Analysis and Forecasting Of Electrical Energy a Literature Review

M.Anita Priscilla Mary
Department of Computer Applications
Dr.M.G.R Educational and Research Institute
(Deemed to be University)
Maduravoyal, Chennai-600095, Tamil Nadu, India.
anitapriscilla80@gmail.com

Abstract—Electricity plays a vital role in the economic development growth. The prosperity that development brings in turn increases the demand for more and better quality of energy services.

Keywords—Electricity; Demand; Development; Services;

I. INTRODUCTION

The generation and demand is one of the core issues in electricity market research. In order to analyse about energy production, we need to know about various sources of power generation such as conventional and non-conventional energy sources and supply is one of the important factor that affect the energy demand. We need to know about the various areas of supply. This research proposes about analysis of the various sources of electricity generation and to predict the electricity generation to meet the future demand using data mining techniques.

II. ENERGY CONSERVATION

Manish and Ram Prasad (2010) had estimated the energy savings potential for each of the industries using unit level annual survey of industries data. The results of the model point mostly to the significance response of energy consumption to own price increases and to insignificance of the responsiveness of the corresponding capital requirement to effect such energy conservation.

III. ENERGY CONSUMPTION

Desley Vine, Laurie Buys, Peter Morris (2013) this paper describes about the electricity consumption and to identify the prospective electricity response in residential consumer’s in usage of electricity models. The different response criteria of the residential customer’s are recognized, overall conservation, peak demand reduction and its effectiveness highlighted.

Noorollahn Karimtabar, Sadegh Parban and Sivash Alipour (2015) in this paper the electricity consumption rate are predicted. The datasets that were collected for predicting the
electricity consumption, related to Islamic Republic of Iran Mazandaran province using data mining techniques.

Alghandoor and Samhouri (2009), describes about electricity consumption as a function with different variables such as number of establishments, employees, electricity duty, popular fuel prices, manufacture outputs, power utilization and the structural effects. It has been analysed as two important variables that effect on electrical power demand first one is the industrial production and the other is capacity consumption

Chaoqing and Liu, Sifeng and Rang, Zhigeng and Xie, Naming (2010) describes the relation between the chinese energy consumption and economic growth development. It has been examined by applying by the method grey incidence analysis. It has been identified that the degree of grey incidence between total energy consumption and the values that are added to secondary industry is larger. The results show that the relations in different periods are not equal.

Navjot Kaur and Amrit Kaur (2016) the paper describe about the predictive modelling approach for forecasting electricity consumption. It defines about two phases that are involved in this model. In the first phase data set consist of the input values and desired output values. In the second phase is the learnt model which is used for prediction. The data mining techniques are applied to find the forecasting of electricity consumption.

IV. ENERGY EFFICIENCY

Duke Ghosh and Joyashree Roy (2011) describes that it is a practice in India to engage consultants in firms. The review is about the usage and ways to improve the energy efficiency. Further investigation suggest that the majority of these firms have either implemented the process to reduce the costs associated with energy consumption or to ensure uninterrupted power supply.

The paper Sovacool and Brown (2010) describes that efficiency means ensuring energy security by minimizing the unit resource input per unit output efficiency and it can be subdivided into two parts namely economic and energy efficiency. The efficiency is the measure of performance increased deployment of more energy efficiency equipment and conservation.

Raphael Wenteni Apeaning (2012) describe about the cost effective methods for energy management. The energy efficiency measures gives industries an effective means of gaining the economic and social development. It affects the energy usage and reduces the negative environmental effects.

V. ENERGY FORECASTING

Yi-Shian and Lee-Ing (2012) describes about the model proposed for forecasting energy consumption. It applies a novel dynamic hybrid approach and combines a dynamic grey model using genetic programming. It is an accurate method as it uses two case studies with limited data sets and mathematical software. It gives an efficient result for forecasting energy consumption.

VijayaMohan Pillai.N (2001) describes about the forecasting of energy consumption. The number of continuous energy problems has made the need for accurate projection of electricity demand and the importance of the forecasting methods. The method proposes about class time series framework for forecasting.

Amel Graa, Ismail Ziane and Farid Benhamida (2015) describes about the prediction of methods used for electric energy demand. It uses a set of forecasting methods like daily status approach, trend method, quantitative analysis of economic, environmental, societal systems and end-use approach are the most frequently used techniques for energy forecasting.

VI. CHALLENGES

CSEE journal of Power and Energy Systems (2017) describes about the protection challenges in renewable energy resources in power system. There are different sources of energy among different sources of energy wind and solar are the two prominent and promising alternatives to meet the future electricity needs for mankind. The power generated by the sources is bulk and they are integrated at the distribution/transmission level. The Integration of these renewable in the power network will change the fault level and network topologies. Therefore the design and proper protection schemes are very much essential for reliable control and operation of renewable integrated power systems.

VII. METHODS

Data mining is used to get meaningful patterns from large databases. Data mining consists of collection, managing data, analysis and prediction. The information and knowledge gained can be used in various applications. Data mining techniques provide a way to use data mining tasks in order to predict solution sets for a problem and a level of confidence.

Naïve Bayesian Classification

The Naïve Bayes model is a simple and well-known method for performing supervised learning of a classification problem.
Given the class label of a tuple, the values of the attributes are assumed to be conditionally independent of one another. Assume independence among attributes \( A_i \) when class is given:

1. Let \( D \) be a training set of tuples and their associated class labels. Let \( X = \{X_1, X_2, \ldots, X_n\} \), depicting \( n \) measurements made on the tuple from \( n \) attributes.

2. Suppose that there are \( m \) classes, \( C_1, C_2, \ldots, C_m \). Given a tuple \( X \), the classifier will predict that \( X \) belongs to the class having the highest posterior probability, conditioned on \( X \). The Naive Bayesian Classifier predicts the tuple \( X \) belongs to the class \( C_{i1} \) if and only if

\[
P(C_{i1} \mid X) > P(C_{j2} \mid X) \quad \text{for} \quad 1 \leq j \leq m, j \neq i
\]

Maximize \( P(C_{i1} \mid X) \). The class \( C_{i1} \) for which \( P(C_{i1} \mid X) \) is maximized is called the maximum posterior hypothesis.

\[
P(C_{i1} \mid X) = \frac{P(X \mid C_{i1}) P(C_{i1})}{P(X)}
\]

3. If the class prior probabilities are not known, then it is commonly assumed that classes are equally likely, that is,

\[
P(C_1) = P(C_2) = \ldots = P(C_m),
\]

and maximize \( P(X \mid C_{i1}) \)

Otherwise maximize

\[
P(X \mid C_{i1}) P(C_{i1})
\]

4. In order to reduce the computation in evaluating \( P(X \mid C_{i1}) \), the naïve assumption of class conditional independence is made. This presumes that the values of the attributes are conditionally independent of one another, given the class label of the tuple

\[
P(X \mid C_{i1}) = \prod_{k=1}^{n} P(X_k \mid C_{i1})
\]

\[
= P(X_1 \mid C_{i1}) P(X_2 \mid C_{i1}) \ldots P(X_n \mid C_{i1})
\]

\( \blacktriangledown \) To Compute \( P(X \mid C_{i1}) \)

If \( A_k \) is categorical, then \( P(X_k \mid C_{i1}) \) is the number of tuples of class \( C_{i1} \) in \( D \) having the values \( X_k \) for \( A_k \).

If \( A_k \) is continuous valued, is typically assumed to have a Gaussian distribution with mean \( \mu \) and standard deviation \( \sigma \), defined by

\[
g(x, \mu, \sigma) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)
\]

Such that

\[
P(X \mid C_{i1}) = g(x_{1}, \mu, \sigma, C_{i1})
\]

In order to predict the class label of \( X \), \( P(X \mid C_{i1}) \) \( P(C_{i1}) \) is evaluated for each class \( C_{i1} \). The classifier forecast that the class label of tuple \( X \) is the class \( C_{i1} \), if and only if

\[
P(X \mid C_{i1}) P(C_{i1}) > P(X \mid C_{j1}) P(C_{j1}) \quad \text{for} \quad 1 \leq j \leq m, j \neq i
\]

Advantages

- Bayesian classifiers have the minimum error rate in compared to all other classifiers
- Implementation is very easy
- Accurate results are produced in most of the cases

References

2. Yuan, Chaoqing & Liu, Sifeng & Fang, Zhigeng & Xie, Naiming,( 2010) The relation between Chinese economic development and energy consumption in the different periods, Article provided by Elsevier in its journal Energy Policy,Volume:38,pp 5189-5198
4. Irawati Naik, Prof. Mrs. S.S. More, Himanshu Naik, —Scope of Energy Consumption & Energy Conservation in Indian auto part manufacturing Industry”, ISSN 2222-1727 (Paper) ISSN 2222-2871 (Online).