الرواد الرقميون
DiGiLiANS

DIGI
Digital Egypt Pioneers Initiative
Track: AI & Data Analysis

الأكاديمية العسكرية المصرية
EGYPTIAN MILITARY ACADEMY

وزارة الاتصالات وتكنولوجيا المعلومات

Building Digital Leaders for a Smarter Egypt

Electricity Theft Detection

Smart-meter fraud detection with Dual-Branch CNN-LSTM + Transfer Learning · Digilians · Track: AI & Data Analysis

1 Project Identity

- Electricity Theft Detection
- **Dual-Branch CNN-LSTM** + Transfer Learning
- Supervisor: Dr. Gouda Ismail Salama

2 Team

- Tarek Said Mohamed
- Mahmoud Ahmed Rashad
- Mohamed Hossam Eldin
- Mohamed Alshahat Mohamed
- Mostafa Mohamed Ibrahim

3 Problem & Audience

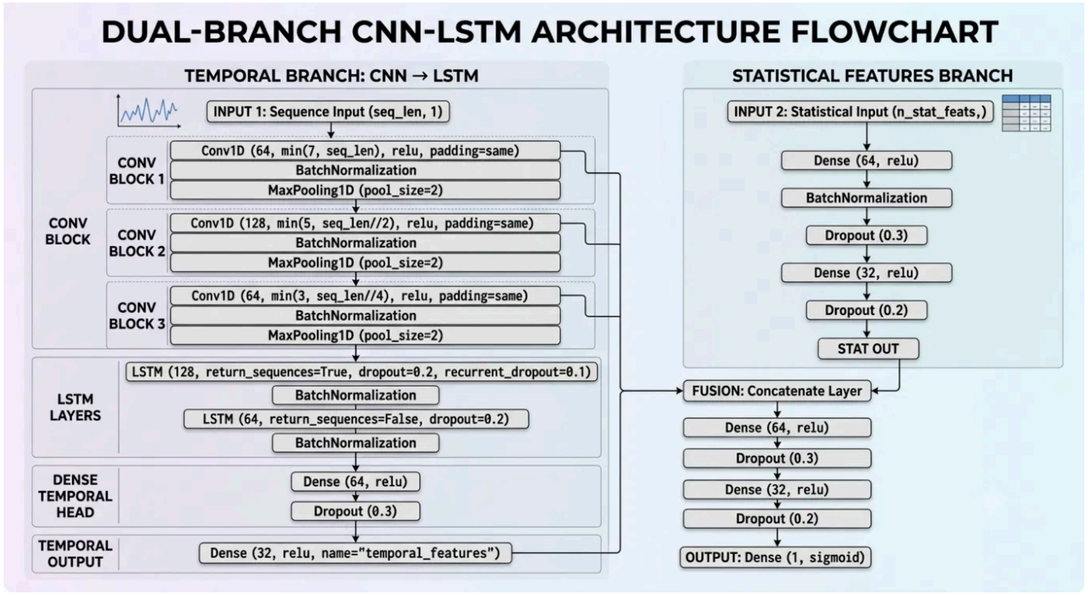
18,193	8.8%	≈ 1:10
consumers (SGCC)	labelled theft	class imbalance

- Target users: electric utilities
- Goal: cut Non-Technical Losses

4 Solution & Core Idea

- Flags smart-meter consumers: normal vs fraudulent
- Fuses **dual-branch CNN-LSTM** with 59 statistical features

Model architecture · Dual-Branch CNN-LSTM



Temporal branch (CNN → LSTM) + statistical features branch, fused for classification

INPUT	Raw sequences (120 daily readings) + 59 statistical features
MODEL	**Dual-branch CNN → LSTM** + statistical branch → fusion · Transfer Learning
OUTPUT	Sigmoid score · optimized threshold 0.290 → normal / theft

5 Pipeline

Data Prep › Synthetic Theft › 59 Features › CNN-LSTM + TL › Threshold

6 Tools & Technologies

Python · TensorFlow · pandas · SQLite · Streamlit

7 Deliverables

- Trained model
- Synthetic theft data
- Demo
- Presentation

8 Impact & KPIs

94.00%	94.4%
Accuracy	F1-score
98.3%	**91.7%**
AUC-ROC	Recall

Held-out test set (n = 3,600) · decision threshold 0.290

PROJECT LINK & QR CODE

https://q.me-qr.com/l1vlxu36
Scan for the project demo

Digilians · National Telecommunication Institute (NTI)
Graduation Project · 2025 / 2026