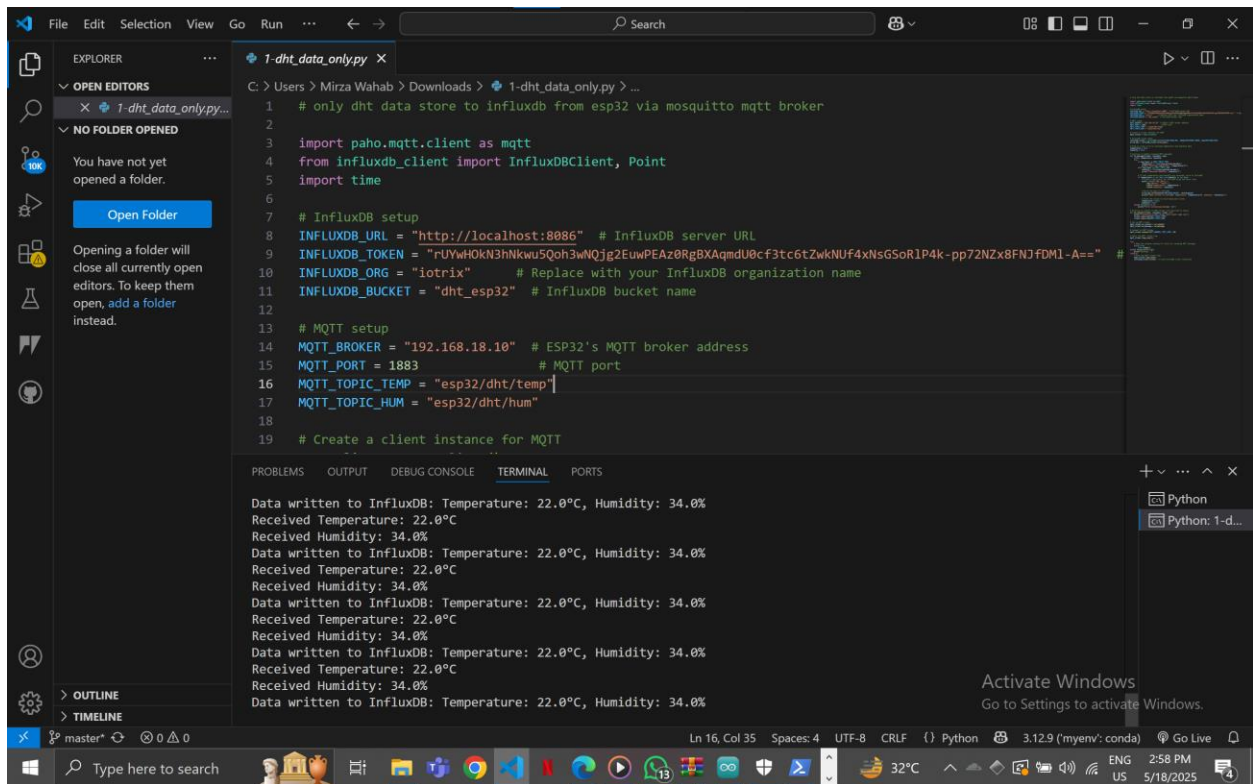
Message (Enter to send message to 'ESP32S3 Dev Module' on 'COM7') New Line 115200 baud

Published Temperature: 23.20
Published Humidity: 34.00
waiting next value
Published Temperature: 23.20
Published Humidity: 34.00
waiting next value
Published Temperature: 23.20
Published Humidity: 34.00
waiting next value

Activate Windows
Go to Settings to activate Windows.

Ln 9, Col 35 ESP32S3 Dev Module on COM7 2

32°C 1:56 PM 5/18/2025

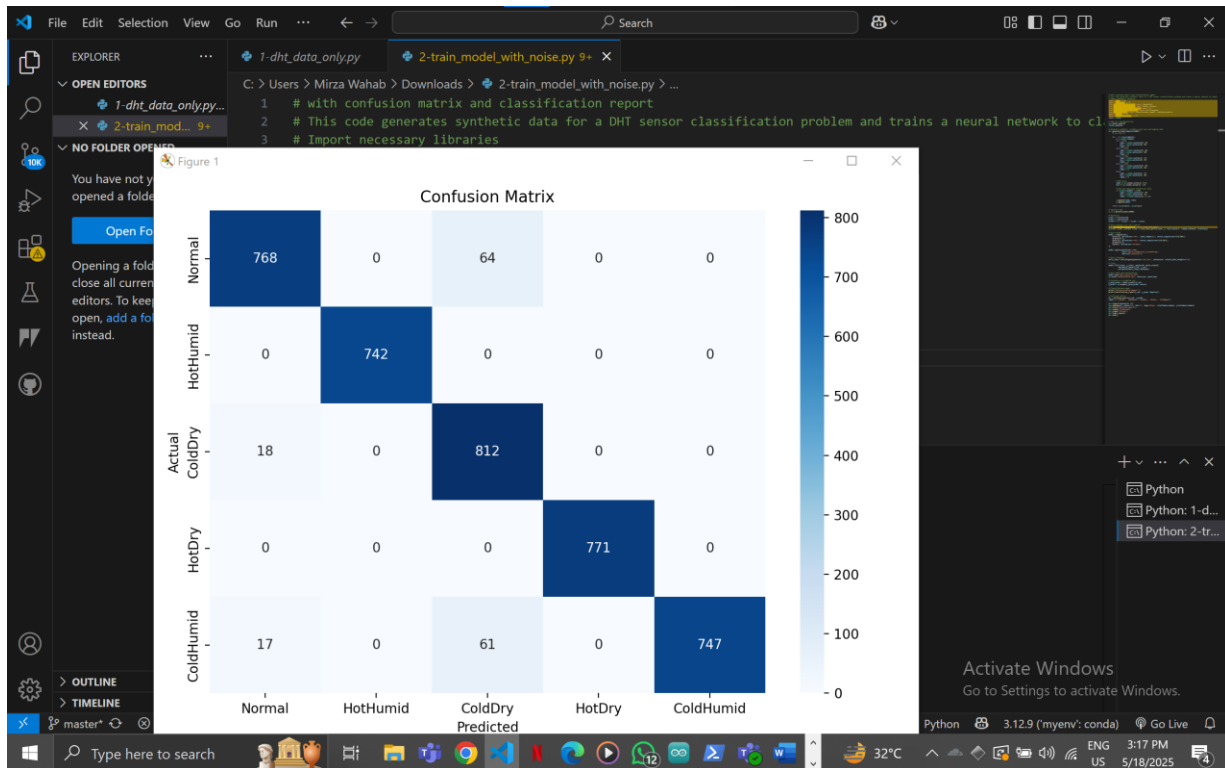


2. Execute the Python script 1-dht_data_only.py to **store MQTT data in InfluxDB**.

The screenshot shows the InfluxDB Data Explorer interface in a web browser. The browser tabs include 'lab13-pre-requisites.pdf', 'ESP32 MQTT Connection Fix', and 'Data Explorer | iotrix | InfluxDB'. The address bar shows 'localhost:8086/orgs/8492945fce27f50/data-explorer?fluxScriptEditor'. The interface has a dark theme and a sidebar with navigation icons. The main area displays a table of data with columns: _start, _stop, _time, _value, _field, _measurement, and device. The data shows humidity readings of 34 from device esp32. Below the table, there is a 'Query 1 (0.00s)' section with a 'View Raw Data' toggle, a 'CSV' button, and a 'Past 1h' time range selector. The 'SCRIPT EDITOR' tab is active, showing a 'FROM' section with a search for 'dht_esp32' and a 'WINDOW PERIOD' section set to 'AUTO' with a 10s interval. A 'No tag keys found in the current time range' message is displayed in the center. The Windows taskbar at the bottom shows the time as 3:03 PM on 5/18/2025.

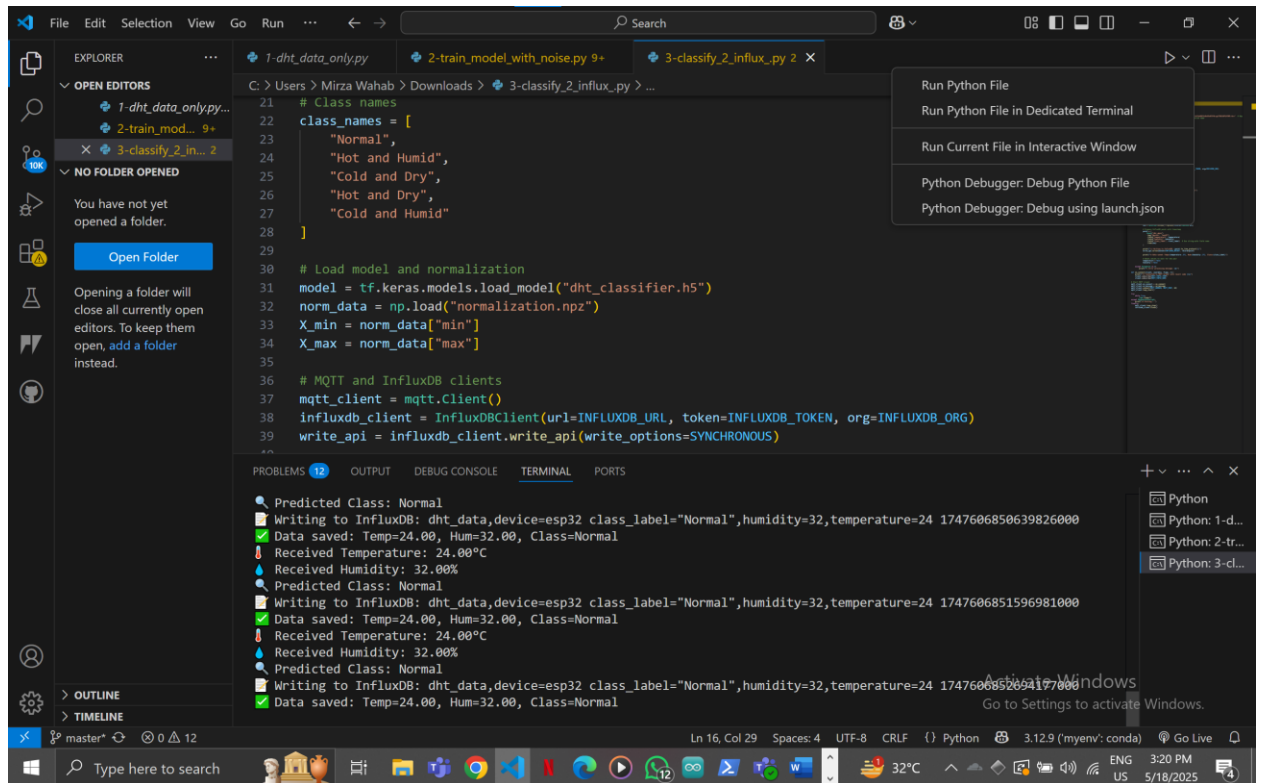
_start	_stop	_time	_value	_field	_measurement	device
2025-05-18 02:...	2025-05-18 03:...	2025-05-18 02:...	34	humidity	dht_data	esp32
2025-05-18 02:...	2025-05-18 03:...	2025-05-18 02:...	34	humidity	dht_data	esp32
2025-05-18 02:...	2025-05-18 03:...	2025-05-18 02:...	34	humidity	dht_data	esp32
2025-05-18 02:...	2025-05-18 03:...	2025-05-18 02:...	34	humidity	dht_data	esp32

3. Run 2-train_model_with_noise.py and record the confusion matrix and classification report



Classification Report:				
	precision	recall	f1-score	support
0	0.8957	0.9700	0.9313	832
1	0.9987	1.0000	0.9993	742
2	0.9415	0.9506	0.9460	830
3	1.0000	1.0000	1.0000	771
4	1.0000	0.9055	0.9504	825
accuracy			0.9640	4000
macro avg	0.9672	0.9652	0.9654	4000
weighted avg	0.9659	0.9640	0.9642	4000

4. Execute 3-classify_2_influx.py and **verify InfluxDB data** for temperature, humidity, and classification results



```
21 # Class names
22 class_names = [
23     "Normal",
24     "Hot and Humid",
25     "Cold and Dry",
26     "Hot and Dry",
27     "Cold and Humid"
28 ]
29
30 # Load model and normalization
31 model = tf.keras.models.load_model("dht_classifier.h5")
32 norm_data = np.load("normalization.npz")
33 X_min = norm_data["min"]
34 X_max = norm_data["max"]
35
36 # MQTT and InfluxDB clients
37 mqtt_client = mqtt.Client()
38 influxdb_client = InfluxDBClient(url=INFLUXDB_URL, token=INFLUXDB_TOKEN, org=INFLUXDB_ORG)
39 write_api = influxdb_client.write_api(write_options=SYNCHRONOUS)
```

Predicted Class: Normal
Writing to InfluxDB: dht_data,device=esp32 class_label="Normal",humidity=32,temperature=24 1747606850639826000
Data saved: Temp=24.00, Hum=32.00, Class=Normal
Received Temperature: 24.00°C
Received Humidity: 32.00%
Predicted Class: Normal
Writing to InfluxDB: dht_data,device=esp32 class_label="Normal",humidity=32,temperature=24 1747606851596981000
Data saved: Temp=24.00, Hum=32.00, Class=Normal
Received Temperature: 24.00°C
Received Humidity: 32.00%
Predicted Class: Normal
Writing to InfluxDB: dht_data,device=esp32 class_label="Normal",humidity=32,temperature=24 1747606852692197000
Data saved: Temp=24.00, Hum=32.00, Class=Normal

lab13-pre-requisites.pdf

ESP32 MQTT Connection Fix

Data Explorer | iotrix | InfluxDB

localhost:8086/orgs/8492945fcd27f50/data-explorer?fluxScriptEditor

Import favoritesGmailYouTubeMaps

i

Data Explorer

Table

CUSTOMIZE

Local

SAVE AS

_start	_stop	_time	_measurement	device	class_label	humidity	temperature
2025-05-18 02:24:04 ...	2025-05-18 03:24:04 ...	2025-05-18 03:20:40...	dht_data	esp32	Normal	32	23.90
2025-05-18 02:24:04 ...	2025-05-18 03:24:04 ...	2025-05-18 03:20:41 ...	dht_data	esp32	Normal	32	23.90
2025-05-18 02:24:04 ...	2025-05-18 03:24:04 ...	2025-05-18 03:20:42 ...	dht_data	esp32	Normal	32	24
2025-05-18 02:24:04 ...	2025-05-18 03:24:04 ...	2025-05-18 03:20:43 ...	dht_data	esp32	Normal	32	24

Query 1 (0.00s)

+

View Raw Data

CSV

Past 1h

SCRIPT EDITOR

SUBMIT

FROM

Search buckets

dht_esp32

_monitoring

_tasks

+ Create Bucket

No tag keys found in the current time range

WINDOW PERIOD

CUSTOM

AUTO

auto (10s)

Fill missing values

Activate Windows

AGGREGATE FUNCTION

Go to Settings to activate Windows.

CUSTOM

AUTO

Type here to search32°CENG US3:24 PM5/18/2025