

# Comprehensive Error Handling Instructions for Weather Station Project

Ravishan BBN

January 23, 2025

## 1 Introduction

This document provides an extensive guide to identifying and resolving errors encountered during the setup and execution of the Weather Station project. The issues include those related to sensors, Python dependencies, virtual environments (venv), Node-RED, MQTT, and ThingSpeak integrations.

## 2 Common Errors and Resolutions

### 2.1 Sensor Read Errors

- **Error Message:** `RuntimeError: Failed to get reading. Try again!`
- **Cause:** Sensor is not connected properly, faulty, or lacks power.
- **Resolution:**
  1. Verify physical connections between the sensor and Raspberry Pi.
  2. Check the power supply to the sensor.
  3. Ensure that the correct GPIO pins are used.
  4. Test the sensor with a different script or device to confirm functionality.

## 2.2 Missing Python Libraries

- **Error Message:** `ModuleNotFoundError: No module named '<library>'`
- **Cause:** Required Python library is not installed in the current environment.
- **Resolution:**
  1. Install the missing library using pip:

```
pip3 install <library>
```
  2. Verify installation by importing the module in a Python shell.

## 2.3 Virtual Environment (venv) Issues

- **Error Message:** Command `'pip'` not found or `ModuleNotFoundError` in venv.
- **Cause:** Virtual environment is not activated, or libraries are not installed in the venv.
- **Resolution:**
  1. Create and activate the virtual environment:

```
python3 -m venv myenv  
source myenv/bin/activate
```
  2. Install required libraries inside the virtual environment:

```
pip install <library>
```
  3. Verify activation with the command:

```
which python3
```

## 2.4 Node-RED Not Starting

- **Error Message:** Various errors during startup.
- **Cause:** Port conflict, missing dependencies, or improper installation.
- **Resolution:**

1. Check if Node-RED is already running:

```
ps aux | grep node-red
```

2. Change the default port if there's a conflict by editing `settings.js`.
3. Reinstall Node-RED:

```
sudo npm install -g --unsafe-perm node-red
```

4. Install any missing Node-RED dependencies:

```
npm install
```

## 2.5 MQTT Connection Issues

- **Error Message:** Connection refused or timeout.
- **Cause:** MQTT broker is not running or misconfigured.
- **Resolution:**

1. Ensure that the MQTT broker (e.g., Mosquitto) is installed and running:

```
sudo systemctl status mosquitto
```

2. Restart the broker if necessary:

```
sudo systemctl restart mosquitto
```

3. Verify MQTT topics using:

```
mosquitto_sub -h localhost -t "sensor_data"
```

4. Check the network connectivity between Raspberry Pi and Node-RED.

## 2.6 ThingSpeak Data Not Updating

- **Error Message:** HTTP 403 Forbidden or 400 Bad Request.
- **Cause:** Incorrect API key, malformed data, or network issues.
- **Resolution:**
  1. Verify the ThingSpeak API Write Key in `thingspeak.config.py`.
  2. Ensure that data fields match the ThingSpeak channel configuration.
  3. Check URL formatting in the HTTP request.
  4. Test the ThingSpeak connection using Postman or a browser.

## 2.7 Pushbullet Notifications Not Working

- **Error Message:** HTTP 401 Unauthorized.
- **Cause:** Invalid API key or incorrect HTTP headers.
- **Resolution:**
  1. Verify the API key in the Pushbullet configuration.
  2. Ensure that the header format is correct:

```
Authorization: Bearer <API_KEY>
```

3. Test the Pushbullet API using Postman.

## 2.8 Node-RED Flows Not Working

- **Error Message:** "Invalid nodes detected" or "Flow is not deployable".
- **Cause:** Nodes are not properly configured or dependencies are missing.
- **Resolution:**

1. Open Node-RED, locate invalid nodes (highlighted in red), and reconfigure them.
2. Install missing nodes using:

```
npm install <node-package-name>
```

3. Restart Node-RED:

```
node-red
```

## 3 General Troubleshooting Tips

- **Check Logs:** Review logs from Raspberry Pi, Node-RED, and ThingSpeak for detailed error messages.
- **Validate Configurations:** Double-check all configuration files for typos or incorrect settings.
- **Update Software:** Ensure all software packages and dependencies are up to date.
- **Test Communication Locally:**

- Open two terminal windows.
- Start the MQTT broker in one window:

```
mosquitto
```

- Publish a test message in another:

```
mosquitto_pub -h localhost -t "test_topic" -m "Hello MQTT"
```

- Subscribe to the topic in the second window to confirm:

```
mosquitto_sub -h localhost -t "test_topic"
```

- **Community Support:** Refer to forums and communities such as Stack Overflow or Node-RED forums.

## 4 Conclusion

By addressing these common errors, you can ensure a smooth setup and operation of the Weather Station project. Proper error handling and regular maintenance will enhance the system's reliability and functionality.