CUCULUS

Innovation for Grid Management
- Data Analytics Module ZONOS™ Fraud Detect -

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Affordable energy and water for everyone

Problem Statement

Problem

Unauthorized access, meter tampering, and various forms of electricity theft lead to substantial revenue losses, impacting the overall sustainability of the utility.

Impact

Electricity fraud poses a significant threat to the financial stability and operational integrity of utility providers.

Gap

The absence of a robust fraud detection system results in delayed identification of fraudulent activities, hindering timely interventions and increasing the complexity of investigations.

ZONOS™ FraudDetect: High level data driven AI solution

From ZONOS™/Utility to FraudDetect

DATA INPUT

Customer consumption data
- from ZONOS/other HES
- file based imports

Customer profile data
- E.g., fraudulent history
- E.g., household size

Non-Customer Data
- E.g., climate variables
- E.g., holidays

FraudDetect AI Engine

AI Driven Customer Profile Engine

DERIVED PROFILES

- Energy profile
- Behavioral profile

FraudDetect Application Layer

From FraudDetect to ZONOS™/Utility

FRAUD-DETECT OUTPUT

List of potential fraudsters

List of most common fraudster characteristics

Insightful Reporting/Dashboards

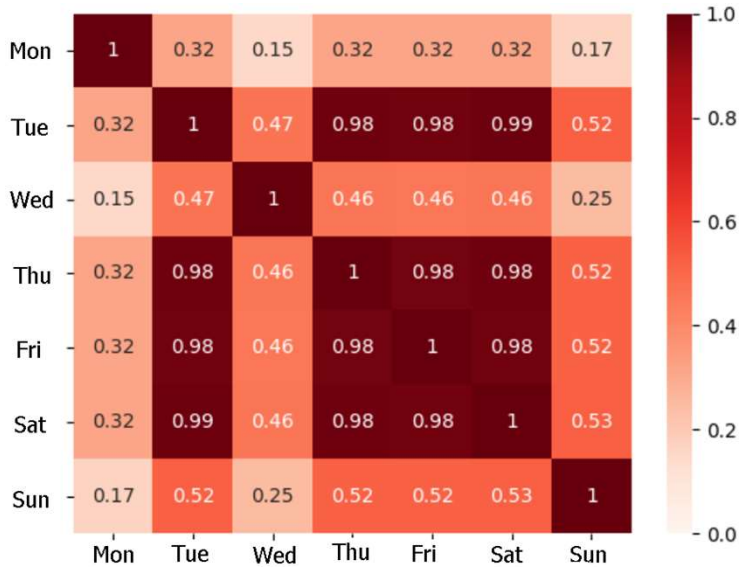
Detects also sophisticated fraudsters mimicking standard consumption.

Case study: Fraudsters differ from honest customers

Honest customers

Correlation analysis

- Strong consumption pattern
- Sunday differs from rest of week
- Tue/Thu/Fri/Sat are similar



Fraudulent customers

Strong correlation among all weekdays

- No strong consumption pattern
- Sunday similar to other weekdays
- Life of fraudsters looks “pretty boring”, to hide misbehaviors under a fake standard consumption

Analysis conducted using publically available real data provided by State Grid Cooperation of China (SGCC)

- **Daily power consumptions of 42,372 electric meters over a period of 1035 days**
- **3,615 fraudulent customers and 38,757 honest customers**

Case study: comparison of different ML approaches

Distinguish honest from fraudulent customers
- with high probability -

Machine learning method	Accuracy
Decision Trees	85 %
K-Nearest Neighbours	91 %
Logistic Regression	91 %
Support vector machine	91 %

Correctly classified honest customers are just as important as correctly classified fraudsters

- **High accuracy is meaningless because correctly classified honest customers count.**
- **Though analysis may be based on customers requirements, results are almost useless.**

Identify fraudulent customers
- with high probability -

Machine learning method	Precision
Decision Trees	16 %
K-Nearest Neighbours	36 %
Logistic Regression	58 %
Support vector machine	77 %

Only correctly classified fraudsters count.

- **Data analysis based on customer needs.**
- **Results are useful and solve the problem.**
- **Commercially available as ZONOS™ FraudDetect.**

An advanced version based on xAI is in development.

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We're Cuculus GmbH

Enabling utilities and organisations to successfully transition to a new era of providing and managing electricity, water, and gas.

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