NOVEMBER 2025

ADAPTIVE FRAUD DETECTION ENGINE

Real-Time ML Decisioning with Auto Case Resolution

PRESENTED BY

Vachan Sardar

1. WHAT THIS PROJECT IS

Goal:
Build a production-style fraud detection system, not just a model.

Focus:
- Real-time fraud scoring
- Business-driven decisions
- Analyst review workflows
- Operational monitoring

Data:
- Credit Card Fraud Detection Dataset (2023 – Kaggle)
- Synthetic streaming data to simulate live transactions

2. DATA & STREAMING SETUP

Base data
- Anonymised PCA features (V1–V28)
- Transaction amount
- Highly imbalanced fraud labels (realistic)

Why synthetic data
- Original data is static
- Production systems are continuous

Synthetic stream preserves
- Fraud rate
- Feature distributions
- Transaction velocity (Tx/min)

Used by
- Live Feed
- Ops Analytics
- Case Queue

3. MACHINE LEARNING & DECISIONING

Model
- LightGBM (Gradient Boosted Trees)
- Optimised for imbalanced tabular data

Decision strategy
- Cost-sensitive thresholding
- False Negative $\gg$ False Positive
- Cost ratio: FN = 100× FP

Output
- Fraud probability score
- Business decision:
  - APPROVE
  - REVIEW

Impact
- Optimises financial loss, not accuracy
- Aligns model output with real fraud risk trade-offs

4. CORE SYSTEM COMPONENTS

Live Transaction Feed
- Simulated real-time transaction stream
- Instant fraud scoring per transaction
- Threshold-based decisioning
- Visual risk indicators for fast triage

Batch Scoring
- CSV-based ingestion for bulk transactions
- Designed for backfills and daily extracts
- Outputs:
  - Fraud probability
  - Business decision at active threshold

Single Transaction Analysis
- Manual feature input
- Immediate scoring and decision
- SHAP explainability:
  - Top risk-increasing features
  - Top risk-reducing features
- Used for debugging and analyst trust

Case Management
- REVIEW decisions automatically create cases
- Tracks:
  - Case status
  - Customer response
  - Resolution source
  - Timestamps & SLAs

Auto-resolution (demo)
- Time- and probability-based logic
- Simulates customer confirmation & back-office actions

5. OPERATIONAL ANALYTICS (OPS VIEW)

Monitors system health & workload
- Transactions per minute (rolling avg)
- Review rate
- Case backlog
- False positive rate
- Case resolution rate
- Average time to resolution
- Risk concentration by hour & day