**ELECTRICITY ENERGY THEFT DETECTION IN SMART GRIDS USING DEEP NEWRAL NETWORKS**

**A project report submitted in partial fulfillment of the requirement for the award of the degree of**

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**Of**

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**ABSTRACT**

Electricity theft is a global problem that negatively affects both utility companies and electricity users. It destabilizes the economic development of utility companies, causes electric hazards and impacts the high cost of energy for users. The development of smart grids plays an important role in electricity theft detection since they generate massive data that includes customer consumption data which, through machine learning and deep learning techniques, can be utilized to detect electricity theft. This paper introduces the theft detection method which uses comprehensive features in time and frequency domains in a deep neural network-based classification approach. We address dataset weaknesses such as missing data and class imbalance problems through data interpolation and synthetic data generation processes. We analyze and compare the contribution of features from both time and frequency domains, run experiments in combined and reduced feature space using principal component analysis and finally incorporate minimum redundancy maximum relevance scheme for validating the most important features. We improve the electricity theft detection performance by optimizing hyper parameters using a Bayesian optimizer and we employ an adaptive moment estimation optimizer to carry out experiments using different values of key parameters to determine the optimal settings that achieve the best accuracy. Lastly, we show the competitiveness of our method in comparison with other methods evaluated on the same dataset. On validation, we obtained 97% area under the curve (AUC), which is 1% higher than the best AUC in existing works, and 91.8% accuracy, which is the second-best on the benchmark.

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**CONTENTS**

**Chapter 1:** INTRODUCTION 1-3

1.1 Introduction 1

1.2 The Contributions of our project 2

**Chapter 2:** LITERATURE SURVEY 4-82.1 Electricity theft detection using pipeline in machine learning 4

2.2 Wide and deep convolution neural networks for electricity-theft detection to secure smart grids 4

2.3 Smart grid – The new and improved power grid: A survey 5

2.4 Efficient detection of electricity theft cyber attacks in

AMI network 5

2.5 Tackling energy theft in smart grids through data driven-analysis 6

2.6 Progress and challenges in smart grids: Distributed generation,

Smart metering energy storage and smart loads 6

2.7 Minimizing household electricity theft in Nigeria using GSM based meter. 7

2.8 Power theft detection & initiate energy meter information through SMS with auto power cut off. 7

2.9 Prototype development to detect electric theft using PIC18F452 microcontroller. 8

**Chapter 3:** SYSTEM ANALYSIS 9-17

3.1 Existing system 9

3.2 Disadvantages in Existing System 10

3.3 Proposed system 10

3.4 Advantages of Proposed system 11

3.5 Algorithms 11

3.6 System requirements 17

**Chapter 4:** SYSTEM DESIGN18-26

4.1 System Architecture 18

4.2 Detailed Design 19

4.2.1 Data Flow Diagram 19

4.2.2 Work Flow Diagram 19

4.3 UML Diagrams 20

4.3.1 Use Case Diagram 22

4.3.2 Class Diagram 23

4.3.3 Sequence Diagram 24

4.4 Flow Chat Diagram 25

4.4.1 Flow Chart: Remote User 25

4.4.2 Flow Chart: Service Provider 26

**Chapter 5:** IMPLIMENTATION27

5.1 Service Provider 27

5.2 View and Authorize Users 27

5.3 Remote User 27

**Chapter 6:** TECHNOLOGY DESCRIPTION28-43

6.1 Python Introduction 28

6.2 Introduction 30

6.3 Machine Learning 39

6.4 Packages and Versions 42

**Chapter 7:** SYSTEM STUDY AND TESTING44-48

7.1 Feasibility Study 44

7.1.1 Economic Feasibility 44

7.1.2 Technical Feasibility 44

7.1.3 Social Feasibility 45

7.2 System Testing 45

7.2.1.1 Unit Testing 45

7.2.1.2 Integration Testing 46

7.2.1.3 Functional Test 46

7.2.1.4 System Test 46

7.2.1.5 White Box Testing 47

7.2.1.6 Black Box Testing 47

7.2.1.7 Unit Testing 47

7.2.1.8 Acceptance Testing 48

**Chapter 8: OUTPUT SCREENS** 45-57

8.1 Remote User 45

8.2 Service Provider 48

**Chapter 9: CONCLUSION** 58

**Chapter 10: FUTURE ENHANCEMENT** 63

**Chapter 11: REFERENCES** 63

**LIST OF FIGURES**

|  |  |  |
| --- | --- | --- |
| **FIGURE NO.** | **FIGURE NAME** | **PAGE NO.** |
| 4.1 | Architecture Diagram | 13 |
| 4.2.1 | Block Diagram | 14 |
| 4.2.2 | Data Flow Diagram | 15 |
| 4.3.1 | Use Case Diagram | 17 |
| 4.3.2 | Class Diagram | 18 |
| 4.3.3 | Sequence Diagram | 19 |
| 4.3.4 | Activity Diagram | 20 |
| 4.4.1 | Flow Chart Of Remote User | 21 |
| 4.4.2 | Flow Chart Of Service Provider | 22 |
| 6.1.1 | Official Website Of Python | 28 |
| 6.1.2 | Download Latest Version | 29 |
| 6.1.3 | Click download on specific version | 29 |
| 6.1.4 | Different Versions Of Python | 30 |
| 6.1.5 | Installation | 31 |
| 6.1.6 | Click Install Now | 31 |
| 6.1.7 | Close After Setup | 32 |
| 6.1.8 | Command Prompt | 33 |
| 6.1.9 | Check Python Version | 33 |
| 6.1.10 | Python idle | 34 |
| 6.1.11 | Save The File | 34 |
| 6.1.12 | Example For Writing And Executing | 35 |