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REVIEW ON POWER THEFT DETECTION

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ABSTRACT:

We all know power theft is a major issue face by all electricity companies and it directly affect the profit made by electricity companies, so detection and prevention of power theft is necessary. In this paper we are proposing a hybrid approach to detect the electricity theft. We use SVM and ELM for our approach.

KEYWORDS: **Power Theft, ELM, Transmission Loss, Distribution Loss.**

I. INTRODUCTON

As we know power theft is a major problem for all electricity companies. Electricity companies losses money every year due to theft. There are two types of losses namely transmission loss and distribution loss, some research papers uses term technical loss and non-technical loss respectively. Transmission loss occurs while transmitting energy form generation side to consumer's side.

Distribution losses occur due to wrong billing, false meter reading, electricity theft, etc. First two losses can be prevented, but electricity theft is hard to prevent since no one predict about which consumer is genuine or non-genuine. Still losses due to power theft can be reduces by detecting theft or fraud consumer and taking actions accordingly.

Current theft detection process is time consuming and requires large number of field staff. The cost for this process is too high and detection rate is not so high. To overcome these costs, now a day some data mining, knowledge discovery methods, use of advance meters etc. are used to detect theft. We are proposing a hybrid approach for detection of theft, which will improve accuracy of detection and requires less cost for whole process.

II. PREVIOUS WORK

There are many techniques proposed and developed for detection and estimation of power theft. [1] This paper talks about Advanced Metering Infrastructure. This paper discuss about AMI and security requirements AMI should meet. They also presented current theft detection techniques and classify into three categories as classification-based, state estimation-based and game theory-based. [2] This paper presents a framework to identify power loss activities. They used automatic feature extraction methods for customer profile with ELM, OS-ELM and SVM to identify customer who is doing fraud. They extracted consumption patterns using data mining and statistical techniques. ELM, OS-ELM and

SVM classifies profiles for fraud detection. ELM and OS-ELM used as main classifier for their framework. [3] This paper discusses the problems while doing theft detection and previous ways to reduce the theft. In this paper they developed approximate patterns for classification using customer load profiles. Then they trained the SVM to classify data based on the suspicious energy consumption. [4] This paper presents a procedure to detect distribution losses. They use an automatic feature extraction for data with support vector machine to identify fraud customer. They use Genetic algorithm and support vector machine for their approach.

III. PROPOSED APPROACH

Machine learning explores the study and construction of algorithms that can learn from and make predictions on data. We are proposing two stage approaches to detect suspected customers who are doing electricity theft. Our approach contains two main phases namely data classification phase and training phase. The first phase uses SVM to classify data and latter phase use ELM to train classified data. These two methods explain below as:

- **SVM**: A Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyper-plane. In other words, given labelled training data, the algorithm outputs an optimal hyper-plane which categorizes new examples. A good separation is achieved by the hyper-plane that has the largest distance to the nearest training-data point of any class (so-called functional margin), since in general the larger the margin the lower the generalization error of the classifier.

- **ELM**: It is a feed forward neural network for regression with a single layer of hidden nodes, where the weights connecting inputs to hidden node are randomly assign & never updated. The learning speed of feed-forward neural networks including is in general far slower than required and it has been a major bottleneck in their applications for past decades. This issue is removed by ELM. For example, ELM not only achieves state-of-art results but also shortens the training time from days (spent by deep learning) to several minutes (by ELM) in MNIST OCR dataset, traffic sign recognition and 3D graphic application, etc. It's difficult to achieve such performance by conventional learning techniques.

We give data as an input to the first stage which is training stage, is done using ELM. In training we train the system which will produce labeled data as normal behavior and abnormal behavior. Then this labeled data is passed to second stage, which implements SVM classifier, which will classify data and gives final result i.e. list of suspected customers who is probably doing theft, so on onsite inspection can be carried out. We will test the approach to find high loss occurring areas and fraud customers and its detection accuracy rate.

IV. DATA SET

We have collected data from IT Office of MSEDCL. This data is a collection of 24 months consumption data of customer. Dataset consists fields like dtc-code, consumer number, tariff code, connection load, meter number, unit consumption of a month, meter status, bill month. We separate some part of dataset as training set and some as test dataset. We are using method to separate the dataset into training data and testing dataset (roughly 70% used for training and 30% used for

testing purpose). Below figure shows snapshot of the dataset.

TARIFF_CODE	CONN_LOAD	METER_NO	METER1_AVG	U
37	12.5	06294048	0	
37	12.5	06294048	0	
37	12.5	06294048	0	
37	12.5	06294048	0	
37	12.5	06294048	0	
37	12.5	06294048	0	
37	12.5	06294048	0	

DTC_CODE	CONSUMER_NUMBER
4612001	118221017073
4612001	118221017073
4612001	118221017073
4612001	118221017073
4612001	118221017073
4612001	118221017073
4612001	118221017073
4612001	118221017073
4612001	118221017073
4612001	118221017073

Figure 1. Snapshot of Data Set

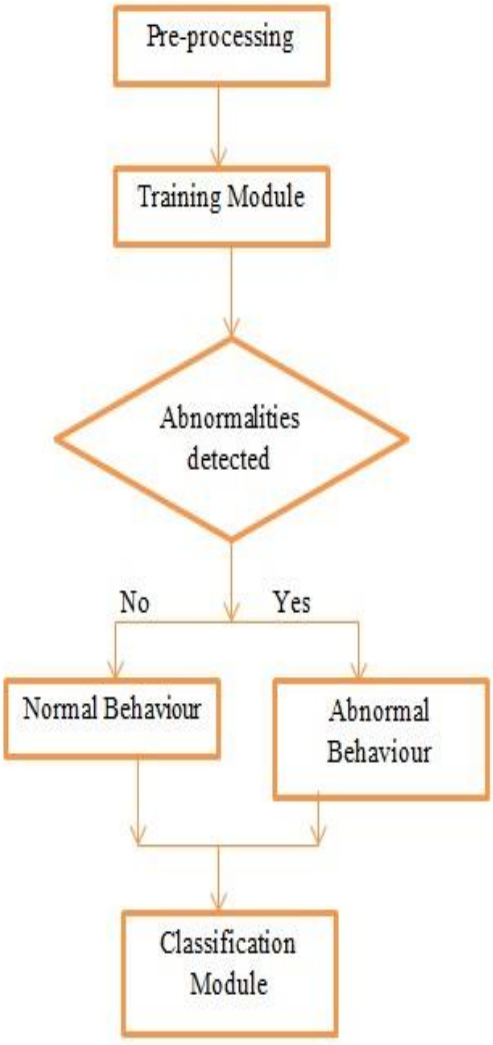

Figure 2. Abstract operational flow of approach

V. CONCLUSION

This paper presents a hybrid approach for detection of electricity theft. We use combination of ELM and SVM to detect theft. We have collected a data from Maharashtra Govt. electricity utility, based on this data we develop rules and train the system. The proposed approach is fast compare to other conventional machine algorithm. This paper also talks about previous work done in this area.

REFERENCES

[1] Rong Jiang, Rongxing Lu, Ye Wang, Jun Luo, Changxiang Shen, And Xuemin (Sherman) Shen "Energy-Theft Detection Issues For Advanced Metering Infrastructure In Smart Grid". TSINGHUA SCIENCE AND TECHNOLOGYIssn 1007,0214 01/12 pp10 5-120 Volume 19, Number 2, April 2014.

[2] D.Dangar, S.K.Joshi "Electricity Theft Detection Techniques For Distribution System In GUVNL". INTERNATIONAL JOURNAL OF ENGINEERING DEVELOPMENT AND RESEARCH | IJEDR (Two Day National Conference (RTEECE-2014) -January 2014).

[3] Soma Shekara Sreenadh Reddy Depuru, Lingfeng Wang, And Vijay Devabhaktuni "Support Vector Machine Based Data Classification For Detection Of Electricity Theft".2011 IEEE.

[4] J. Nagi, K. S. Yap, S. K. Tiong, Member, *IEEE*, S. K. Ahmed, Member, IEEE, A. Mohammad "Detection Of Abnormalities And Electricity Theft Using Genetic Support Vector Machines". TENCON 2008 - 2008 IEEE Region 10 Conference, Pages 1 – 6, 19-21 Nov. 2008.

[5] Paria Jokar, Nasim Arianpoo And Victor C. M. Leung, "Electricity Theft Detection In AMI Using Customers' Consumption Patterns", IEEE TRANSACTIONS ON SMART GRID.

[6] Breno C. Costa, Bruno. L. A. Alberto, André M. Portela, W. Maduro, Esdras O. Eler, "FRAUD DETECTION IN ELECTRIC POWER DISTRIBUTION NETWORKS USING AN ANN-BASED KNOWLEDGE-DISCOVERY PROCESS", International Journal Of Artificial Intelligence & Applications (IJAIA), Vol. 4, No. 6, November 2013