# CoMPEA: Cognitive Power Metering and Prediction using Edge AI


## Abstract

This project aims to optimize the use of solar energy in home solar systems by exploring power generation, consumption forecasting, and load management. Load management can distribute the energy generated by the solar panels to different appliances in the home, reducing energy demand during peak periods and maximizing solar energy utilization. The project evaluates the system's performance under different weather conditions and assesses the economic and environmental benefits of using solar energy for home electricity needs.


## Problem Statment

To develop a smart and efficient home solar system through a blend of IoT and Machine Learning to improve the existing conventional solar system solutions.

## Methodology

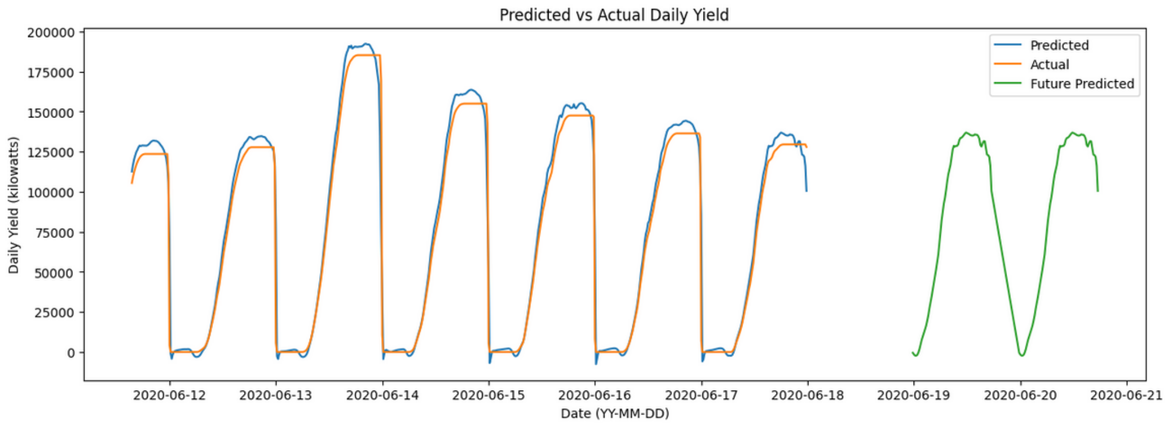
- The meteorological data such as humidity, temperature, and photovoltaic panel data is being logged in real time.
- LSTM and ARIMA models predict power generated and consumed that emulates the actual power generation and consumption.
- Optimal demand side management is achieved through implementation of load shedding algorithm

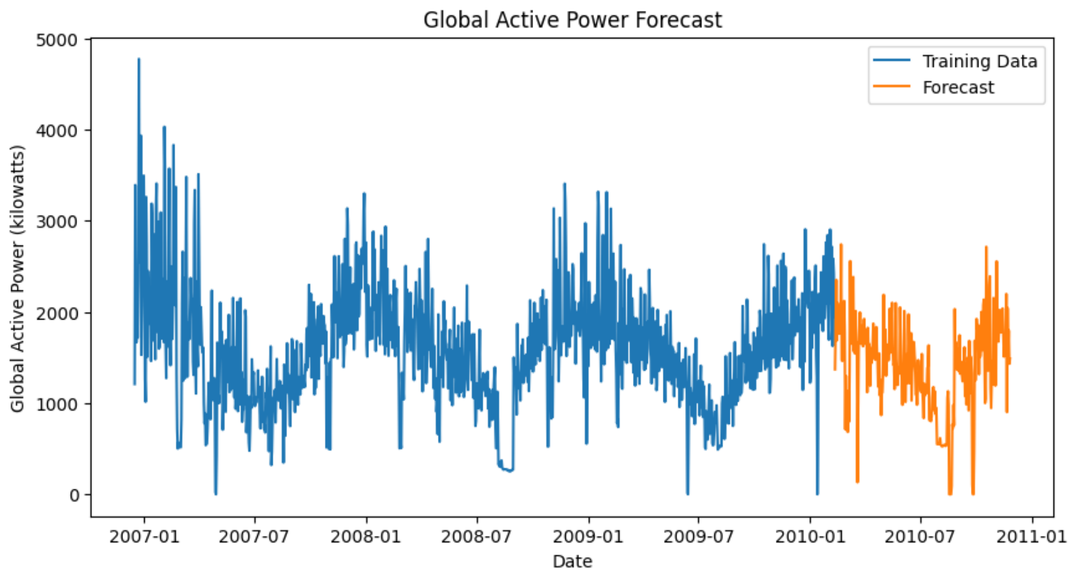
## Objectives

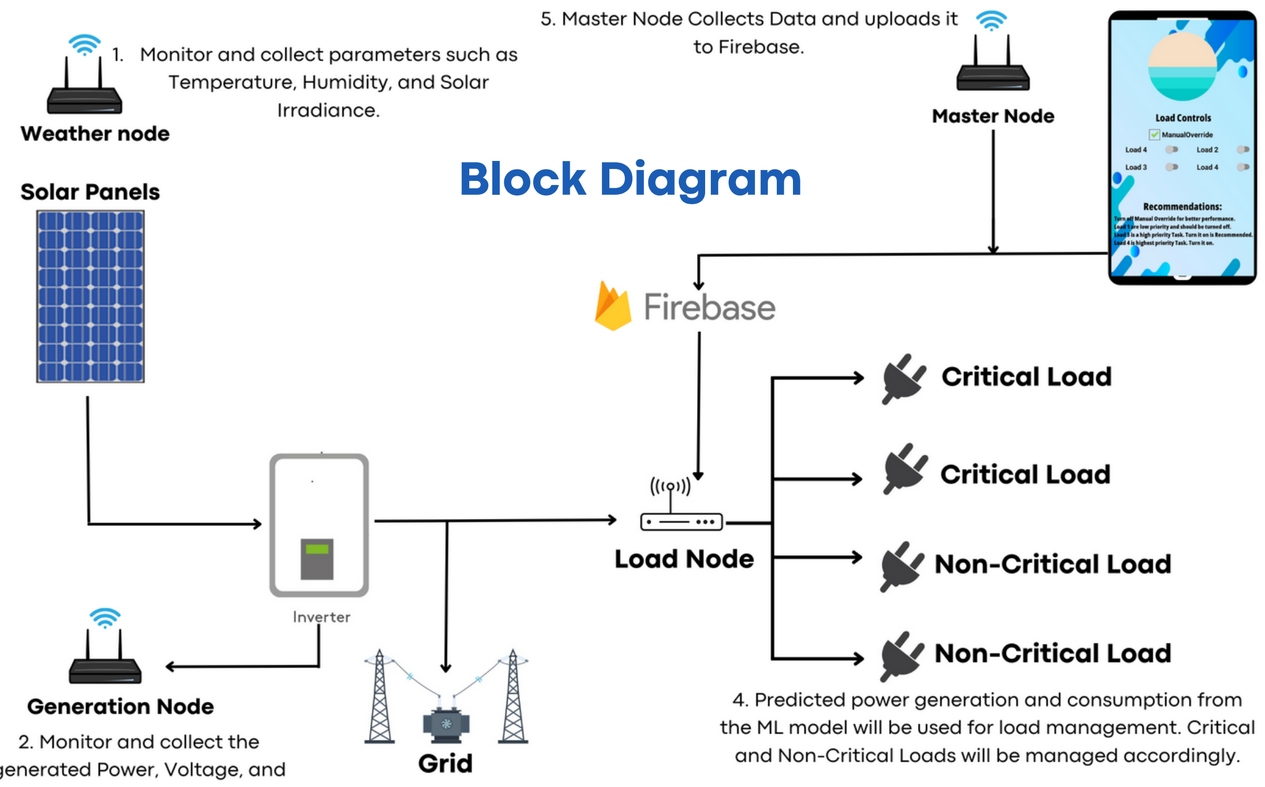
- Cost effective
- Minimal human intervention
- Accurate predictions for power consumption and power generation
- Efficient load management

## Analysis

LSTM Model has been implemented to forecast the power generated by the solar panels, as well as the power consumed by the household. The graphs depict how well the models predict. LSTM had the least error metric compared to other time series models




## Conclusion

A smart and cognitive IoT-based lab test bed for a 2kVA hybrid system. The design of the hardware incorporates an actual PV array with an On-Grid inverter to make a product-based solution. This devised solution offers additional features on top of conventional systems. Prediction of future power generation and consumption through state-of-the-art machine learning models and load management to optimize the use of solar energy in home. A front-end application development for insights, control, and monitoring.

## References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