**Project 4: Measure Energy Consumption**

**Design**:

Automate energy consumption data collection, analysis, and visualization.

**Applicability**:

Optimize energy usage in various sectors with accurate insights.

**Technology**:

loT devices and data analysis tools for energy data.

**Coding**:

Combination of languages like C++, Python, and data analysis libraries

**Architecture**:

A digital energy detective tracking usage for informed decisions.

**Transformation**:

Shifts energy management from manual to data-driven Real-World Analogy: A smart meter that helps monitor and manage home energy

We are implement our AI program by this data set:

https://www.kaggle.com/datasets/robikscube/hourly-energy-consumption

**Project Implementation**

**Steps:**

**1.Identify the Device**:

Decide on the device whose energy consumption you want to measure.

**2.Understand the Device's Power Rating**:

Most electronic devices have a power rating, often found on a label or in the device's manual. This rating is usually given in watts (W).

**3.Get an Energy Monitor**: Purchase a plug-in energy monitor, also known as an electricity usage monitor. These devices measure the real-time power usage and can often estimate the cost over time based on your electricity rates.

**4.Plug in the Device**:

* + Plug the energy monitor into a wall socket.
  + Then plug the device you want to measure into the energy monitor.

**5.Operate the Device**: Turn on the device and let it operate normally. The energy monitor will display the power the device is using in real-time.

**6.Collect Data**:

Many energy monitors will also record usage over time, so you can see how much energy the device uses in a day, week, or month.

**7.Calculate Total Consumption**:

* + If your monitor doesn't give a cumulative reading, you can calculate it.
  + Energy (in watt-hours) = Power (in watts) x Time (in hours).
  + To convert to kilowatt-hours (kWh), divide by 1000.

**8.Cost Estimation**:

If you want to calculate the cost of running that device:

* + Find out your electricity rate (usually in cents per kWh) from your electricity bill or provider.
  + Multiply the energy consumption in kWh by your rate.

**9.Analyze and Optimize**:

Based on your findings, decide if the device is consuming more power than necessary. Consider replacing old and inefficient appliances or adjusting usage patterns to save energy.

**10.Scale Up**:

If you want to measure the energy consumption of your entire home or building:

* + Consider using a whole-home energy monitor system.
  + Engage with your utility provider. They often provide tools, resources, and sometimes even rebates for energy audits and consumption measurements