

HackSprint GDGoC SSIU 2026

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- **Project Title:** Power Theft Detection System (**PTDS**)
- **Problem Statement :** Open Innovation - Social Impact

Brief about solution and problem statement



Some people use electricity illegally by bypassing meters or stealing power.

This causes:

- Financial loss to electricity companies.
- Higher bills for honest users.
- Power supply problems.



Solution:

The Power Theft Detection System uses Machine Learning (ML) to monitor and analyze electricity consumption data. The system detects abnormal usage patterns that indicate possible power theft and automatically alerts authorities for quick action.

Opportunities

A. *Difference* from existing systems

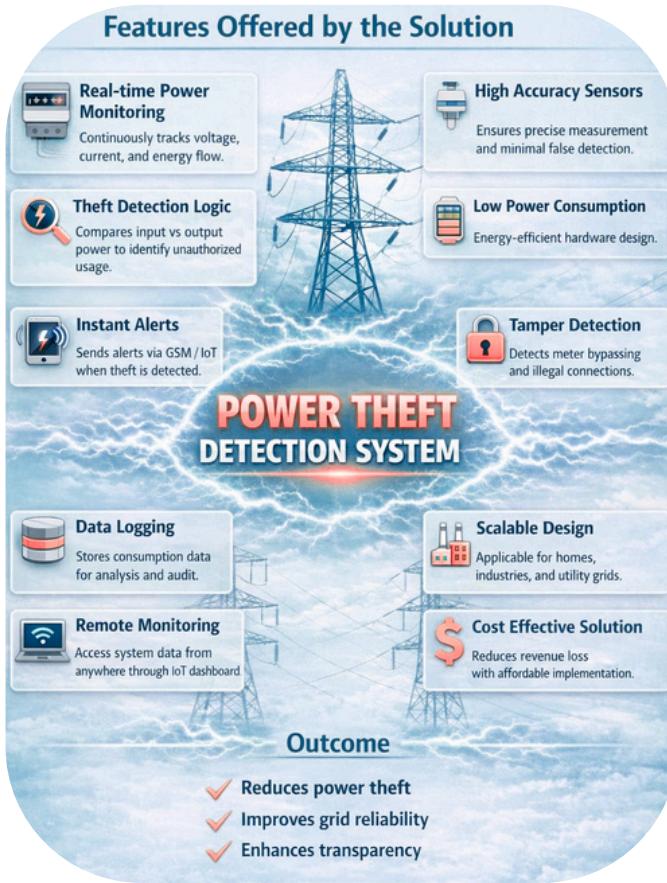
Traditional methods depend on manual inspection.

- Our system uses Machine Learning for automatic detection.
- Identifies abnormal and hidden power theft patterns.
- Faster and more accurate than rule-based systems.

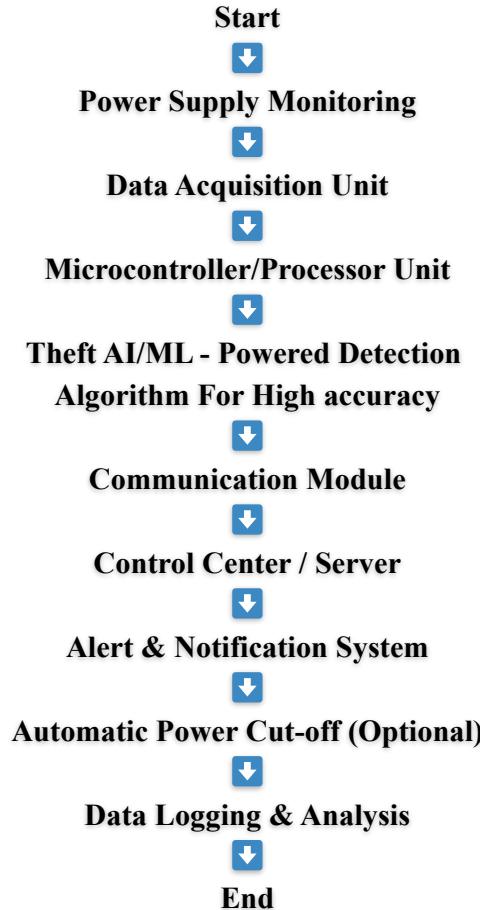
B. *How it solves* the problem

Collects electricity consumption data from meters.

- Analyzes data to find unusual usage patterns.
- Flags suspected theft cases instantly.
- Helps authorities take quick action and reduce losses.



Flow chart of Power Theft Detection System Features



Google Technologies used in the solution



Machine Learning & AI Frameworks

The core of modern detection systems relies on deep learning to distinguish between normal consumption and fraudulent patterns (e.g., meter bypassing or hooking).

- Vertex AI: Model training, tuning, deployment, monitoring.
- Utility providers use the Google Vertex AI platform to manage the end-to-end ML lifecycle. It automates feature engineering, model training (using algorithms like CNNs or LSTMs), and hyperparameter tuning to achieve accuracy rates often exceeding 93%.

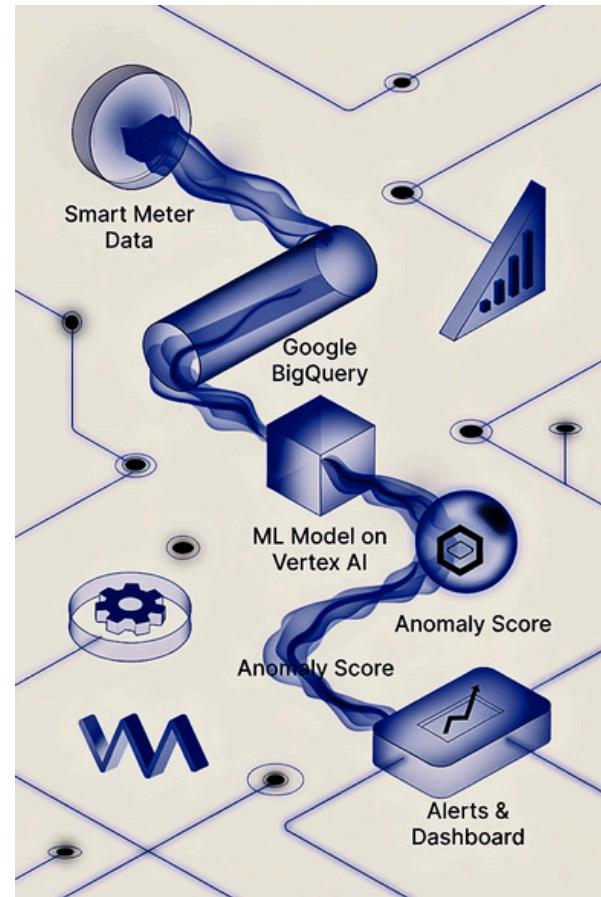
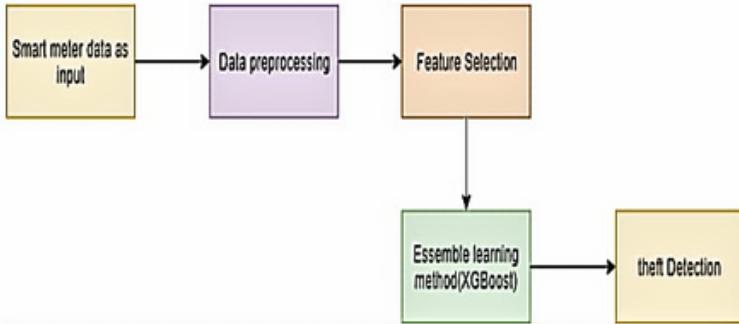
- TensorFlow: Anomaly detection models on consumption data
- This open-source framework, developed by Google, is the industry standard for building the neural networks used in anomaly detection. Researchers use it to develop 1D Densely Connected Convolutional Networks (DCNNs) specifically designed for time-series energy data.

TensorFlow Lite – on-device inference for smart meters.



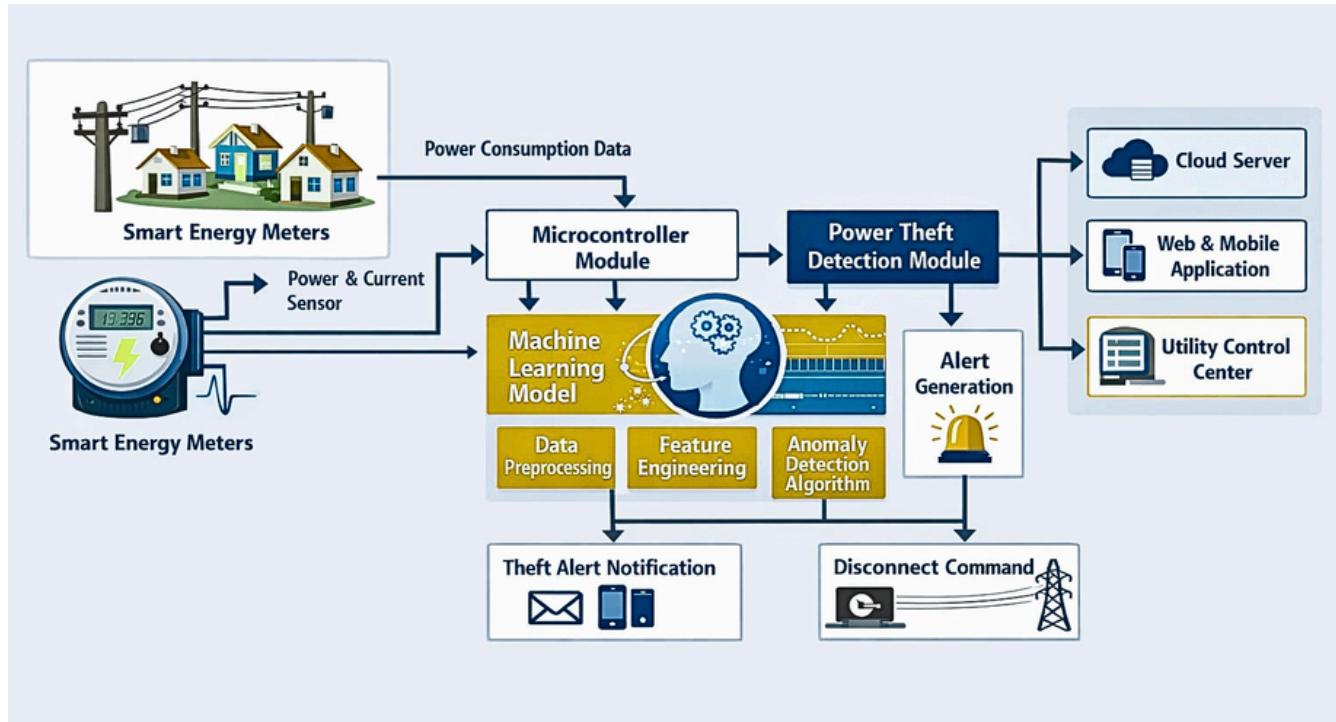
Process flow diagram or Use-case diagram

SYSTEM ARCHITECTURE





Architecture diagram of the proposed solution





MVP Snapshots of power Theft detection System

Live Consumption Dashboard

Power Theft

- Dashboard
- Alerts
- Reports
- Settings

Current Usage: 8.2 kW Normal Range: 2 - 4 kW Anomalies Detected: 3

KW

14K
8K
4K
0K

10:00 11:00 12:00 13:00 14:00 15:00 16:00

Theft Alert Notification

9:41
Monday August 2:24

⚠️ Power Theft Alert!

Suspicious activity detected at Meter ID: 10234
Unusual spike in consumption. Check immediately!

[View Details](#)

Anomaly Detection Report

Anomaly Detection Report

Meter ID: 10234
Location: Sector 5, Mt Maple St.
Anomaly Detected: High Consumption Spike
Date: 24-Apr-2024
Time: 03:15 PM

Consumption Analysis

7K
8K
9K

Recommendations: Investigate site and verify connection.

Map View of Alerts

1 Alert: Meter ID 10234
Status: Power Theft Suspected
Last Alert: 03:15 PM

Additional Details

- **Future Research Directions** : This basic system we can upgrade to a great level by introducing the **GPS module** in the system. If we introduced the GPS in the system, then it would become easy to identify the perfect energy theft area. Thing Speak Cloud also provides the Map in their charts to display the locations of systems. So to improve the performance of the system more efficiently we have to connect the GPS module to the Particle photon board and the location we have to send on the cloud location chart.
- **Explainable AI (XAI)** : Implementing techniques like SHAP (SHapley Additive exPlanations) and LIME to ensure that the AI model's decisions are transparent, which is crucial for legal actions against electricity theft.
- **Quantum Machine Learning (QML)** : Exploring the application of quantum computing for faster, more efficient classification of high-dimensional energy data, a nascent field in power theft detection.

Provided links are:

1. **GitHub Public Repository:** <https://github.com/tejsvekariya29/Power-Theft-Detection-System-PTDS.git>

2. **MVP Link:** <https://drive.google.com/file/d/1JyCvZmWdnIpkuU1Gv5mpwcLxRA-pCxR/view?usp=drivesdk>