SCOPE DOCUMENT

New Jersey Courts E-Z Pass Fraud Detection

OVERVIEW

Project Name: E-Z Pass Fraud Detection

Sponsor: New Jersey Courts

Business Project Leaders: Prabakar Radhakrishnan, Tasnim Hadi

Project Manager: Meer Modi

NJIT Team Members: Eric, Chloe, Xitlaly, Joshua

Project Timeline: September 29, 2025 – December 06, 2025

I am pleased to submit this proposal to support the New Jersey Courts in their efforts to detect and eliminate fraudulent E-Z Pass usage while strengthening financial accountability across state vehicle fleets. Our team will design and implement advanced fraud detection solutions powered by Artificial Intelligence and Machine Learning, delivering real-time monitoring, intelligent pattern recognition, and comprehensive reporting capabilities.

THE OBJECTIVE

To develop and implement an automated fraud detection system that identifies unauthorized E-Z Pass usage patterns, reduces financial losses, and ensures compliance with state vehicle usage policies through advanced AI/ML powered transaction analysis.

- **Need #1:** Eliminate manual review of 4,000+ monthly E-Z Pass transactions currently requiring hours of staff time through automated processing and AI/ML analysis.
- **Need #2:** Detect sophisticated fraud patterns that traditional rule-based systems miss, achieving high detection with the help of AI/ML and preventing human errors.
- **Need #3:** Encrypt or mask data in transit and at rest to ensure compliance with judiciary policies.
- **Need #4:** Clean, simple, and focused UI - a single-page dashboard that surfaces fraud analytics first, with minimal navigation and clear call-to-actions for investigators.
- **Need #5:** Single-source, non-redundant technical document set that explains the fraud rules, full end-to-end workflow, and exactly how to implement and operate the system.
- **Need #6:** keep the codebase minimal, modular, and easily transferable so the team can implement features without chasing files or hidden logic.

OUR PROPOSAL

Our proposal is to develop a Fraud Detection Dashboard that will serve as the central command center for the New Jersey Courts' E-Z Pass fraud monitoring operations. The dashboard will be designed as an intuitive, React-based application to ensure accessibility, usability, and scalability for investigators and administrators.

Each month, the system will automatically process CSV files containing approximately 4,000 transactions. These transactions will be analyzed using our AI and Machine Learning-powered detection engine, which leverages official toll authority rate validation. This approach ensures both accuracy and reliability in identifying fraudulent activity.

The dashboard will present real-time fraud analytics through interactive and user-friendly visualizations, including:

- Confidence distribution charts to show the strength of AI-based fraud assessments
- Trend analysis over time to track recurring patterns and emerging risks
- Detailed transaction grids with explainable AI reasoning to provide transparency and support investigative decision-making

By reducing manual review time through intelligent automation, the dashboard will provide clear, actionable fraud intelligence. Complex AI analysis will be translated into investigator-ready insights, enabling immediate action, stronger case support, and measurable financial recovery for the New Jersey Courts.

TECHNICAL/PROJECT APPROACH

Our solution follows a three-phase Agile methodology that integrates deterministic business rules with inhouse Machine Learning & AI model to deliver accurate and explainable fraud detection.

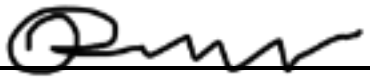
- Phase 1: Foundation: Monthly E-Z Pass CSV files will be extracted and validated against official Port Authority and NJ Turnpike rate schedules and ingested into Azure File Storage with full audit trails and batch tracking.
- Phase 2: Detection Engine: A dual-layer system will first apply deterministic rules, including threshold check, then apply ML based rules for contextual scoring and explanations of complex patterns such as geographic impossibilities and vehicle type mismatches.
- Phase 3: Dashboard & Alerts: A React-based dashboard will present real-time fraud analytics, visualizations, and flagged transactions.

RISK ANALYSIS

- **Risk #1**: Data Security – Sensitive E-ZPass records stored and transmitted for fraud detection could be at risk of exposure or misuse if not properly protected. This includes both personally identifiable information (PII) and financial transaction data that courts must safeguard. To mitigate this, we will apply data masking, enforce encryption both at rest and in transit, and implement strict access controls.
- **Risk #2**: Fraud Detection Accuracy – The accuracy of identifying fraudulent toll transactions is a critical risk, as false positives may burden the courts while false negatives could allow fraud to go unchecked. Relying solely on machine learning may introduce errors due to data bias or unseen scenarios. To address this, we adopt a two-factor approach that combines ML predictions with predefined business rules, ensuring higher accuracy and reliable outcomes.

PROJECT DELIVERABLES

DELIVERABLE	DESCRIPTION
Defined Business Rules	A comprehensive document outlining all business rules used in fraud detection and data analysis.
System Architecture Diagram / Workflow	Visual diagrams showing system design, data flow, and integration points across ingestion, detection, and dashboard layers.
Technical Documents – UI / Backend / Integrations / Operations	Detailed technical references specifying technologies, frameworks, versions, restrictions, and integration requirements.
Machine Learning / AI Model	Implementation of state-of-the-art ML/AI models for E-Z Pass fraud detection, including explainability features and model performance metrics.
API Endpoint	Secure and well-documented APIs for integration with other applications, tools, or reporting systems.
Clean & Interactive UI	A modern React-based dashboard providing intuitive fraud analytics, visualizations, filtering, and reporting capabilities.
Midterm Presentation	A progress update presentation to NJIT faculty to demonstrate system architecture, prototype features, and early results.
Codebase & Required Credentials	Delivery of the complete codebase with documentation, along with necessary credentials and permissions for deployment and ongoing use.
Final Presentation	A formal presentation to NJIT Capstone faculty and NJ Courts representatives, showcasing the final system and project outcomes.

X  X 

Sponsor Signature

Project Manager Signature