

False Positives in Indian Digital Banking Fraud Detection: Challenges, Impacts and Mitigation Strategies

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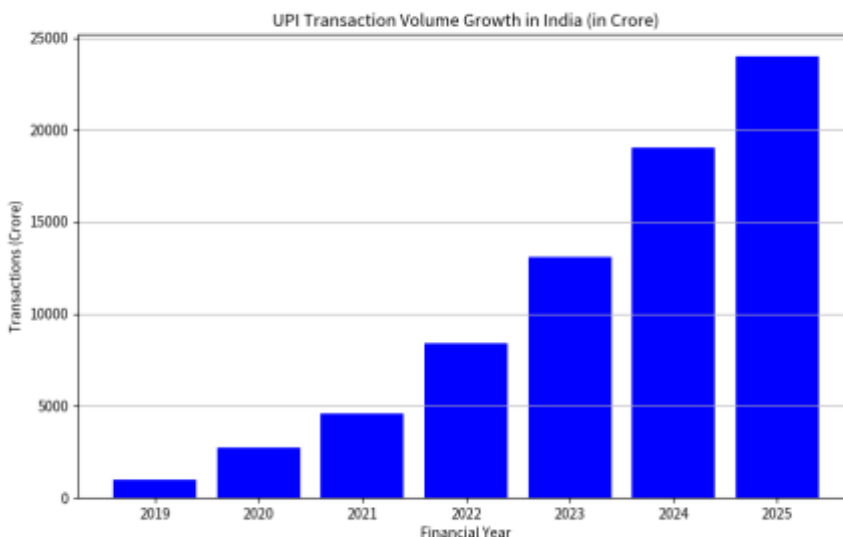
Abstract

Indian digital banking fraud detection systems are having a problem. They are incorrectly flagging transactions as fraudulent. This is what we call positives. It is a challenge in India's rapidly growing digital payments ecosystem. The main reason for this growth is the Unified Payments Interface or UPI for short. When there are a lot of positives it leads to legitimate transactions being declined. This makes customers unhappy. Causes operational inefficiencies. It also results in revenue.

This paper is going to look at the issue of positives in the Indian context. We will be drawing on rule-based legacy systems and emerging Artificial Intelligence and Machine Learning solutions. We will also be looking at case studies, such as the ones from the State Bank of India ICICI and HDFC. Additionally, we will be looking at benchmarks like the ones from Danske Bank and BBVA. We will also be getting insights from research scholars and industry experts.

Advanced techniques like Machine Learning and Deep Learning models behavioural analytics and feature engineering have been shown to reduce false positives by 15-80%. At the time they are able to maintain high detection rates. The main recommendations are to use real-time systems, Explainable Artificial Intelligence and regulatory support like the initiatives from the Reserve Bank of India.

Figure 1: Growth of UPI Transactions in India (Volume in Crore)



Indian digital banking has seen an amount of growth. The number of UPI transactions has surged dramatically reaching over 185 billion in the year 2024-25. However, this growth has also been accompanied by a surge in frauds. The traditional rule-based systems are struggling to keep up with the evolving threats resulting in false positive rates.

Table 1: Key Performance Metrics in Fraud Detection

Metric	Traditional Rule-Based	AI/ML Hybrid Models
Detection Accuracy	40-70%	95-99%
False Positive Rate	70-99.5%	0.05-3%
Precision	Low	94-97%
Recall	Moderate	92-99%

Metric Traditional Rule-Based AI/ML Hybrid Models

False positives happen when genuine transactions trigger alerts because they deviate from the baseline patterns. In India this is making things worse in a volume low-value environment.

2. Causes of High False Positives in Context

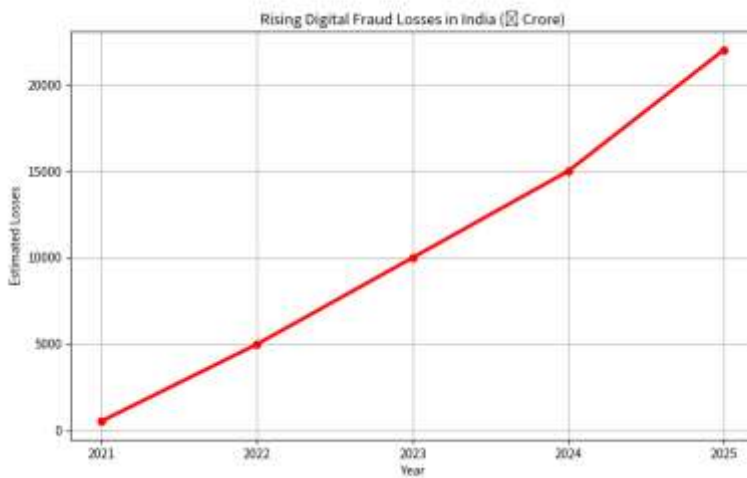
- * The rule-based systems are too rigid.
- * There are class imbalance and data issues.
- * There are evolving threats, like accounts and phishing.
- * There are real-time constraints with the scale of UPI.

Indian scholars are using models like Random Forest, Isolation Forest and Long Short-Term Memory on UPI data to highlight these challenges.

3. Impacts

- * Customer Experience: When transactions are declined it erodes trust. Hinders inclusion.
- * Operational Costs: High alert volumes are costly.
- * Financial Losses: False positives can exceed the cost of fraud in lost opportunities. The number of payment frauds has risen sharply with reported cases in the millions.

Chart 1: Rising Digital Payment Frauds in India (2021-2025)



4. Mitigation Strategies

4.1 Feature Engineering and Behavioural Profiling

Automated methods and behavioural patterns like velocity, device and geolocation can reduce positives effectively.

4.2 Machine Learning and Hybrid Models

Tree-based and Deep Learning models, like XGBoost and Long Short-Term Memory can achieve accuracy with low false positives. Ensembles and cost-sensitive learning are also effective.

Table 2: Model Performance Comparison (Selected UPI Studies)

Model	Accuracy	Precision	FP Rate (approx.)
Random Forest	96-97%	96-97%	Low (~3%)
Hybrid ML/DL	95-98%	94-97%	0.05-3%
Isolation Forest	High	High	Reduced significantly

4.3 Explainable AI and Rule Induction

This can enhance transparency and compliance.

4.4 Indian Initiatives

The Reserve Bank of India and the National Payments Corporation of India are taking initiatives. Bank pilots, like the ones from the State Bank of India ICICI and HDFC are also showing results.

5. Case Studies

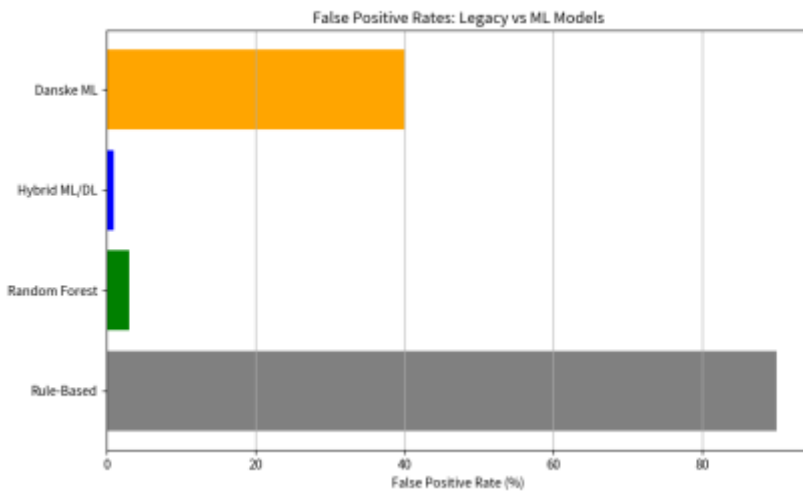
* The State Bank of India ICICI and HDFC have done AI pilots that show a 15%+ reduction in positives improved signal-to-noise and real-time UPI monitoring.

Figure 3: Before vs. After FP Reduction in Indian Bank Pilots

* Danske Bank was able to reduce positives by 50-60% and increase detection by ~50-60% from a 99.5% false positive baseline.

* BBVA was able to reduce positives by 54% via Deep Feature Synthesis saving ~€190K.

Chart 2: FP Reduction Comparison (Legacy vs. ML)



6. Challenges and Future Directions

There are challenges like privacy, concept drift and scalability. In the future we can expect to see the Reserve Bank of Indias Digital Payments Intelligence Platform, federated learning and advanced biometrics.

7. Advancements in Artificial Intelligence and Machine Learning combined with regulatory initiatives and global lessons can offer substantial reductions in false positives. This can lead to a customer experience and improved fraud prevention.

References

Indian Scholarly Papers & Studies

1. Lingareddy, N. (2025). Enhancing Digital Payment Security: UPI Fraud Detection with Advanced Machine Learning Algorithms. IEEE Conference Publication. <https://ieeexplore.ieee.org/document/11077038/> (Accuracy 98.7%, False Positive Rate 1.2%).
2. Sethi, B., Mhatre, S., Yadav, S., Das, S., & Jadhav, V. (2025). Machine Learning-Based UPI Fraud Detection: A Comprehensive Approach Using Random Forest. Atlantis Press. (Precision 97%, strong minimization of false positives).
3. Kumar, J. (2025). Optimized Machine Learning and Deep Learning Approaches for UPI Fraud Detection. International Journal of Science and Advanced Technology.
4. (2026). A Convolutional Neural Network Framework for Real-Time UPI Fraud Detection. TIJER. (Accuracy 97.8%, Precision 96.4%, False Positive Rate 1.4%).
5. (2026). AI-Based Detection and Analysis of Fraud in UPI Transactions. Mazedan. (Low FP count of 28 in confusion matrix example).
6. (2026). UPI Fraud Detection and Prevention. ResearchGate. (95.7% detection accuracy on >5 million anonymous UPI transactions).
7. Various authors (2025). Papers in IJERT, IJCRT, IJISRT, and IRJET on ensemble methods, Isolation Forest, LSTM, and hybrid models for UPI fraud detection emphasizing FP reduction.
8. Reserve Bank of India (RBI). (2025–2026). Digital Payments Intelligence Platform (DPIP) – AI/ML-based real-time risk scoring and intelligence sharing to reduce false positives in digital payments.
9. RBI & NPCI initiatives (including MuleHunter.AI pilot) for mule account detection and behavioural analytics in UPI ecosystem.
10. State Bank of India (SBI) & ICICI Bank Pilots (2025). ML-based systems reduced false positives by ~15%, improved real-time UPI monitoring.
11. HDFC Bank + Mastercard AI Integration. Real-time behavioural analytics for fraud detection, significantly lowering false alerts.