[illegible] based Smart Grid Metering System - Threats & Solutions

PROJECT

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BONAFIDE CERTIFICATE

Certified that this project synopsis ***"AI based Smart Grid Metering System Threats & Solution"*** *is the bonafide work of* ***"Sonam Dargey Bhutia (11901620003), Tsheringma Tamang (11901621016), Abinab Nag (11901620011), Rupa Sharma (11901621026), Amit Kumar Ram (11901621035)"*** *who carried out the project work under my supervision.*

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ACKNOWLEDGEMENT

We would like to express our deepest appreciation to all those who provided us with the possibility to complete this project. We give special gratitude to our project supervisor, whose contribution in stimulating suggestions and encouragement, helped us to coordinate our project, especially in writing this acknowledgment.

We are indebted to our friends who have given the effort and time in reviewing our work and for their valuable comments on this project.

Their insights and expertise about AI-based Smart Grid Metering Systems have been valuable and helpful.

Finally, we express our heartfelt thanks for the support and guidance of our family and well-wishers.

Thank you.

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TABLE OF CONTENTS

INTRODUCTION

The significance of smart metering in the context of the energy transition, where data from smart meters plays a crucial role in the exchange between energy suppliers, Distribution Operators (DSOs), and end- users. The focus is on anomaly detection within smart meter data, addressing issues such as abnormal events and unusual consumption behaviors in electricity distribution.

The challenges faced by electricity companies include various anomalies in the energy distribution grid, ranging from broken smart meters to electricity theft. While remote sensing has alleviated some issues, there remains a need for human intervention to manually analyse and detect anomalies, posing a demand for an automatic process.

The primary objective is to process and analyse data from smart meters in real-time, as these meters offer remote recording of electricity consumption and power quality. Algorithms have been developed to identify different types of errors, including opponent events, successive events, and erroneous smart meters. Multiple smart sensors producing the same error simultaneously may indicate a network-wide issue.

The context also mentions existing work in related to anomaly detection in the smart energy sector. Various methods, including ESP 32 integration, Blynk IOT App interface, Google Sheet as Data Storage as CSV file to feed data to unsupervised learning such as isolation forest, are discussed for detecting anomalous electricity consumption.

The visualization and statistics of the proposed solutions, and the paper concludes with insights into future work.

SYSTEM COMPONENTS AND THEIR WORKING

Hardware: -

- **ESP 32** - The ESP32 is a low-cost, low-power system on a chip (SoC) microcontroller series with integrated Wi-Fi and dual-mode Bluetooth. It is designed and manufactured by Espressif Systems. The ESP32 is highly popular in the Internet of Things (IoT) domain due to its versatility, powerful performance, and extensive range of features.

Figure - 1

ESP32 IOT INTEGRATION

The ESP32 is a versatile and affordable microcontroller that enables wireless communication and is commonly used in IoT (Internet of Things) projects. It has built-in Wi-Fi and Bluetooth capabilities, making it suitable for various applications, from smart devices to sensor networks. Integrating ESP32 for IoT to collect data from a smart meter involves the following steps: