



## Conservation of Power Energy Analysis in Domestic Residency Using Data Mining Techniques

Jamuna. A, Shenbagavadivu. N

Department of computer Applications, Annauniversity BIT- Campus, Trichy,  
Tamilnadu, India

---

**Abstract**— Energy has become an essential for human existence and development. As a result energy conservation has become a major topic that attracts global attention. Data mining is a powerful and versatile tool to automatically extract the valuable knowledge embedded in huge amount of data. Energy consumption is the utilization of energy or power. The main aim of the project is to analyze and maintain power energy consumption usage in a domestic residential consumers. In the current environment the domestic residential consumers receives only month wise power energy usage. They are not receives power energy usage of a particular equipment an energy consumption alert messages. The objectives of the project is to provide various services which will give periodic energy usage of particular equipments ,energy usage of particular period and provide alert messages using the data mining techniques of the classification, prediction such as decision tree algorithm. This system provides various report like monthly billing information also the system provides efficient way of energy consumption related information through smart meter.

**Keywords**— Data mining, data analysis, classification, prediction, service provider

---

### I. INTRODUCTION

Energy has become essential for human existence and development. As a result, energy conservation has become a topic that attracts global attention. Data mining (DM) is a powerful and versatile tool to automatically extract the valuable knowledge embedded in huge amounts of data. It can be defined in many different ways. Data mining techniques are machine learning, pattern recognition, statistics, databases, and visualization to address the issue of information extraction from large databases. The data mining technology focuses on data rather than computing with complicated formulas, thereby it is easier to integrate in many applications. It is an emerging powerful technology with great information helpful in improving energy management and reducing energy consumption. It is also the most intuitive source of data concerning the operational status of buildings.

The ongoing deployment of Automated Meter Reading systems (AMR) in the European electricity industry has created new challenges for electricity utilities in terms of how to fully utilize the wealth of timely measured AMR data, not only to enhance day-to-day operations, but also to facilitate demand response programs. Electricity consumption with a focus on the comparison of two sets of seasonal and time based variables. To make the best use of this large quantity of data, it is essential to apply data mining techniques to extract relevant information valuable to the utilities industry. Data mining is defined as a “type of database analysis that attempts to discover useful patterns or relationships in a group of data. The analysis uses advanced statistical methods, such as cluster analysis, and sometimes employs artificial intelligence or neural network techniques. A major goal of data mining is to discover previously unknown relationships among the data, especially when the data come from different databases.” In this paper the consumer person information maintain separately. Similarly history of energy consumption data are maintained for analysis applying in data mining techniques. The knowledge information are obtained and send to consumer via SMS

### II. RELATED WORKS

Ian Dent [1] describes a method for defining representative load profiles for domestic electricity users in the UK. It considers bottom up and clustering methods and then details the research plans for implementing and improving existing framework approaches based on the overall usage profile. The work focuses on adapting and applying analysis framework approaches to UK energy data in order to determine the effectiveness of creating a few archetypical users with the intention of improving on the current methods of determining usage profiles. Assessing the impact of any initiatives to reduce overall energy usage in order to discover the amount of overall reduction which occurs during different times of the day.

Vera Figueiredo [2] stated that presents an electricity consumer characterization framework based on a knowledge discovery in databases (KDD) procedure, supported by data mining (DM) techniques, applied on the different stages of the process. The core of this framework is a data mining model based on a combination of unsupervised and supervised learning techniques. Two main modules compose this framework: the load profiling module and the classification module. The load profiling module creates a set of consumer classes using a clustering operation and the representative load profiles for each class. The classification module uses this knowledge to build a classification model able to assign different consumers to the existing classes.

Liang Zhao [3] describe the Energy consumption data, in particular those involving public buildings, are impacted by many factors: the building structure, climate/environmental parameters, construction, system operating condition, and user behavior patterns. Traditional methods for data analysis are insufficient. the data mining technology to determine its application in the analysis of building energy consumption data including energy consumption prediction, fault diagnosis, and optimal operation. The recent work on data mining technology in the application of building energy consumption data analysis, including energy consumption prediction, fault diagnosis and control optimization.

### III. PROPOSED SYSTEM

The proposed system is to reduce energy consumption usage in a domestic residential consumer. The objective of the proposed system is to provide various services which will give periodic energy usage of particular equipments, energy usage of particular period and provide alert messages. The alert message service includes utilization of unit intimation in a particular period, power shutdown intimation and billing information to consumer. The system obtained efficient energy consumption related information through smart meter. The energy consumption information are analysed using decision tree algorithm which generate knowledgeable information. That information will help to reduce cost as well as energy.

The benefits of a proposed systems are

- To predict the energy usage.
- To provide monthly billing information and graphical report.
- To provide individual home appliance unit graphical report.
- Alert message service for the consumer.

The proposed model is shown in Fig. 1.

The energy consumption information are collect through smart device. The information are maintained is the form of excel, xml database. Those information are manipulated and converted in the form of relational table which are maintained MySQL database. The data are analysed and classified in various categories applying data prediction mechanism (i.e. decision tree algorithm) for obtaining knowledge information. The information are forward to consumer through alert message.

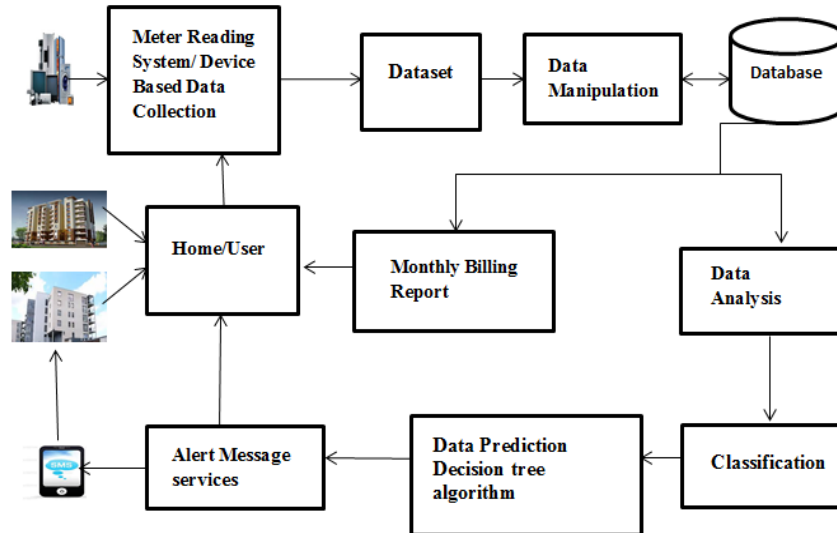


Fig. 1. Architecture of energy consumption in domestic residency

### IV. METHODOLOGY

#### 1. Acquiring Information

In this process is energy consumption information are obtained are retrieved through smart device. The pervious history of energy consumption is maintained in the form of excel, xml. That information's are collect from electricity board for analysis and obtained knowledge information. Then the dataset will collect a large amount of information from different houses within the target area of certain locations. The data was then stored in a related database.

#### 2. Classification

In this process data is classified to make prediction about new data. Using old data to predict new data has too fitted on the old data. Classification tree are used for the kind of data mining problem which are concerned with prediction

#### 3. Prediction

Prediction is same as classification but output is continuous not discrete. Construct a model then to predict continuous output value for given input. Predictive modelling uses statistics to predict outcomes. Most often the event one wants to predict is in the future, but predictive modelling can be applied to any type of unknown event, regardless of when it occurred. For example, predictive models are often used to detect crimes and identify suspects, after the crime has taken place. To predict this process using decision tree algorithm

**Decision Tree Algorithm:**

The decision tree algorithm is implemented in java. Decision tree learning is a method commonly used in data mining. The goal is to create a model that predicts the value of a target variable based on several input variables. Each interior node corresponds to one of the input variables; there are edges to children for each of the possible values of that input variable. Each leaf represents a value of the target variable given the values of the input variables represented by the path from the root to the leaf. A decision tree is a simple representation for classifying examples. For this section, assume that all of the features have finite discrete domains, and there is a single target feature called the classification. Each element of the domain of the classification is called a class. A decision tree or a classification tree is a tree in which each internal (non-leaf) node is labelled with an input feature. The arcs coming from a node labelled with a feature are labelled with each of the possible values of the feature. Each leaf of the tree is labelled with a class or a probability distribution over the classes.

**Working Principle:**

Data comes in records of the form:

$$(x, Y) = (x_1, x_2, x_3, \dots, x_k, Y)$$

The dependent variable, Y, is the target variable that we are trying to understand, classify or generalize. The vector x is composed of the input variables, x<sub>1</sub>, x<sub>2</sub>, x<sub>3</sub> etc., that are used for that task.

**4. Alert Message**

Due to the power shutdown periods to give the alert message to Domestic residential consumers. It is automatically intimate the usage level is exceed the consumer usage level of message. Energy service demand reflects changes in the level of comfort and lifestyle requirements of households. Individual appliance energy services and helps to intimate periodic energy graphically. The reduction in electricity consumption for usages of consumer to intimate the usage level is greater between beginning with the highest wattage electric devices. Compared with the previous month usage a fall of unit level precent in energy consumption per household and per person was recorded.

In various service to give the consumer responsible for electricity generation, distribution and transmission, and it regulated the electricity supply in the state. Meter reading the electricity usage information in everyday and providing the month wise energy usage and providing billing report. This process represent only the overall energy usage in the individual house.it is provide graphical report for the each home appliance energy usage. Then provides the periodic report for the whole home electricity usage. Then compare the previous month of data and current month of data to provide graphical report.

**V. SIMULATION AND TEST BED**

**Implementation Process**

The proposed model is implemented in J2EE environment. The front end forms are developed using java swing and the database is created in MYSQL. The entire application is deployed in Wamp server.

**Create Admin page in energy consumption:**

Collect consumer details and home appliance details and generate the consumer id number .Store all the details in database. Then administrator View all the details and Adding the unit details and amount. Admin Select the consumer id number and select the month and view the dataset. To classify the dataset then predict the dataset using decision tree algorithm and provide the usage prediction. Finally To provide the graphical report and total unit and cost of unit. Admin to provide the Alert message for the unit usage for particular consumer and power shutdown intimation.

**Consumer Page for energy consumption:**

Consumer enter the specific id number. To view the particular details about the consumer and view the monthly billing report. Then Select the month and predict data view and also view the graphical report for the individual appliance graphical report. Consumer getting alert message for the unit usage and power shutdown intimation.

**VI. SAMPLE SCREEN SHOT**

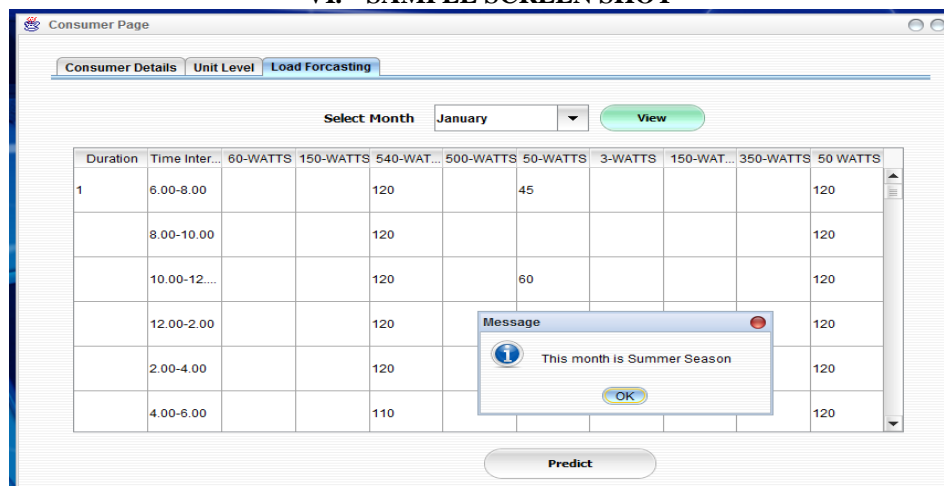


Fig.2. classification

Estimation										
Duration	Time Inte...	60-WATTS	150-WAT...	540-WAT...	500-WAT...	50-WATTS	3-WATTS	150-WAT...	350-WAT...	50 WATTS
1	6.00-8.00	0	0	120	0	45	0	0	0	120
	8.00-10...	0	0	120	0	0	0	0	0	120
	10.00-1...	0	0	120	0	60	0	0	0	120
	12.00-2...	0	0	120	0	0	0	0	0	120
	2.00-4.00	0	0	120	0	0	0	0	0	120
	4.00-6.00	0	0	110	0	0	0	0	0	120
	6.00-8.00	15	0	120	0	120	0	0	0	120
	8.00-10...	30	0	120	0	30	0	0	0	120
2	6.00-8.00	0	0	120	0	0	0	0	0	0
	8.00-10...	0	0	120	0	0	0	0	0	90
	10.00-1...	0	0	120	0	0	60	0	0	0
	12.00-2...	0	0	120	0	0	0	0	0	0
	2.00-4.00	0	0	120	0	0	0	0	0	120
	4.00-6.00	0	0	120	0	0	0	0	0	0
	6.00-8.00	15	0	120	0	0	0	0	0	0
	8.00-10...	30	0	120	0	0	0	0	0	120

Usage Prediction

Fig .3. usage prediction

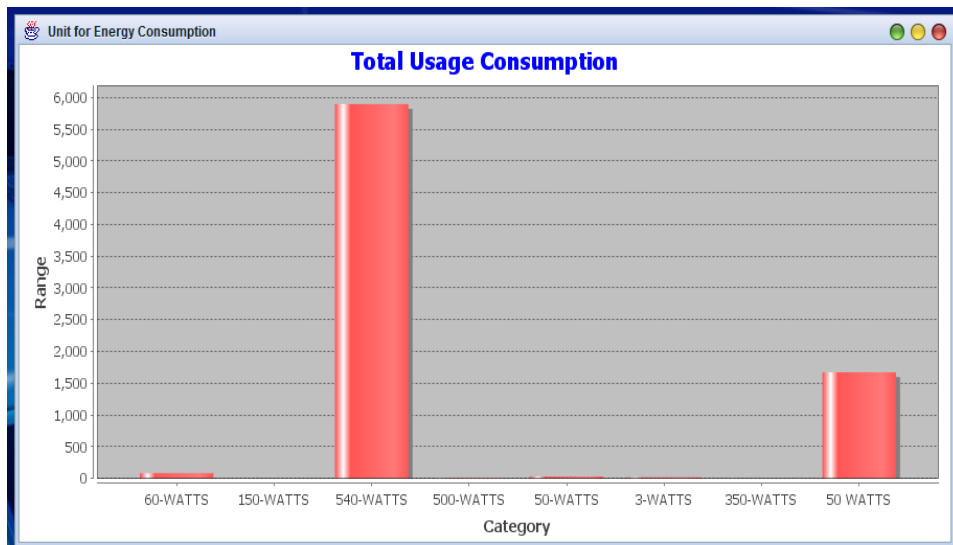


Fig .4. Graphical report for individual appliance

Consumer Page	
Consumer Details   Unit Level   Load Forecasting	
User ID	20161
Consumer Name	jamuna
Address	a1 apartment 2/95
State	tamilnadu
Country	india
Mobile No.	9003863175
Total Unit	7710
Amount	8867

Fig .5. Monthly billing report

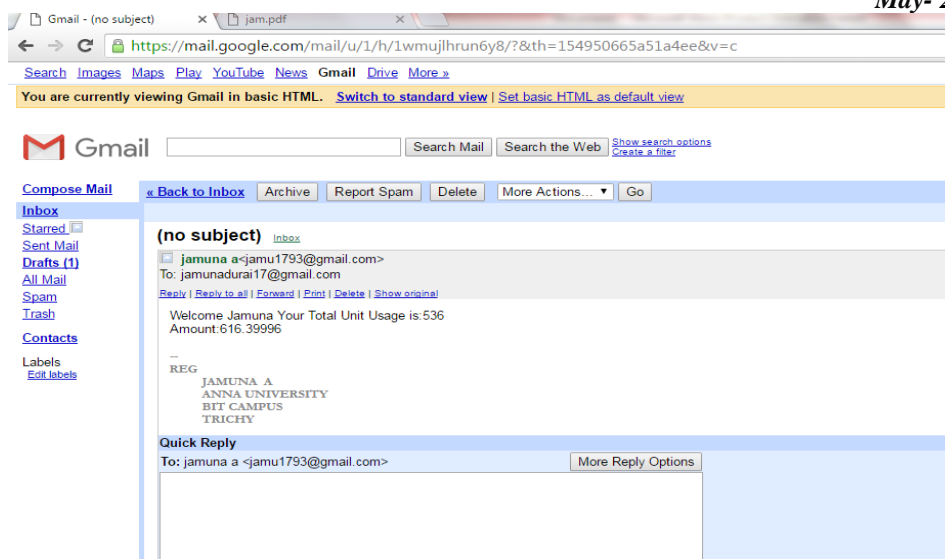


Fig.6. Alert unit intimation

## VII. CONCLUSION

The project entitle “energy consumption over data mining” deals with energy consumption domestic residential consumers using data mining techniques of decision tree algorithm. Data set has been collected from the real time data source. Data set looked unstructured and hence it needed preprocessing. Then cleaning the noise data. The decision tree algorithm is applied for finding a prediction model and analyze the large set energy consumption data. The obtained knowledgeable information can be forwarded to consumers through alert messages .the reports are generated graphically best understanding for consumer. Finally predicting energy usage graphical report data to the consumer. And alerting the overall unit usage, and cost to the consumer.

## VIII. FUTURE WORK

As the part of future work to implementing this work using smart meter technologies for each home appliance reading the input data and produce the appropriate unit intimation to the consumer. The system is designed with the maximum possible excellence. The system can be more useful to the users. The program is coded in more structured manner so we can include future enhancement. There is scope for improvement of the system. Apart from these there is scope for generating many more features. In the future, we can use the dynamic report generating system using smart device for each home appliance.

## REFERENCES

- [1] Ian Dent, Uwe Aickelin, Tom Rodden –The Application Of A Data Mining Framework To Energy Usage Profiling In Domestic Residences Using Uk Data 28 June 2011.
- [2] Vera Figueiredo, Fátima Rodrigues An Electric Energy Consumer Characterization Framework Based on Data Mining Techniques
- [3] Sonia1 , Satinder Pal2 Analysis of Energy Consumption in Different Types of Networks for Cloud Environment Volume 2, Issue 2, February 2012.
- [4] Liang Zhao, Jili Zhang, Chongquan Zhong -The Application of Data Mining Technology in Building Energy Consumption Data Analysis Vol:10, No:1, 2016
- [5] Joshua D. Rhodes , Charles R. Upshaw -Experimental and data collection methods for a large-scale smart grid deployment: Methods and first results.
- [6] Itard L, Meijer F, Vrins E, et al. Building renovation and modernization in Europe: State-of-the-art review (R).Netherlands: OTB Research Institute for Housing, Urban and Mobility, 2008.
- [7] Zeguo Qiu Electricity Consumption Prediction based on Data Mining Techniques with Particle Swarm Optimization
- [8] Han J W, Kamber M. *Data Mining: Concepts and Techniques* (M). 3<sup>rd</sup> ed. The Morgan Kaufmann Series in Data Management Systems, 2011.
- [9] Seem J E. Using intelligent data analysis to detect abnormal energy consumption in buildings (J). *Energy and Buildings*, 2007.
- [10] Li X L, Bowers C P, Schnier T. Classification of energy consumption in buildings with outlier detection (J). *IEEE Transactions on Industrial Electronics*, 2010.
- [11] Qing X X, Xiao D, Wang B. A real-time monitoring method of energy consumption based on data mining (J). *Journal of Chongqing University*, 2012.