**A Real Time, Wireless And Low Cost Data Acquisition System For Residential Pv Modules**

**Alternative Title:**

 Weather and Load Forecasting system for Prosumers using Machine Learning system.

**Aim:**

Aim of this projects is to build a Weather and Load forecasting system for residential microgrid systems using machine learning algorithm.

**Introduction:**

Sustainable development and environmental issues are crucial objectives of the energy sector. Re-structure of the electrical power market, diffusion of the renewable energy technologies, promotion of distributed generation (DG), and transmission integration are some leading tools for the energy sector to sustainable development as its ultimate goal. The deployment of DG units has received a great deal of attention. For instance, renewable energy sources (RESs) accounted for 26.5% of the global electrical power demand in 2017, and it is predicted to increase in next years.

Prosumers- An individual who produce and consume the value. Prosumer microgrid systems are grabbing attention in recent studies. Such this systems person who producing the electricity using power sources like Photo Voltaic Modules (PV Modules) and Wind turbine. To effectively utilize these kind of systems we are proposing a model which forecast the Load and Weather. By forecasting production of electricity and consumption of electricity we effectively control the microgrid system and also can store it in batteries. Based on forecasted data, we can analyze the Battery storage system and we can minimize the cost of maintaining it.

In this system, we are having 6 nodes with different value of nodes and all the nodes connected to the main server. Within sever system, we are running machine learning algorithms to forecast the weather and load. Each node contains NodeMCU, Current sensor, voltage sensor and various loads. Here, Raspberry pi act as server system which portable and power efficient.

**Existing System:**

Existing system aims to measure the current and the voltage and to calculate the resulting power and energy of a residential PV system. The collected data are stored into a micro SD card, and are sent to the user via Bluetooth. This measurement system will afford a real time monitoring of the installation that will facilitate its maintenance, fault detection and will provide a record of all the data at fixed intervals.

**Proposed System:**

Proposed system forecasts the load and weather using SVM algorithm based on stored data from various nodes. Every node contains Current sensor, voltage sensor, NodeMCU as a controller and loads with different values. Each node sends their values to server through local network.

**Block Diagram:**

Charging controller

Battery

Load 1

Load 2

Load 3

Raspberry PI

Node MCU

Current Sensor

Voltage Sensor

Solar Panel

**Block Diagram Description:**

In this project solar panel grid is connected with various loads via the charging controller. Charging controller is responsible for switching the connection between solar panel and battery with loads.Voltage sensor is connected across the panel and current sensor is connected in series. These sensor values fed to raspberry pi via NodeMCU while NodeMCU and Raspberry pi connected through wireless network. Amount of Current and Voltage produced by the solar panel is measured by respective sensors and send to nodemcu. By using Collected data raspberry pi predicts the usage of current. By using weather data, production of the current value will be predicted.

**Module Description:**

* Dataset Collection
* Data Pre-Processing
* Feature Selection And Reduction
* Classification Modeling and Performance Measures

**Dataset Collection**

 Sensor and controller arrangement will be done as per block diagram. Current and voltage produced by solar panel will store in dataset. Also amount of consumption of current by different users will be stored in dataset. These values used to forecast the load by different users. Weather data collected from kaggle to predict the production of current by solar panel.

**Data Pre-Processing**

 Weather and sensor is pre-processed after collection of various records. The dataset contains a total of 15 consumer records, where 2 records are with some missing values. Those 2 records have been removed from the dataset and the remaining 13 consumer records are used in pre-processing.

**Feature Selection and Reduction**

 From among the 8 attributes of the data set, two attributes pertaining to temperature and humidity are used to identify the weather information of the location. The remaining 6 attributes are collected from the grid.

**Classification Modeling and Performance Measures:**

 The clustering of datasets is done on the basis of the variables and criteria of Decision Tree (DT) features. Then, the classifiers are applied to each clustered dataset in order to estimate its performance. The best performing models are identified from the above results based on their low rate of error.

* Support Vector Classifier
* Random Forest Classifier

 Several standard performance metrics such as accuracy, precision and error in classification have been considered for the computation of performance efficacy of this model.

# Hardware Requirements:

# Raspberry pi 4

# NodeMCU

# Voltage Sensor module

# Current Sensor module

# TP4056 Charging module

# 6V,3W/1W solar panel

# 5V Battery

# DC motor

# LED

# Software Requirements:

* Language : Python
* Compiler : GCC Complier
* OS : Linux