Case Study 3: Indoor Climate Monitoring and Visualization with Raspberry Pi

DAT-230 Data Visualization & Storytelling with AI

Instructor: Dr. Vikas Thammanna Gowda Semester: Fall 2025
Contact: vthammannagowda@champlain.edu Office Location: West Hall 100
Office Hours: TBD

Case Study 3: Weather and Climate Patterns
Assigned Date: 10/09/2025
Due Date: 10/22/2025

LLM Prompts for Raspberry Pi Setup

Prompt 1: Dependency Installation

```
You are a Raspberry Pi expert.
Please guide me step-by-step to update the package index and install Python3, pip, venv,
and the sensor libraries (Adafruit_DHT, adafruit-circuitpython-tsl2561,
adafruit-circuitpython-ads1×15) on Raspberry Pi OS. Explain each command's purpose
and how to verify successful installation.
```

Prompt 2: Enable I^2C

```
You are a Raspberry Pi configuration assistant.
Explain how to enable I2C on Raspberry Pi OS using raspi-config, including menu navigation
and verification of I2C status.
```


Prompt 3: MQ135 Instantiation

```
You are an Adafruit sensor library tutor. Show me how to correctly instantiate an
AnalogIn channel for the MQ135 sensor using adafruit-ads1x15 in Python, including import
statements and usage.
```

Prompt 4: LDR Integration

```
You are a hardware integration instructor. Describe how to wire an LDR in a resistor
divider to an ADS1115 channel, and update the read_light_lux() function to read and
return raw or normalized LDR values in Python.
```

Prompt 5: MQ135 Calibration

```
You are a data calibration guide. Explain how to record a clean-air baseline for
MQ135 at startup, implement normalization (normalized = (raw - baseline)/(max_expected
- baseline)), and log both raw and normalized readings.
```

Prompt 6: Time Synchronization

```
You are a system administrator. Instruct me on installing and configuring NTP or
systemd-timesyncd on Raspberry Pi and how to verify the clock synchronization status.
```

Prompt 7: Deployment Metadata

```
You are a deployment documentation assistant. Show me how to structure a JSON metadata
section to record placement details, intentional bias notes (e.g., \sunlight exposure
14:00{16:00"), and calibration offsets before a data run.
```