TITLE PAGE

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Problem Statement Title- *Fraud Detection in UPI Transaction using AI & ML*

Theme ID - *9*

PS Category- *Software*

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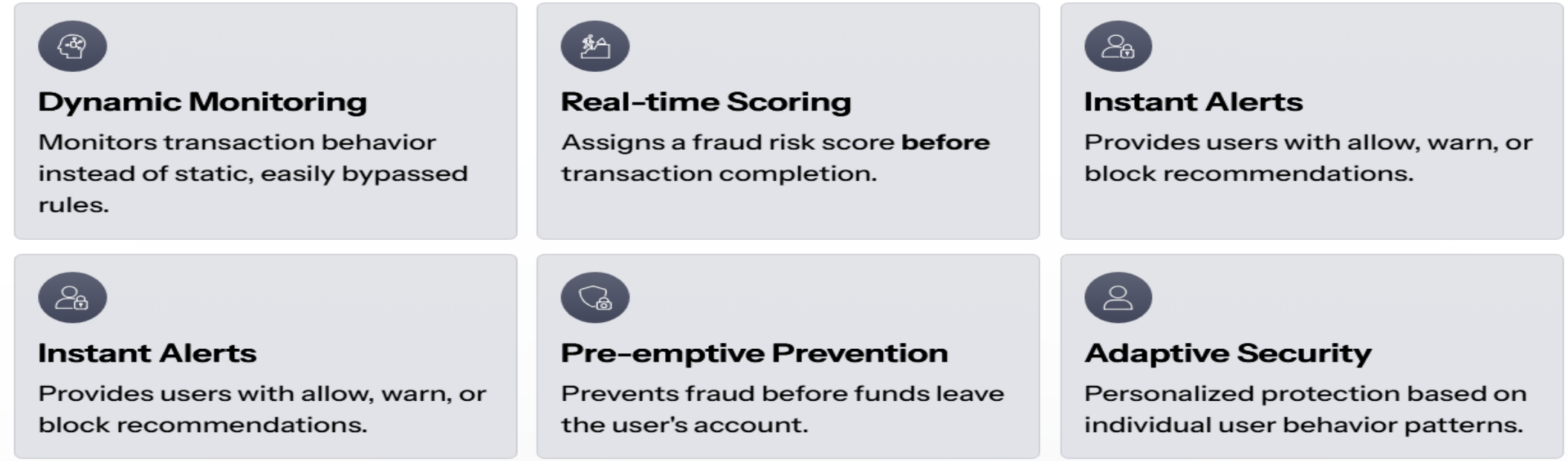
FRAUD DETECTION IN UPI

Proposed Solution

- AI-based real-time system that analyzes UPI transaction behavior and generates a fraud risk score before payment confirmation
- Detects abnormal user behavior using behavioral analysis instead of static rules to prevent fraud proactively
- Instantly alerts users with allow / warn / block actions to stop fraudulent transactions before money is transferred



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TECHNICAL APPROACH

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Technology Stack

- **Backend:** Python, FastAPI, Uvicorn for high-performance APIs.
- **Machine Learning:** Isolation Forest, Random Forest, XGBoost, Autoencoder (Anomaly Detection) for comprehensive fraud detection, with Ensemble Scoring for accuracy.
- **Frontend:** React (**Web.app** / PWA) for a responsive user interface.
- **Database:** PostgreSQL for reliable data storage.
- **Caching:** Redis for ultra-fast real-time checks.
- **Alerts:** Firebase Cloud Messaging for instant user notifications.

Workflow Overview

1. **Initiate Transaction**
   User starts a UPI transaction.
2. **Data Transmission**
   Transaction data securely sent to the backend.
3. **ML Analysis**
   ML models analyze behavioral patterns for anomalies.
4. **Risk Scoring**
   A real-time fraud risk score is generated.
5. **Decision & Alert**
   System decides: Allow / Warn / Block, and alerts the use instantly.

Scalable and Integrated Solution

Key Advantages

- Uses lightweight ML models optimized for real-time systems.
- Does not interfere with existing UPI transaction speed.
- Easily scalable via microservice architecture.
- Works seamlessly alongside current UPI infrastructure.

Challenges & Mitigation

- **False Positives:** Minimized through behavioral profiling per user and adaptive risk score threshold tuning.
- **Real-time Latency:** Addressed with Redis caching for faster decision-making and efficient data retrieval.

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IMPACT AND BENEFITS

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Potential Impact on the Target Audience

- Protects UPI users from real-time fraud and financial scams
- Reduces financial stress caused by fraudulent transactions
- Builds trust and confidence in digital payment systems

1

User Protection

Shields users from real-time UPI frauds.

2

Financial Security

Significantly reduces financial losses for individuals.

3

Trust in Digital Payments

Enhances user confidence in cashless transactions.

4

Institutional Support

Assists banks and fintech platforms in fraud prevention.

Benefits of the Solution

- **Social**: Improves user safety and awareness during digital payments
- **Security**: Strengthens fraud prevention and digital transaction security
- **Economic**: Reduces financial losses for users and payment platforms

Foundations of Our Fraud Detection System

- RBI reports on digital payment frauds: Key insights into the landscape of financial cybercrime in India.
- NPCI UPI security guidelines: Adherence to national standards for secure payment infrastructure.
- Research papers on anomaly detection in financial fraud: Incorporating cutting-edge academic insights.
- IEEE studies on real-time fraud detection: Leveraging global engineering advancements.
- Public financial transaction datasets: Used for training and validating our machine learning models.