Dissertation Implementation approach

## Data-Collection: from heat probes

### Option 1: Vendor Data-Logger (No Coding Required)

1. Plug in the probe to the USB/RS-485/Modbus interface box.
2. Install the vendor’s software on your PC.
3. Configure sampling (e.g. 1 Hz), choose a file path, click Start, and you’re collecting data.
4. Export the CSV or JSON when you’re done.

### Option 2: Raspberry Pi + Python (More Flexible)

1. A Raspberry Pi (any model with GPIO pins; Pi 3/4/Zero W are common).
2. A digital temperature probe (e.g. DS18B20 for 1-Wire, or an RTD with an SPI/ADC breakout).
3. A micro-SD card (with Raspberry Pi OS installed).
4. A USB power supply or battery pack.

**Step-by-step**

1. **Set up the Pi**
   * Flash Raspberry Pi OS to your SD card (use the Raspberry Pi Imager).
   * Boot the Pi, connect to your network (Ethernet or Wi-Fi).
2. **Connect your sensor**
   * For a DS18B20 1-Wire probe:
     + Plug its red wire to **5 V**, black to **GND**, yellow (data) to **GPIO 4**.
     + Add a 4.7 kΩ pull-up resistor between 5 V and GPIO 4.
   * For other sensors (Modbus, SPI ADC, etc.), wire per the breakout’s instructions.
3. **Enable the interface**
   * Open a terminal on the Pi and run sudo raspi-config.
   * Under **Interface Options**, enable **1-Wire** (for DS18B20) or **SPI/I2C** as needed.
   * Reboot.
4. Install Python libraries

sudo apt update

sudo apt install python3-pip

pip3 install adafruit-circuitpython-ds18x20 adafruit-circuitpython-pureio (Or, for Modbus: pip3 install minimalmodbus

1. Write a simple Python script
2. Run the script to log the temperature reading into a CSV file
3. **Automate at boot (optional)**

Edit the crontab: crontab -e

@reboot /usr/bin/python3 /home/pi/read\_temp.py & (Pi will start logging whenever it powers on)