# HOME ELECTRICITY FORECAST

**B. E. Information Technology**

By


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|---|---|
| **Akshay Gunjal** | **34** |
| **Shaun Dsilva** | **35** |
| **Davon Carvalho** | **36** |


Mentor:

**Prof. Vaishali Salvi**
Designation


Department of Information Technology
St. Francis Institute of Technology
(Engineering College)



University of Mumbai
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## DECLARATION

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources.

We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in this submission.

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1. ----------
(Signature)

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(Akshay Gunjal Roll No. 34)

2. ----------
(Signature)

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(Shaun Dsilva Roll No. 35)

3. ----------
(Signature)

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(Davon Carvalho Roll No. 36)

Date:

## CERTIFICATE

This Internet of Everything Lab Mini-project “Home Electricity Forecast” by Akshay Gunjal, Shaun Dsilva, Davon Carvalho is complete in all respects and was successfully demonstrated on.

Name : ----------

Signature :----------

(Internal examiner)

Name : ----------

Signature :----------

(External examiner)

Date:

Place:

## CONTENTS

# Chapter 1
# Introduction

- **Introduction to IoE:** Internet of Everything (IoE) as bringing together people, process, data, and things to make networked connections more relevant and valuable than ever before-turning information into actions that create new capabilities, richer experiences, and unprecedented economic opportunity for businesses, individuals, and countries.

- **Introduction to domain :** You must have your traditional energy meters at home that generates bill every month, too boring. We can make our own smart energy meter that generates bill every minute which we can see on your smart phone or laptop.

- **Introduction to problem :** Checking the number of units consumed on our electricity meter every time is very difficult as it can be located at uneasy places. Smart Home Electricity forecast is useful in this situation.

- **Proposed solution :** Smart Home Electricity forecast systems cover a range of products that use a combination of technologies to identify how much energy is been consumed by every electric product. This is useful to calculate the actual amount of electricity bill that we receive every month.

# Chapter 2
# Literature Review

| | Summary | Gaps Identified |
|---|---|---|
| *[1]* | This article applied these concepts to home energy monitoring system and create an application to forecasting the user's electricity bill. The system has applications programming interface (API) that allow users to create applications upon their requirements. | 87% data was available but 13% data was lost due to low signal in Wi-Fi connectivity. |
| *[2]* | This model consists of three sub models: user electricity consumption sub model, renewable energies sub model(solar cells and wind turbines) and EVs power consumption and storage sub model. All these sub models together build an accurate model that provides low error predictions for EMSs. | Was not able to produce estimate consumption of ample households. |
| *[3]* | This paper proposes a novel forecast method for individual household electricity loads. Besides using smart meter data together with weather and temporal variables this approach integrates the information contained in typical daily consumption profiles extracted by clustering and classification methods. | The method still remains practical in terms of data requirements as it mostly utilizes smart meter data. Most energy companies do not own detailed survey information of households. |
| *[4]* | The goal of this paper is to benchmark state-of-the-art methods for forecasting electricity demand on the household level across different granularities and time scales in an explorative way, thereby revealing potential shortcomings and find promising directions for future research in this area. | This paper was having a limited data. |

# Chapter 3
# Problem Statement

This project aims to build a Home Electricity forecast system using various sensors, which will be efficient for people to know their monthly, yearly, and timely consumption of energy that their appliances use and calculate the estimated bill amount.

# Chapter 4
# System Design and Requirements

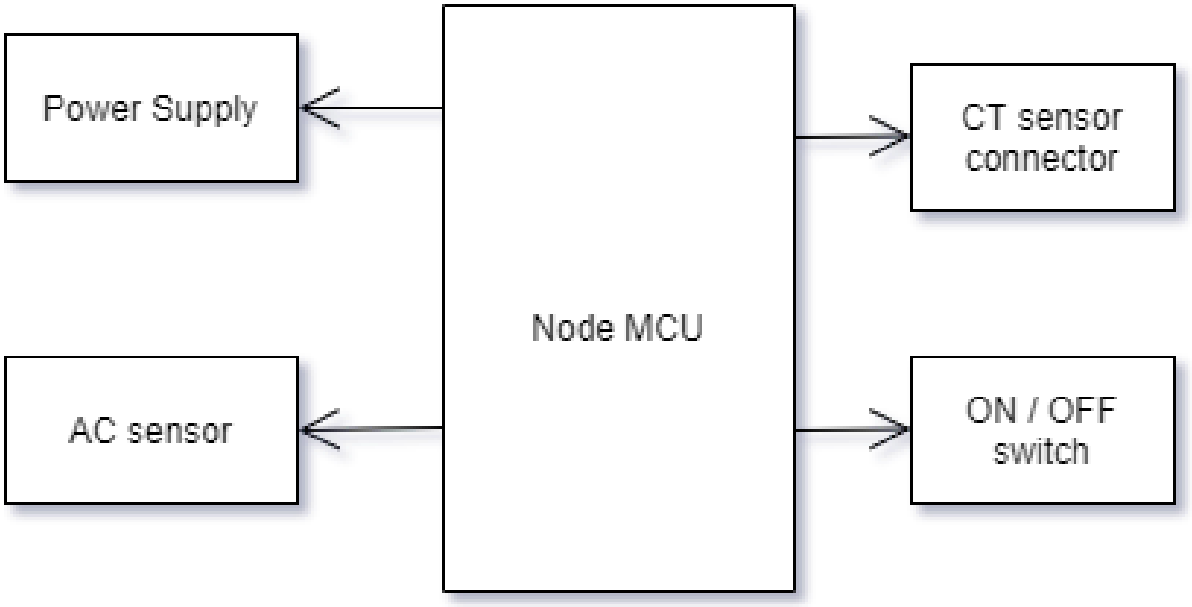


Fig 1: System Design

| Hardware / Software | No. Required | Cost of per Component |
|---|---|---|
| Node MCU | 1 | 200/- Rs. |
| CT Sensor | 1 | 600/- Rs. |
| On / Off Switch | 1 | 10/- Rs. |
| Breadboard | 1 | 70/- Rs. |
| Connectors | As per requirement | - |
| Power supply | 1 | - |
| Arduino IDE | - | - |
| Ubidots | - | - |
| | | Total – 880/- Rs. |

Table 1: System Requirements

# Chapter 5
# Data Analytics

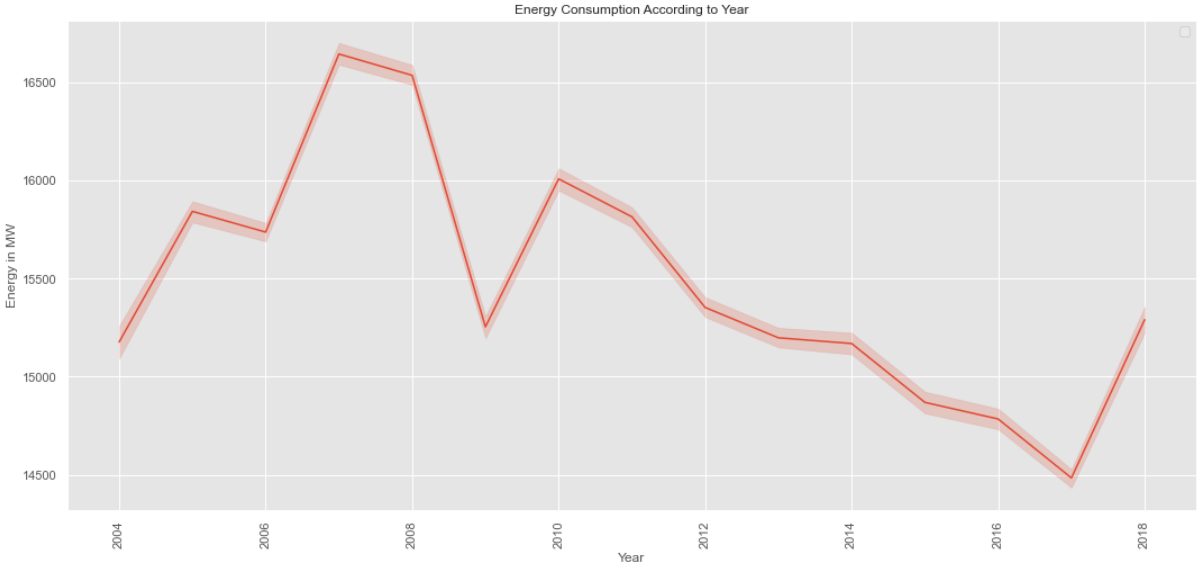


Fig 2. Yearly Energy consumption

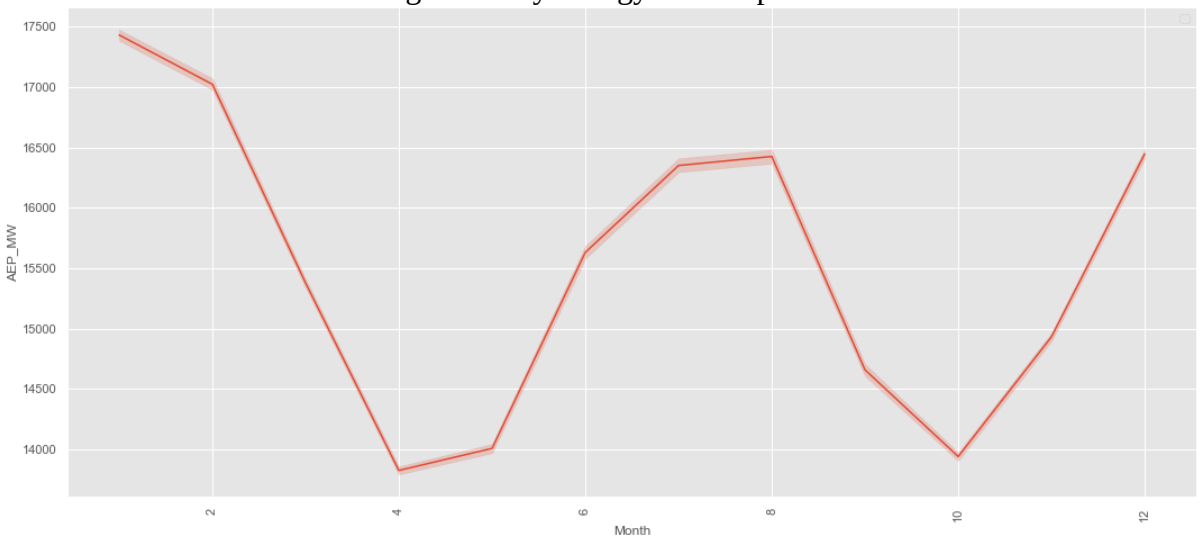


Fig 3. Monthly Energy consumption

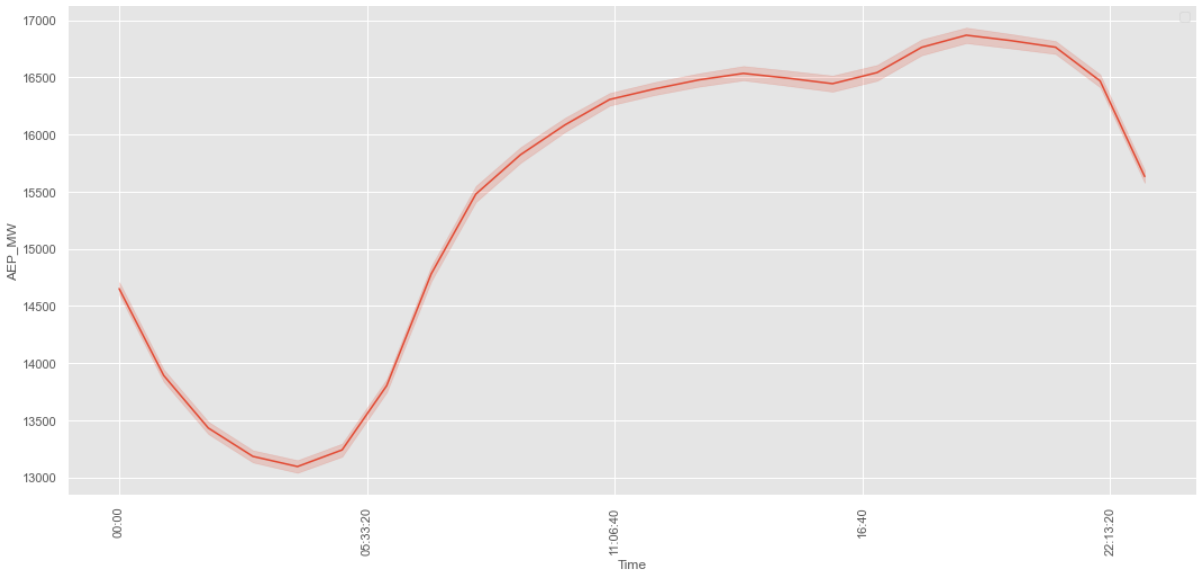

Fig 4. Timely Energy consumption

# Chapter 6
# Results

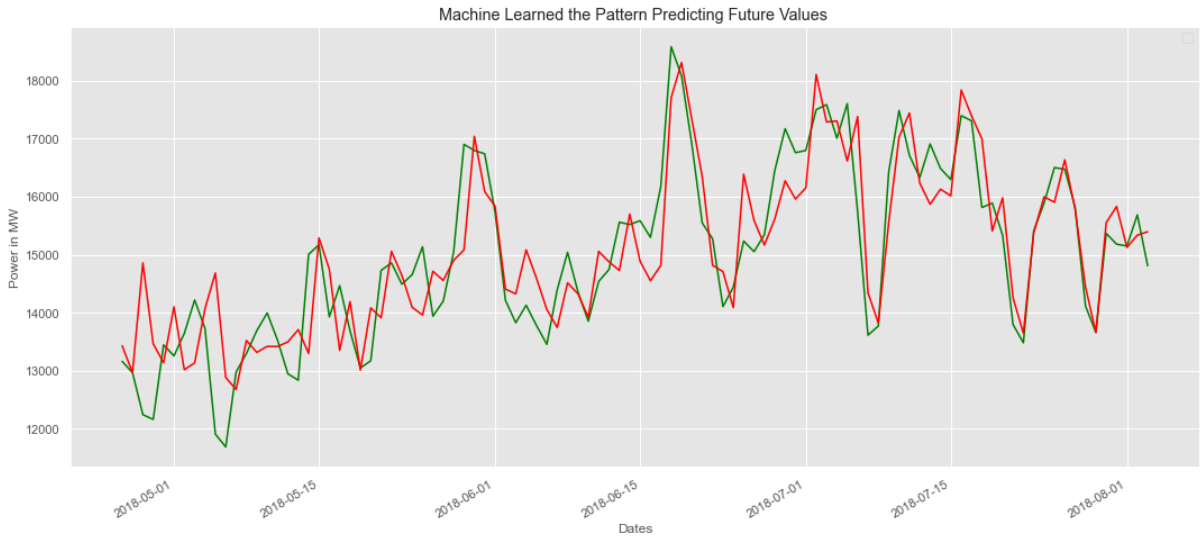


Fig 5. Predicted Energy Consumption

The red line is the line that the model has predicted. The green line is the actual values in the dataset. The model was able to predict the energy consumption as we see in Fig. 6.

:

| | Date | TrueMegaWatt | PredictedMeagWatt |
|---|---|---|---|
| 0 | 2018-04-26 | 13157.791667 | 13426.632812 |
| 1 | 2018-04-27 | 12964.000000 | 12966.675781 |
| 2 | 2018-04-28 | 12237.583333 | 14857.886719 |
| 3 | 2018-04-29 | 12156.791667 | 13460.255859 |
| 4 | 2018-04-30 | 13443.500000 | 13135.405273 |
| ... | ... | ... | ... |
| 95 | 2018-07-30 | 15368.083333 | 15554.164062 |
| 96 | 2018-07-31 | 15180.291667 | 15831.950195 |
| 97 | 2018-08-01 | 15151.166667 | 15124.528320 |
| 98 | 2018-08-02 | 15687.666667 | 15336.732422 |
| 99 | 2018-08-03 | 14809.000000 | 15395.705078 |

Fig 6. Predicted Energy Consumption Table

$$\frac{220 * Current\ (CTSensor)\ *5.36}{60000}$$

Rs.5.36/unit(1kWt)
220 Volts

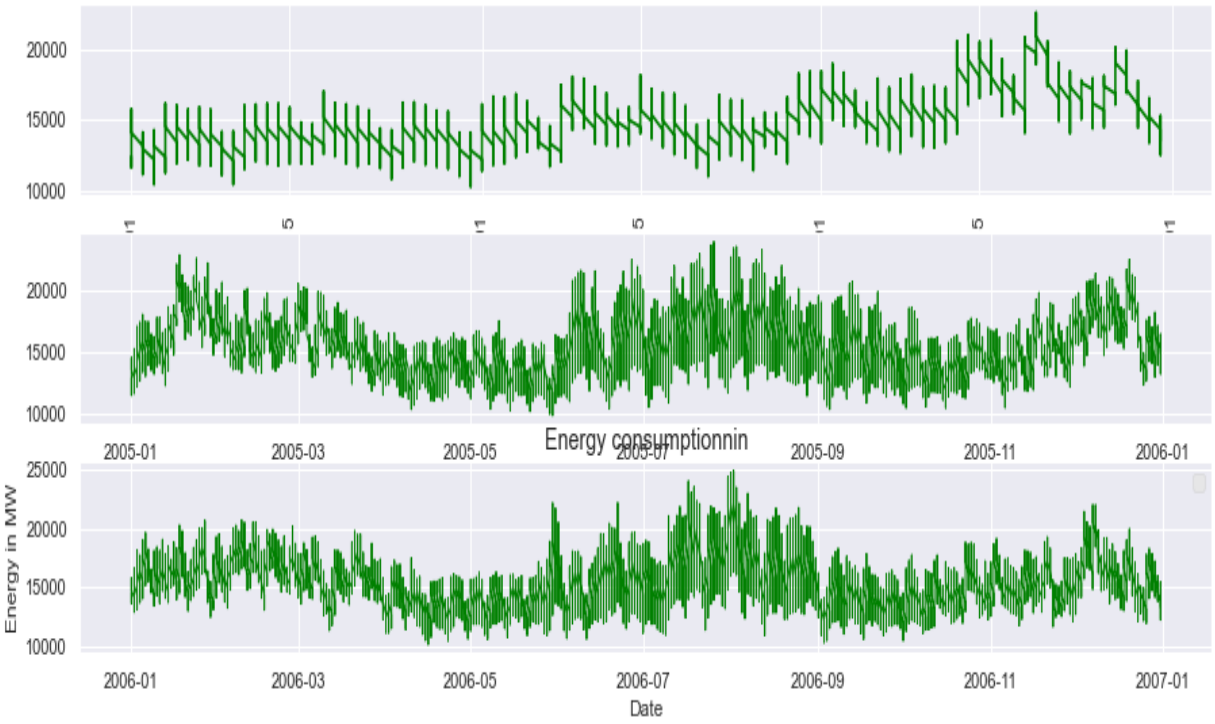


Fig 7. Concentrated energy consumption

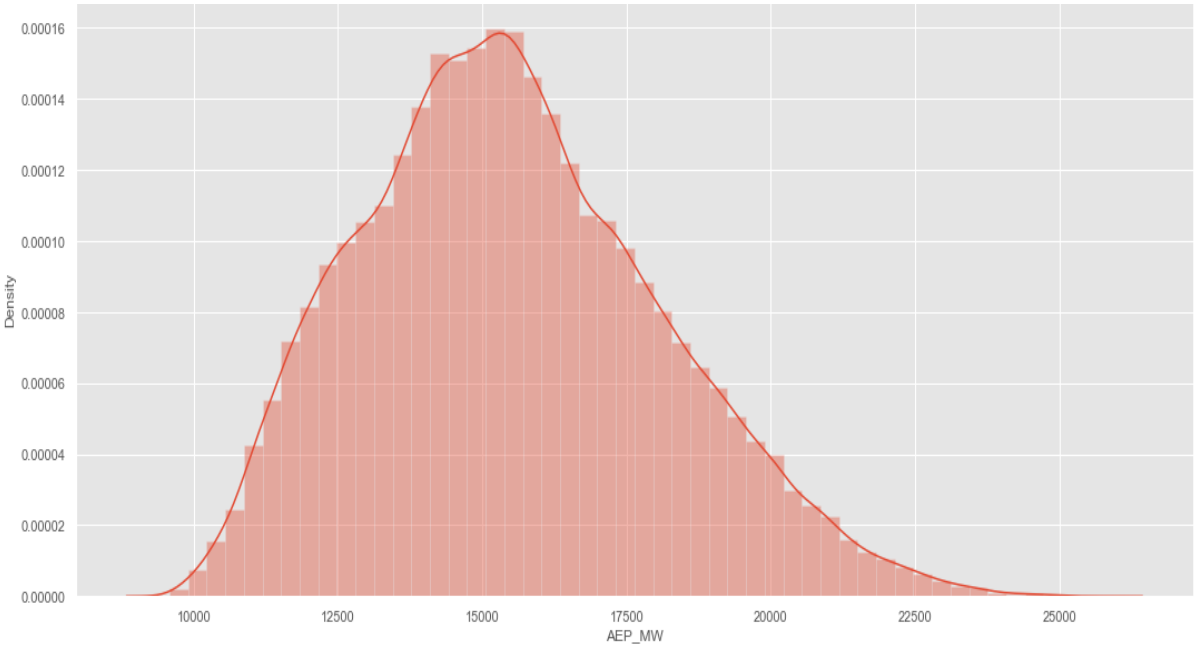


Fig 8. Energy Distribution

# Chapter 7
# Conclusion and Future Scope

Home Electricity Forecast is becoming increasingly important in our homes as it keeps track of the daily units consumed by our electrical appliances. Thereby giving us an opportunity to save electricity by future predictions. This technology also helps us in avoiding unnecessary wastage of electricity. We proposed a graphical model-based algorithm that addresses prediction of energy consumption with respect to previously consumed energy. The number of laborers from electricity department can be reduced as there is no need to appoint extra personnel for house to house meter reading. The system is capable to record the yearly, monthly, and timely energy usage as intended.

**Future Scope**:

- Learning and refining the values and predictions in real – time.
- Calculate energy consumed by each electrical appliance working at home.
- Can be extended with the evolution of other real time data.
- Monthly bill can be sent to the user via SMS or Email along with the energy consumption reading.
- Recommend how much energy can be saved.

## References

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