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Electricity Theft Detection using Deep Neural Network

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Abstract: *The increasing demand for electricity has led to the growth of smart grids, which offer numerous advantages such as improved energy efficiency, reduced power outages, and enhanced security. However, one of the significant challenges in smart grids is electricity theft, which is a major cause of revenue loss for utility companies. So, electricity theft is a major concern for electric power distribution companies. The aim of this project is to develop an effective approach for detecting electricity theft in smart grids based on Artificial Neural Network (ANN). The proposed approach will use electricity usage dataset which is referred from the popular web repository kaggle. The collected data will be preprocessed and fed into the ANN, which will learn to identify patterns and anomalies in the consumption data. The ANN model will be trained using a dataset of legitimate consumption patterns and then tested with data that contains instances of electricity theft. To evaluate the performance of the proposed approach, the model will be tested on a test data. The results predicted from our proposed system of electricity theft detection in smart grids using ANN is Good. Our system achieved Training Accuracy of 99% and Validation Accuracy of 99%. The performance metrics used will include accuracy, precision, recall, and F1-score. We also developed the proposed system in Flask Web framework for easy usage with better User Interface for the predicting the results. The expected outcome of this project is an effective approach for detecting electricity theft in smart grids using ANN, which can be used by utility companies to improve their revenue collection and enhance the security of the smart grid. This project can also be extended to other domains that involve anomaly detection in large-scale datasets, such as fraud detection in financial systems and intrusion detection in computer networks.*

Keywords: Theft Detection, Machine Learning, Artificial Neural Network (ANN), Flask Web framework, User Interface, Smart Grids, etc

REFERENCES

[1]. S. Foster. (Nov. 2, 2021). Non-Technical Losses: A $96 Billion Global Opportunity for Electrical Utilities. [Online]. Available: https://energycentral.com/c/pip/ non-technical-losses-96-billion-globalopportunity-electrical-utilities

[2]. Q. Louw and P. Bokoro, ‘‘An alternative technique for the detection and mitigation of electricity theft in South Africa,’’ SAIEE Afr. Res. J., vol. 110, no. 4, pp. 209–216, Dec. 2019.

[3]. M. Anwar, N. Javaid, A. Khalid, M. Imran, and M. Shoaib, ‘‘Electricity theft detection using pipeline in machine learning,’’ in Proc. Int. Wireless Commun. Mobile Comput. (IWCMC), Jun. 2020, pp. 2138–2142.

[4]. Z. Zheng, Y. Yang, X. Niu, H.-N. Dai, and Y. Zhou, ‘‘Wide and deep convolutional neural networks for electricity-theft detection to secure smart grids,’’ IEEE Trans. Ind. Informat., vol. 14, no. 4, pp. 1606–1615, Apr. 2018.

[5]. P. Pickering. (Nov. 1, 2021). E-Meters Offer Multiple Ways to Combat Electricity Theft and Tampering. [Online]. Available: https://www.electronicdesign.com/technologies/meters

[6]. X. Fang, S. Misra, G. Xue, and D. Yang, ‘‘Smart grid—The new and improved power grid: A survey,’’ IEEE Commun. Surveys Tuts., vol. 14, no. 4, pp. 944–980, 4th Quart., 2012.

[7]. M. Ismail, M. Shahin, M. F. Shaaban, E. Serpedin, and K. Qaraqe, ‘‘Efficient detection of electricity theft cyber-attacksin AMI networks,’’ in Proc. IEEE Wireless Commun. Netw. Conf. (WCNC), Apr. 2018, pp. 1–6.

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[8]. Maamar and K. Benahmed, ‘‘Machine learning techniques for energy theft detection in AMI,’’ in Proc. Int. Conf. Softw. Eng. Inf. Manage. (ICSIM), 2018, pp. 57–62.

[9]. Jindal, A. Schaeffer-Filho, A. K. Marnerides, P. Smith, A. Mauthe, and L. Granville, ‘‘Tackling energy theft in smart grids through data-driven analysis,’’ in Proc. Int. Conf. Comput., Netw. Commun. (ICNC), Feb. 2020, pp. 410–414.

[10]. Diahovchenko, M. Kolcun, Z. Čonka, V. Savkiv, and R. Mykhailyshyn, ‘‘Progress and challenges in smart grids: Distributed generation, smart metering, energy storage and smart loads,’’ Iranian J. Sci. Technol., Trans. Electr. Eng., vol. 44, no. 4, pp. 1319–1333, Dec. 2020.

[11]. M. Jaganmohan. (Mar. 3, 2022). Global Smart Grid Market Size by Region 2017–2023. [Online]. Available: https://www.statista.com/statistics/246154/global-smart-grid-marketsize-by-region/

[12]. Z. Zheng, Y. Yang, X. Niu, H.-N. Dai, and Y. Zhou. (Sep. 30, 2021). Electricity Theft Detection, [Online]. Available: https://github.com/henryRDlab/ ElectricityTheftDetection

[13]. D. O. Dike, U. A. Obiora, E. C. Nwokorie, and B. C. Dike, ‘‘Minimizing household electricity theft in Nigeria using GSM based prepaid meter,’’ Amer. J. Eng. Res., vol. 4, no. 1, pp. 59–69, 2015.

[14]. P. Dhokane, M. Sanap, P. Anpat, J. Ghuge, and P. Talole, ‘‘Power theft detection & initimate energy meter information through SMS with auto power cut off,’’ Int. J. Current Res. Embedded Syst. VLSI Technol., vol. 2, no. 1, pp. 1–8, 2017.