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Statical Framework for Detection of Electricity Theft Using Smart Grid

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ABSTRACT

Electricity theft is one of the major problems of electric utilities. Such electricity theft produces finan- cial loss to the utility companies. It is not possible to inspect manually such theft in large amount of data. For detecting such electricity theft introduces a gradient boosting theft detector (GBTD) based on the three latest gradient boosting classifiers (GBCs): extreme gradient boosting (XGBoost), categori- cal boosting (Cat Boost), and light gradient boosting method (LightGBM). XGBoost is one machine learning algorithm which gives high accuracy in less time. In this we apply preprocessing on smart meter data then do feature selection. Practical application of the proposed GBTD for theft detection by minimizing FPR and reducing data storage space and improving time-complexity of the GBTD classi- fiers which detect non-technical loss (NTL) detection. It detects theft using anomaly behavior of user. Electricity Data of different user and society is given to find the thefts in which society are available

INTRODUCTION

India loses more money to theft than any other country in the world. The state of Maharashtra which includes Mumbai—alone loses $2.8 billion per year, more than all but eight countries in the world. In this proposed system we use dataset having electricity usage of a smart grid (SG) meter (or simply smart meter).Using this dataset we does feature selection and preprocessing on dataset. When we have large number of features in dataset then feature selection is very impor- tant part in our Machine Learning. As we use feature selection it gives us most important feature and this feature selection gives us more accuracy. Then we perform the preprocessing on that data. After that we use the superiority of XGBoost, a gradient boosting classifier (GBC), over other ML algorithms for nontechnical loss (NTL) detection. Gradient boosting is called gradient boosting because it uses a gradient descent algorithm to minimize loss when adding new trees. This approach supports both regression and classification predictive. The energy losses are normally categorized into technical losses (TLs) and nontechnical losses (NTLs). The technical loss is inborn to the transportation of power, which is brought about by internal activities in the power framework parts, for example, the transmission liner and transformers; the Non-Technical Loss is characterized as the contrast between total loss and TL. With the aid of machine learning algorithms like Extreme Gradient Boosting (XGBoost) and Optical Character Recognition (OCR), we determine non-technical loss (NTL) detection in electricity theft

Power Theft Methods

1) Wires/Cables: Illegal connection to uncovered wires or underground cables, Connecting wires to other household's supply or to other power utilities
2) Transformers: Illicit terminal taps of overhead lines on the low side of the transformer
3) Meters: Damaging or detaching the meters, Meddling with meters and seals, Detouring/Diverging the meters
4) Billing Irregularities: Done by meter readers from electric organisations
5) Unpaid bills: By people, government organizations and untouchable VIPs.

METHODOLOGY

Existing System Disadvantages:
1) Theft happens in large amount of data hence manual inspection is hectic or even not possible.
2) Possibility of theft not detected or bribing of the employees sent by electric utilities.
3) Ineffective and wasteful present techniques for detecting and preventing power robbery cause an income misfortune alongside harm to public and
4) personal property.
5) Enormous measure of power shortage is caused because of power misuse and stealing.
6) The drawback of this system is that real time monitoring of the loads is not possible and location of theft is not determined

Proposed System

India positions top in losing more money to power theft than any other country around the world. The province of Maharashtra loses $2.8 billion everyyear. In this proposed framework, we use dataset which consists of power consumption of a smart grid (SG) meter. Making use of this dataset, carryout preprocessing and feature selection on this particular dataset. At this point, we have enormous number of features in dataset; hence featureselection is a vital part in our Machine Learning model. As we use feature selection, it offers us with most significant features and this in turn makesour theft detection model more accurate and provides us with better results. Henceforth, we take the help of Extreme Gradient Boosting (XGBoost) and Optical Character Recognition (OCR) algorithm to train our model for non-technical loss (NTL) detection.

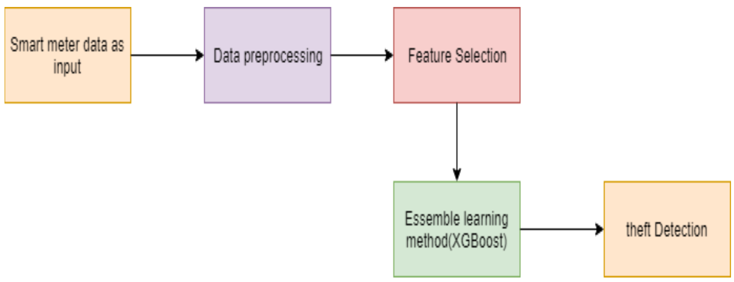
PROBLEM DEFINATION

1) Many electric utilities have financial loss due to electricity theft.
2) They try to catch theft and uses different technique but for all things they required the human efforts.
3) Although after using human power also they didn't get the thefts.
4) In such situation electricity utilities have to bare loss.
5) This proposed system helps to electricity utilities to detect electricity theft and they will not have to bare loss.
6) Power theft is one of the most prevalent issues which not only cause economic losses but also irregular supply of electricity.
7) It hampers functioning of industries and factories, due to shortage of power supplied to them.

SOFTWARE REQUIRMENT SPECIFICATIONS

1) Hardware Interface: The application is intended to be a stand-alone, single-user system. The application will run on an Laptop. No further hardware devices or interfaces will be required.
2) Software Interface:
   Inputs: The software will receive input from One sources. First, the user interface. The user interface will supplythe text and the analysis session.
   Outputs: The output will be In audio format and text format.
3) Operating System: The software will run on the Laptop which will 8GB.
4) User Interfaces: The interface will meet the following requirements to conform to the users' needs. It will besimple and easy to understand. Controls which allow the user to interact with the application will be clear andimply their functionality within the application. The interface will include user inputs as well as two graphics, outlinedbelow. The graphics displayed to the user will provide a visual representation of the output produced.
5) User Inputs (Mandatory): The user will be able to control the sentiment analysis of topics in two ways: first, byadding, editing, or removing keywords for each topic, and second by specifying the duration of each analysis session.
6) Graphic 1 Topic Mood Guage: This graphic will consist of a simple gauge which shows the current mood of theTwitter community on a given topic. This will be done by displaying the percentage of the Twitter users who arecurrently for or against the topic being analyzed. It will also display the total number of Tweets which have beenprocessed in order to calculate this output.
7) Graphic 2 Topic Mood Time-Lapse: This graphic will display an overview of the results of each past analysissession in the form of a graph. This graph should be displayed in a clear and meaningful manner that allows the userto easily interpret the trend of the sentiment toward the topic over all analysis sessions.
8) Commmunication Interface: Describe the requirements associated with any communications functions required bythis product, including e-mail, web browser, network server communications protocols, electronic forms, and so on.Define any pertinent message formatting. Identify any communication standards that will be used, such as FTP orHTTP. Specify any communication security or encryption issues, data transfer rates, and synchronizationmechanisms.

SYSTEM ARCHITECTURE



Explanation

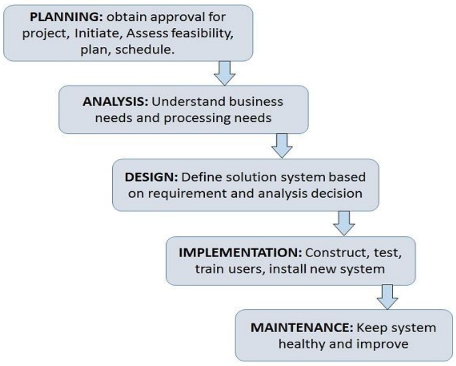
1) SG meter dada is input.
2) Next step is preprocessing on dataset.
3) Feature selection method to select features.
4) Essemble learning method (Xgboost) applied on data.
5) Result theft detection.

ANALYSIS MODELS : SDLC MODEL TO BE APPLIED

Analysis model: SDLC model to be applied An effective System Development Life Cycle (SDLC) should result in a high quality system that meets customer expectations, reaches com- pletion within time and cost evaluations, and works effectively and efficiently in the current and planned Information Technology infrastructure. System Development Life Cycle (SDLC) is a conceptual model which includes policies and procedures for developing or altering systems throughout their life cycles. SDLC is used by analysts to develop an information system. SDLC includes the following activities:

1) Requirements
2) Design
3) Implementation
4) Testing
5) Deployment
6) Operations
7) Maintanance

Phases of SDLC: Systems Development Life Cycle is a systematic approach which explicitly breaks down the work into phases that are required to implement either new or modified Infor- mation System.



APPLICATIONS

It is use to utilization of electricity.
Power theft is one of the most prevalent issues which not only cause economic losses but also irregular supply of electricity.
It hampers functioning of industries and factories, due to shortage of power supplied to them.

CONCLUSION

We have implemented an automatic text detection technique from an image for Inpainting. Our algorithm successfully detects the text region from the image which consists of mixed text-picture-graphic regions. We have applied our algorithm on many images and found that it successfully detect the text region.

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