
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

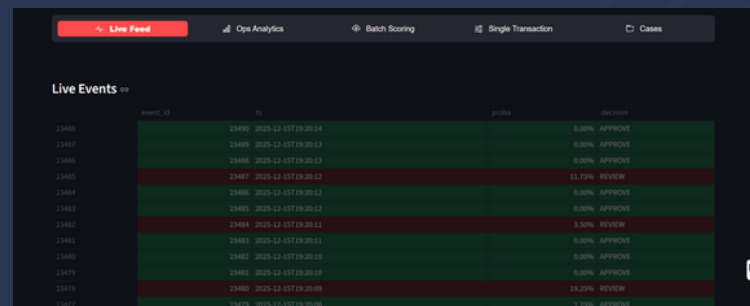
Auto-resolution (demo)

- Time- and probability-based logic
- Simulates customer confirmation & back-office actions

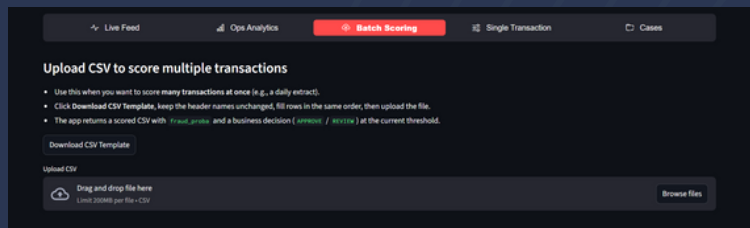
5. OPERATIONAL ANALYTICS (OPS VIEW)

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



event_id	ts	probab	decision
23490	2025-12-15T19:26:14	0.00%	APPROVE
23497	2025-12-15T19:26:13	0.00%	APPROVE
23498	2025-12-15T19:26:13	0.00%	APPROVE
23497	2025-12-15T19:26:12	11.75%	REVIEW
23498	2025-12-15T19:26:12	0.00%	APPROVE
23495	2025-12-15T19:26:12	0.00%	APPROVE
23494	2025-12-15T19:26:11	3.50%	REVIEW
23495	2025-12-15T19:26:11	0.00%	APPROVE
23492	2025-12-15T19:26:10	0.00%	APPROVE
23479	2025-12-15T19:26:09	19.25%	REVIEW
23479	2025-12-15T19:26:08	7.25%	APPROVE



Upload CSV to score multiple transactions

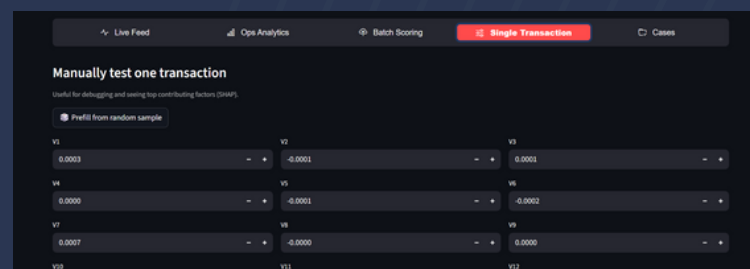
- Use this when you want to score many transactions at once (e.g., a daily extract).
- Click Download CSV Template, keep the header names unchanged, fill rows in the same order, then upload the file.
- The app returns a scored CSV with `fraud_probab` and a business decision (`approve` / `review`) at the current threshold.

Download CSV Template

Upload CSV

Drag and drop file here
Limit: 200MB per file • CSV

Browse files



Manually test one transaction

Useful for debugging and seeing top contributing factors (SHAP).

Profile from random sample

V1	0.0003	-	+	V2	-0.0001	-	+	V3	0.0001	-	+
V4	0.0000	-	+	V5	-0.0001	-	+	V6	-0.0002	-	+
V7	0.0007	-	+	V8	-0.0000	-	+	V9	0.0000	-	+
V10				V11				V12			

Live Feed

Ops Analytics

Batch Scoring

Single Transaction

Cases

Cases / Alerts Queue

Demo: auto-resolve pending cases (simulate customer responses)

Total cases

Pending

Confirmed fraud

Confirmed legit

6601

423

4873

1305

All cases

event_id	ts	probab	status	customer_response	resolution_source	updated_at
6523	24132 2025-12-15T19:24:50	100.00%	CONFIRMED_FRAUD	NO	AUTO_DEMO	2025-12-15T19:26:51
6518	24120 2025-12-15T19:24:45	100.00%	CONFIRMED_FRAUD	NO	AUTO_DEMO	2025-12-15T19:26:51
6513	24114 2025-12-15T19:24:42	100.00%	CONFIRMED_FRAUD	NO	AUTO_DEMO	2025-12-15T19:26:51
6508	24092 2025-12-15T19:24:34	100.00%	CONFIRMED_FRAUD	NO	AUTO_DEMO	2025-12-15T19:26:51
6508	24089 2025-12-15T19:24:33	100.00%	CONFIRMED_FRAUD	NO	AUTO_DEMO	2025-12-15T19:26:51
6505	24085 2025-12-15T19:24:31	100.00%	CONFIRMED_FRAUD	NO	AUTO_DEMO	2025-12-15T19:26:51

