

Sustainable Energy Engineering Project Description – SEE 410W – Fall 2024

Project Title:

Designing a *Data Pi* for Collecting Environmental Sensor Data

Project Summary (250 words):

The Computational Sustainability Lab is hosted within the Faculty of Applied Sciences at Simon Fraser University (SFU). It is focused on developing computational tools and ways to use computational methods to solve difficult sustainability problems.

The main goal of this project is to build an open-source software platform that collects and distributes sensor data on an open hardware platform, such as Raspberry Pi. The main goal of computational sustainability is to build models and algorithms that solve sustainability problems while balancing environmental, social, and economic needs. Developing an open-source data collection system allows for easier access to environmental data, which is vital to building models and sustainability algorithms for learning and testing accuracy to infer or predict environmental events.

The project will use a network of Raspberry Pi nodes as the hardware platform to collect data from various sensors. There will be two types of nodes: one that collects data and one that stores data for retrieval or display. A single Raspberry Pi can be either type or both types. There will be a field test/deployment environment, which will contain donors in an apartment. Sensors in this environment could be serial, USB, wired ethernet, wireless, or cloud accessible. For testing, the first sensor will be a branch circuit power meter that monitors all circuits in a power panel and collects various electrical readings at 1Hz via wired USB. If time permits, other sensors will be prototyped. The store node will have a web-enabled interface allowing for remote data retrieval, a real-time display of current sensor values, and a summary/chart display of historical data. Data communication between the collection node and the store node can use memory cache libraries (e.g., Memcached). Lastly, all programming will be in the latest version of Python 3.

Project Clients: Dr. Stephen Makonin, PI of the SFU Computational Sustainability Lab

Project Design Objectives:

- < Identify all the key design requirements with the clients
- < Explore the potential designs and approaches for *Data Pi*
- < Select an optimum solution, based on consultations with the client
- < Develop a detailed engineering design for the *Data Pi*
- < Undertake an economic, social, and environmental analysis of the selected engineering design
- < Describe in detail the steps involved in the process, including development of the model and results (to be undertaken in SEE 411)

Please review the SEE 410W Handbook to see the list of expected project outputs.