



# IBTTA ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING SUBCOMMITTEE



## IBTTA ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING SUBCOMMITTEE

### Co-Chair



**GEORGE CHRISTOPHER,**  
VP Emovis

**Expertise:** Customer Service Center, Road User Charging, Back Office Solutions, Print/Mail/Fulfillment

**Experience:** 20+ years of government contracting experience with 10+ focused in Tolling

**Role:** Market Development & Client Success

**Background:** A dynamic executive known for spearheading the establishment of new market ventures and implementing cutting-edge technological advancements across diverse industries. With a comprehensive background in executive management, sales, marketing, operations, strategic planning, and systems integration, he brings practical expertise to every endeavor. Additionally, he serves as a Board Member of the IBTTA Foundation. He holds key leadership roles, including Co-Momentum Leader of the DEI Subcommittee on Recognition and Co-Chair of the AI

and Machine Learning Subcommittee.

**Education:** The US Military Academy, West Point; The College of William and Mary; The Howard University School of Law.

## Co-Chair



**RAFAEL HERNANDEZ,  
VP TOLLING SOLUTIONS,  
KYRA SOLUTIONS**

**Expertise:** Rafael Hernandez, Vice President of Tolling Solutions at Kyra Solutions, is a seasoned transportation executive whose track record of managing large-scale toll operations has resulted in processing over 490 million toll transactions and collecting toll revenues exceeding \$790 million.

**Experience:** With 19+ years of experience in electronic transaction processing, revenue collection, cybersecurity, system engineering, project management, change management, and business operations, his expertise in tolling and road usage charging (RUC) is underscored by his significant contributions to major projects such as the implementation of roadside All-Electronic Tolling (AET) systems, tolling Commercial Back-Office Systems (CBOS), toll discount programs, and tolling solar power systems.

Leveraging Kyra Solutions' IntelliManage platform, Rafael helps clients maximize revenue recognition and reduce operating costs while providing excellence in customer service.

**Role:** Tolling Solutions

**Background:** Before joining the Kyra Solutions team, Rafael served as the Director of Tolls at Tampa Hillsborough Expressway Authority (THEA), where he modernized the organization's IT infrastructure, rolled out a tolling rebate program to support THEA's Connected Vehicles Project, and spearheaded the creation of a "Tolling Change Management Office" to protect toll revenue streams from unapproved changes in tolling software and/or business rules.

Rafael served as a Board member for the Alliance for Toll Innovation (ATI) and the Alliance for Toll Interoperability (ATI). He also served at the International Bridge, Tunnel & Turnpike Association (IBTTA) as the chair of the Council of Platinum Sponsors (CoPS) and co-chaired the Artificial Intelligence (AI) and Machine

Learning Subcommittee of the Emerging Technology Committee. The Tampa Bay Business Journal recognized him as a regional leader to watch in the "40-under-40" list. He completed both the IBTTA Leadership Academy and the Tampa Bay Leadership Academy.

**Education:** Rafael is a graduate of the Program for Digital Transformation at MIT. He holds a Bachelor of Science in Electronics Engineering from the Universidad Rafael Bellosó Chacín in Venezuela and a Master of Business Administration (MBA) from the University of South Florida (USF).

## INTRODUCTION

Growing from the larger framework of the IBTTA Emerging Technology Committee, the AI and Machine Learning Subcommittee has been established with a core mission: to foster synergies, innovation, and practical applications of AI and Machine Learning concepts within the transportation and tolling domain. Our strategy is clear: to harness the collective expertise of public and private sector professionals, catalyzing the exploration and implementation of AI-driven solutions for the betterment of our industry and its diverse stakeholders, with a primary focus on the driving public.

Our objectives are twofold: firstly, to facilitate robust collaboration, research, and ideation, nurturing a fertile ground for transformative ideas to flourish. Secondly, we are committed to empowering industry leaders by disseminating knowledge and resources while actively addressing any barriers hindering the widespread adoption of AI and Machine Learning technologies. Together, we strive to pave the way toward a more efficient, responsive, and sustainable transportation ecosystem.

The IBTTA AI and Machine Learning Subcommittee is glad to present the content prepared in 2023. The content is broken down in five following categories:

- Finance
- Roadways
- Traffic
- Cybersecurity
- Customer Satisfaction

### CALL FOR ACTION!!!

While you review this report, please consider how to advance these ideas.  
If you want to discuss developing a pilot project, please contact us anytime.

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Rafael Hernandez, VP IntelliRoad  
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# FINANCE

Lead by



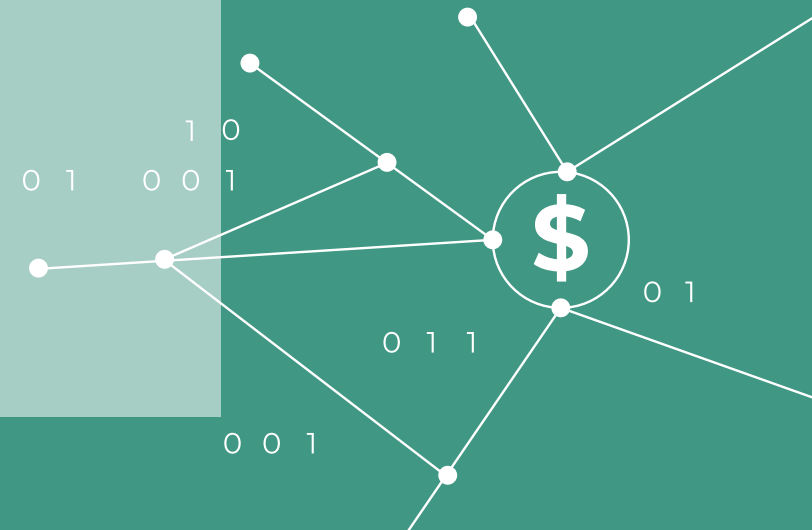
**SEAN TIHAL, P.E. – STANTEC**

Sean leads Stantec's National Toll Systems and Operations Practice. He has a passion for helping transportation agencies plan, procure, implement, and operate all forms of electronic tolling technologies for roadside toll collection systems and back-office systems to support Open Road Tolling, All-Electronic Tolling, and Managed/Express

Lanes. For over 22 years, he has provided technical toll consulting services for over 30 transportation agencies across the United States, Canada and Europe. Sean is also well versed in performing toll strategic planning studies, toll feasibility studies, toll capital and operating cost estimates (CAPEX and OPEX), toll operations analyses, toll policy studies, as well as toll pricing and toll payment analyses.

Sean is a registered Professional Engineer in the State of New York.

**Education:** B.S. Civil Engineering (Highest Hons) Illinois Institute of Technology  
M.S. Civil Engineering (Transportation) University of California at Berkeley



Lead by



**MARY BISWELL –  
OKLAHOMA TURNPIKE  
AUTHORITY**

Mary is the Director of Revenue Assurance, a newly formed Division for the Oklahoma Turnpike Authority. Mary joined the Oklahoma Turnpike in 2000 and has served the Turnpike in various positions including Internal Auditor, Data Analyst Manager and Director of Toll Operations. She earned a Bachelor's Degree in Science from the University

of Central Oklahoma and is a Certified Public Accountant and Project Management Professional.



**ARNIM BERGER –  
ATLAS ARTERIA**

Arnim serves as ATLAS ARTERIA's operations director. In this role, Arnim oversees all of ATLAS ARTERIA's international toll road businesses for technical aspects of operation and maintenance, including supervisory board responsibilities for businesses of the ATLAS ARTERIA Group. Throughout his nearly 30-year career, Arnim has been working as CTO for VINCI Concessions

for nearly 10 years with responsibility for concession project construction and commissioning as well as manager of toll road operations and maintenance. In this role, he has also been defining technical best practices for VINCI Concessions over a period of 5 years. He acquired his foundation for the understanding of transportation projects while working as a transport consultant for 15 years for key infrastructure projects in America, Africa, Europe, the Middle East, and Asia. He has broad experience in asset management strategies and implementation of excellence in toll road operations to reduce OPEX and CAPEX in the medium to long term for concession projects.



**BARBARA Y. ROBERTS –  
CONDUENT, INC.**

Over 30 years of government IT contracting experience as an inventive and results driven executive credited with developing new market businesses. She was a pioneer in the photo enforcement camera market with the first cameras in New York City and bringing the first US digital cameras to market. Business growth stems from her practical experience that combines the disciplines of Executive Management,

Sales/Marketing, Finance, Operations, Manufacturing, Strategic Planning, and Systems Integration. With her expertise in violations processing across photo camera enforcement, parking operations, and tolling, she's currently an active member of IBTTA's new DEI Committee as well as the Emerging Technologies Committee which is focused on Artificial Intelligence and Machine Learning.



**OLGA GONZALEZ –  
VALERANN**

Olga is Marketing Director for Valerann. She brings over 20 years of global experience in the technology sector, having held a range of senior roles in marketing and strategy with some of the most innovative and leading technology companies, such as arm, Intel, Microsoft, Nokia, SAP, Suse and Canon. In her role, Olga drives Valerann's global marketing function and execution of the company's marketing initiatives.

Olga holds an MSc in Applied Mathematics from University of Saint-Petersburg and an MBA degree from Manchester Business School.



**AI/ML FINANCIAL IMPACTS – SUMMARY OF IDEAS**

#	Name	Summary	Delivery	Complexity	Development	Associate cost	Voting
1	Sean Tihal, Arnim Berger, Richard Jaramillo	Using AI to Identify Commercial Vehicles and Toll Evaders to Improve Revenue Collection and Reduce Leakage	Software functionality	High	12-16 months development; 6 months testing		
2	Sean Tihal	Predictive roadside infrastructure maintenance (can be enhanced by real-time traffic analysis and risk modelling)		Complex	6-12 months development. 6 months testing		
3	Mary Biswell	Predictive & proactive customer relationship management			Short		
4	Mary Biswell	Procurement and contract management			Mid-term		
5	Barbara Roberts	Helping our Customers transact quickly via AI-powered virtual agents and reduce CSR call handle and resolution times			Mid-term		
6	Olga Gonzalez	Operational expenses reduction, incl. preventative maintenance, accidents prevention	A case study / white paper	Low	4-8 weeks		
7	Julio Sesti	ROV identification			6-12 months development; 6 months testing		
8	Julio Sesti	Content personalization			9 months development; 3 months testing		
9	Armin Berger	Customer analytics through tolling apps			6-12 months		

## USING AI TO IDENTIFY COMMERCIAL VEHICLES AND TOLL EVADERS TO IMPROVE REVENUE COLLECTION AND REDUCE LEAKAGE

Sean Tihal – Stantec

Arnim Berger – Atlas Arteria

Richard Jaramillo – Maryland Transportation Authority

### IDEA DESCRIPTION

- Use AI to analyze images of the side of vehicles (captured by side fire cameras) as well as overview images and audit video capture to identify supplemental vehicle identification information (e.g., name/address of trucking company, VIN number, etc.)
- Using AI to reduce leakage by stitching data together to reduce reliance on single data points like transponder read or single LPN photos.
- Utilize AI and ML to identify frequent toll evaders (no transponder and invalid, false or obscured license tags) by identifying and matching features such as dents or stickers, vehicle type, vehicle color, time of day, location.
- Combine pattern identification across toll facilities to establish toll evaders travel routes.
- Provide toll evader pattern to law enforcement with location, vehicle and time details including photos of vehicles and drivers where available.
- Supplemental commercial vehicle information can be used to better identify the registered owner of the commercial vehicle beyond using just the front license plate which has inherent limitations.
- The revenue would be generated to the reduction of leakage as the vehicles/customers are identified at an increased rate.
- Increased enforcement activity will counteract the growing incidence of falsification of license plates leading to mis-identification of vehicles at crime scenes or for fee/toll collection.
- Potential to utilize none toll traffic cameras to trace toll evader vehicles to none highway locations where it may be safer for law enforcement action to occur.
- Working with other agencies to standardize data collection and storage formats and processing should provide enforcement cost benefits.

### TIMEFRAME

- 12-16 months for R&D, 6 months for proof-of-concept testing and evaluation.

## CONSTRAINTS / ROADBLOCKS

- **Technical complexity:** Side fire cameras required, in addition to advanced AI/ML OCR. Also need ability to interface with USDOT/Federal Motor Carrier database.
- **User adoption:** Need to demonstrate value of adding additional equipment and AI/ML technology to identify supplemental commercial vehicle information. Similar technology is in principle available by tolling integrators.
- Installation of more vehicle capture devices on the road would allow AI-software to resolve problematic vehicle identification.
- Constraints could be the integration in the existing tolling system or creating an output from the tolling system that only the vehicles not identified are handed over to the additional AI software to stitch the data together.

- Dependencies on other agencies (i.e., parking/mobility as a service).
- Is the technology there?
- Approvals (state, local, board).

## POTENTIAL REVENUE / BUSINESS CASE

- **Operational Efficiency:** Improve the identification of commercial vehicles and toll evaders, mitigate errors in OCRing the just the license plate, and reduce leakage.
- **Revenue Collection:** Improve collection of revenue from commercial vehicles and toll evaders that toll agencies are unable to identify from the license plate only.
- **Customer Satisfaction:** Provide accurate and timely information on tolls incurred. Reduce errors due to incorrect identification via the license plate.



## AI-BASED PREDICTIVE ROADSIDE MAINTENANCE

Sean Tihal – Stantec

### IDEA DESCRIPTION

- Use AI to analyze data from roadside systems and individual components to identify early degradation in system or individual component performance. Furthermore, use AI to prioritize which locations/components to perform corrective maintenance on by considering inputs such as traffic flow changes.
- AI-generated predictive maintenance alerts would be used to trigger preventive/corrective maintenance work orders for specific components and locations to fix issues before they significantly impact operations, revenue collection, and customer service.

### TIMEFRAME

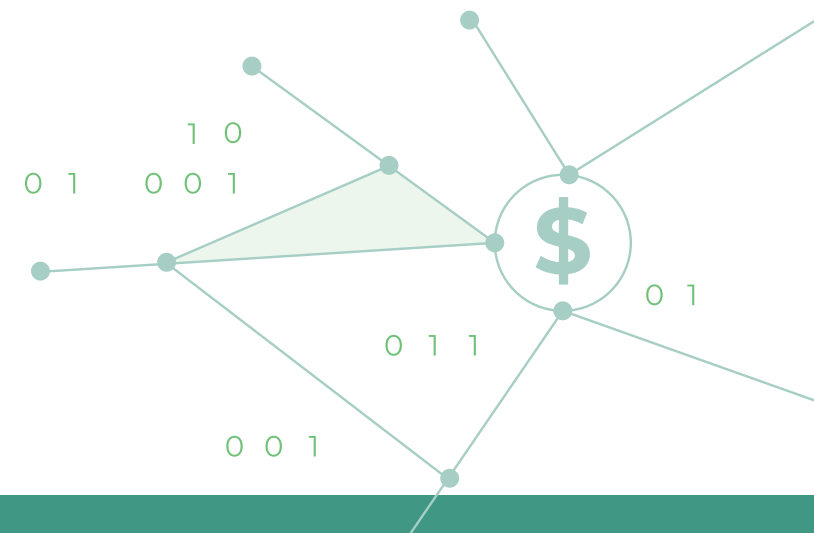
- 6-12 months for R&D, 6 months for proof-of-concept testing and evaluation.

### CONSTRAINTS/ROADBLOCKS

- **Data availability:** Need access to detailed component and system level data.
- **Technical complexity:** Need advanced AI/ML tools to analyze data, establish benchmarks, and identify trends.
- **User adoption:** Need to demonstrate cost-benefit of adding /ML technology to identify early component/system degradation.

### POTENTIAL REVENUE / BUSINESS CASE

- **Operational Efficiency:** Mitigate system outages due to component/system failures due to early identification of issues.
- **Revenue Collection:** Avoid revenue collection loss due to component/system failures.
- **Customer Satisfaction:** Reduce errors due to incorrect system performance due to component/system failures or outages.



## PREDICTIVE, PRO-ACTIVE CUSTOMER RELATIONSHIP MANAGEMENT

Mary Biswell – Oklahoma Turnpike

### IDEA DESCRIPTION

- Utilize AI and ML to provide real-time insights and predict customer behaviors (trips, payments, etc..) to proactively manage the customer instead of reactive management. Allows for 24/7 customer interaction. The Agency anticipates the customer needs.
- Provide relevant customer notification for
  - upcoming charges/replenishments,
  - payment card expiration,
  - expected tolls for the upcoming month based on past months,
  - real-time transponder not reading,
  - out of ordinary transaction notification,
  - and re-route suggestions due to traffic accidents/closures for their commute (not just the turnpike).

- Agency would anticipate more timely payments and issue resolution with more open communication channel.
- Provide additional personalized service to the customer.
- Agency would utilize internal customer data and external traffic data.

### TIMEFRAME

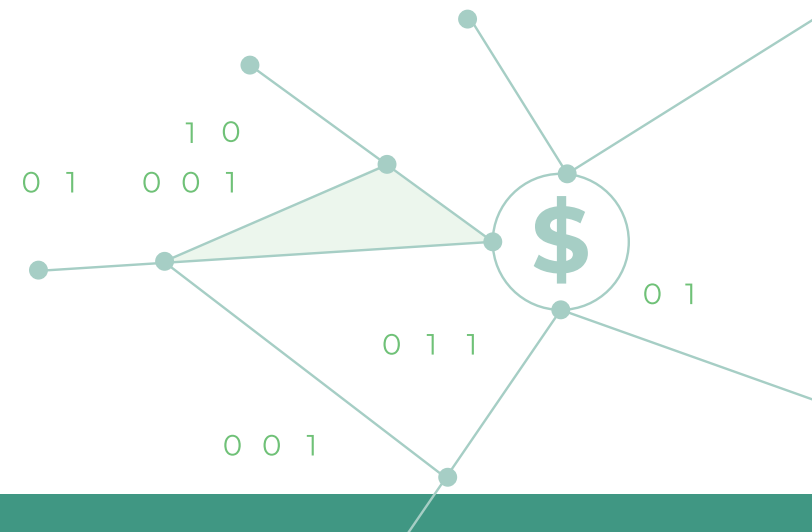
- Short term.

### CONSTRAINTS / ROADBLOCKS

- Incomplete or troublesome to access the data.

### POTENTIAL REVENUE / BUSINESS CASE

- Revenue can be gained through reduced customer service contacts therefore reducing customer service personnel costs.
- Increase revenue with timely identification of leakage and prevent future leakage.



## UTILIZE AI AND ML FOR PROCUREMENT AND CONTRACT MANAGEMENT

Mary Biswell – Oklahoma Turnpike

### IDEA DESCRIPTION

- Utilize procurement data to understand the supply chain data, total cost of ownership, identify patterns within pricing/volume, product assortment and suggest purchasing options.
- Analyze contracts and structure data to identify opportunities and obligations.
- Recommend best practices for procurement and contract management.
- Better forecast of transponder inventory and associated metrics.
- Result in contract consistency across the Agency.
- Would not anticipate creation of new revenue.
- Data could be obtained externally for similar procurement and contracts.

### TIMEFRAME

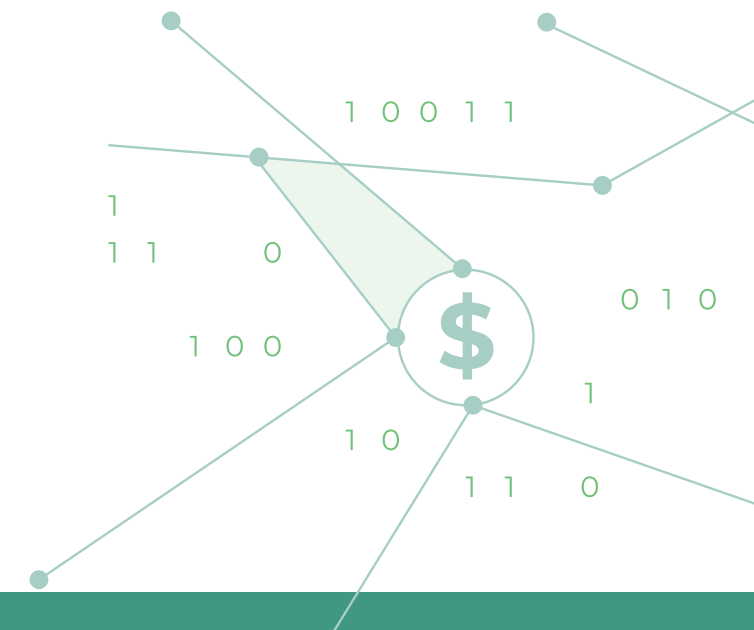
- Medium Term.

### CONSTRAINTS / ROADBLOCKS

- Address Agency legal team concerns.

### POTENTIAL REVENUE / BUSINESS CASE

- Plan and mitigate risks/costs associated with project delays due to supply chain issues.
- Proactive revenue protection by mitigating losses through the effective management of resources.



## HELPING OUR CUSTOMERS TRANSACT QUICKLY VIA AI-POWERED VIRTUAL AGENTS AND REDUCE CSR CALL HANDLE AND RESOLUTION TIMES

Barbara Roberts – Conduent

### IDEA DESCRIPTION

- Tolling call volumes have been increasing with greater AET, administration fees, transponder and violation transactions with routine simple queries still being handled by CSR human agents.
- 55% of customer service teams report an increased customer preference for interacting over digital channels; 45% of customers are more likely to use self-service than before the pandemic.
- Knowledge management systems with AI can streamline workflows and elevate agent productivity.
- Leverage AI chatbots on an Authority's App and/or Website to manage simple queries quickly and AI guided recommendations for optimal action to reduce resolution time.

- AI chatbots would automate the routine simple queries to save money by reducing the number of operational CSR personnel, and reduce call handle times.
- AI chatbots can improve the customer experience for those who are comfortable with self service digital channels; ability to swap over to a CSR if chatbot doesn't resolve the issue.
- AI guided recommendation using a repository of relevant knowledge resources can serve up CSR recommendations for query responses, next action logic, and pointers to historical information necessary for resolution.
- Automating routine payments (e.g. pay a toll) could increase revenues and reduce the time for payments.
- Would it be a one-time revenue stream or reoccurring revenue-Recurring.

- Would agencies do it internally or would it require external participation – depending on the Agency, either internal or external.

### TIMEFRAME

- Timeframe 3-6 months.
- Medium term analysis, long term benefits.

### CONSTRAINTS / ROADBLOCKS

- Need sufficient data to train the AI chatbots and develop AI engines and build repository knowledge resources.
- Need a public education campaign so customers understand the change.
- Is the technology there? Yes, but not used universally in tolling.
- Approvals should remain within Agency control.

**POTENTIAL REVENUE / BUSINESS CASE**

- 10-15% decrease in human CSR routine calls equals \$800K-1.5M savings per year.
- 60-90 second decrease in human CSR call handle times and resolution times equals \$1-2M cost reductions.
- Requires data on number of CSRs, analysis of simple queries that can be automated, analysis of critical information needed for the repository knowledge resource, a flexible system to dynamically populate agent information and next action logic, average call handle times, and a flexible IVR system.

**OPERATIONAL EXPENSES OPTIMISATION – CASE STUDY / WHITE PAPER**

Olga Gonzalez – Valerann

**IDEA DESCRIPTION**

Identify areas where advanced analytics and AI can help with reducing operational expenses through preventative assets maintenance and proactive road management.

- Predictive maintenance – know optimal timing for road resurfacing (lowest traffic levels), prioritize assets maintenance based on predicted traffic flows and weather forecasts.
- Reduce potential congestion through proactive accidents and congestion risk mitigation. Reduce payments for penalty charges (if there are penalty charges for exceeding certain accidents level threshold).
- These are recurring revenue / loss prevention opportunities. Agencies are required to provide operational data.

**TIMEFRAME**

Timeframe anticipated.

- short for mathematical modelling. Once we have data, we can model scenarios.
- short (6 months) for pilot on a road.

**CONSTRAINTS / ROADBLOCKS**

- Dependencies on other agencies – if we get data from a couple of agencies it would be great to compare various operations.
- Is the technology there? Yes data analytics, use of AI for real-time risk analysis and modelling.
- Approvals (state, local, board) – agency level.

**POTENTIAL REVENUE / BUSINESS CASE**

See the Idea description section.



## AI-BASED INVOICE CONTENT PERSONALIZATION

Julio Sesti – PANYNJ

### IDEA DESCRIPTION

- Identify areas where advanced analytics and AI can help with operational expenses reduction or offer additional revenue opportunities.
- The idea is to use AI to generate customized inserts for invoices that are optimized for the recipient based on their demographics and individual analysis. The system would use natural language generation techniques to create relevant and appropriate content for each recipient, such as greetings, reminders, incentives, etc. The system would also use machine learning models to measure and optimize the impact of the content on the probability of payment. The system would provide a personalized and engaging invoice experience for the recipient.

### TIMEFRAME

- 9 months for research and development, 3 months for testing and evaluation.

### CONSTRAINTS / ROADBLOCKS

- Data availability and quality: Not enough or consistent demographic and individual data for each recipient. Need to handle missing, inaccurate, or irrelevant data.
- Data privacy and consent: Ethical and legal issues with using personal and sensitive data. Need to comply with data protection regulations and policies, such as GDPR, CCPA, etc.
- Content generation and optimization: Technical difficulties with generating relevant and appropriate content for each recipient. Need to ensure the quality, accuracy, and consistency of the content. Need to measure and optimize the impact of the content on the probability of payment.

- User adoption and feedback: Different preferences, expectations, and behaviors among recipients when it comes to paying invoices. Need to demonstrate the value and usability of the system. Need to incorporate user feedback and suggestions.

### POTENTIAL REVENUE / BUSINESS CASE

- Payment rate improvement: The system would boost the payment rate with customized inserts that appeal to the recipient. The system would also cut the payment delay with timely and friendly reminders and incentives.
- Customer loyalty enhancement: The system would enhance customer loyalty with a personalized and engaging invoice experience.
- Competitive differentiation: The system could also attract new registered customers by highlighting the system benefits in targeted messages to unregistered customers.

## AI-BASED ROV IDENTIFICATION SYSTEM

Julio Sesti – PANYNJ

### IDEA DESCRIPTION

- Identify areas where advanced analytics and AI can help with operational expenses reduction or offer additional revenue opportunities.
- The idea is to use AI to identify the register owner of a vehicle (ROV) by aggregating and analyzing any existing owner data that can be made available by other agencies. The system would use data fusion, data mining, and anomaly detection techniques to integrate and process data from various sources, such as DMV records, insurance records, car dealers' records, parking services records, etc. The system would also use machine learning models to infer and predict the ROV based on the data analysis and evidence. The system would provide a confidence score and a justification for each ROV identification result.

### TIMEFRAME

- 12 months for research and development, 6 months for testing and evaluation.

### CONSTRAINTS/ROADBLOCKS

- Data availability and quality: Not enough or consistent owner data from different sources. Need to handle missing, inaccurate, or anomalous data.
- Data privacy and security: Legal and ethical issues with using personal and sensitive data. Need to comply with data protection regulations and policies.
- Technical complexity: Advanced AI and machine learning techniques required. Need to ensure reliability, validity, explainability, and transparency of AI system.

- User adoption and feedback: Different levels of familiarity and trust with AI technologies among users. Need to demonstrate value and usability of AI system. Need to incorporate user feedback and suggestions.

### POTENTIAL REVENUE / BUSINESS CASE

- Operational efficiency: Save time and cost of ROV identification. Avoid errors or disputes in ROV identification.
- Customer satisfaction: Provide accurate and timely information on toll charges and payments. Resolve issues or queries related to ROV identification.
- Revenue recovery: Identify ROV of vehicles that evade or avoid toll payments. Enforce toll policies and regulations.

## CUSTOMER DATA ANALYSIS THROUGH AI IN TOLLING APPS

Armin Berger – Atlas Arteria

### IDEA DESCRIPTION

Customer install an app on their phone to pay for their tolls, and the registration includes some customer details when they sign up. The app has location tracking turned on when the customers are travelling. Ideally the app has geofencing on the device that works well enough to be used as the primary device to toll the customer.

Those location pings can be used to better understand which customers are travelling on or off our networks, how frequently, where they live and work, and what type of vehicle they use, etc.

With a big enough sample of users, we can gain some user data that we can generalize across all our customers, and then use those attributes to perform targeted advertising, tariff optimization and other services for the agencies and the customers.

This would be a recurring revenue stream. The agencies would require most likely a software developer to assist them.

### TIMEFRAME

- The timeframe to idea / concept would be 6-12 months.

### CONSTRAINTS / ROADBLOCKS

- The technology in principle is available for collection user data.
- What is missing is the development of a dedicated tolling app / integration in an existing tolling app and to allow the software to gather the user behavior data. Also, an AI-software should analyze the data and make meaningful suggestions to the user and the tolling agency.
- This could be developed also with other tolling agencies, but most likely would require some form of approval from the authorities for the data collection (constraint).

- Also, the data collection should be advantageous for the user so that he / she would allow the data being collected – there should be an advantage for the user. The data privacy requirements / legislation need to be kept in mind.

### POTENTIAL REVENUE / BUSINESS CASE

- The insights into customer behavior / travel patterns can incentivize the agencies to create more tailored tariffs to the benefit of the agency. Additional targeted advertising can generate revenue. The user advantage has to be kept in mind, that the app is used / turned on.

# ROADWAYS

Lead by



**MARGE RANGEL –  
TRANSCORE**

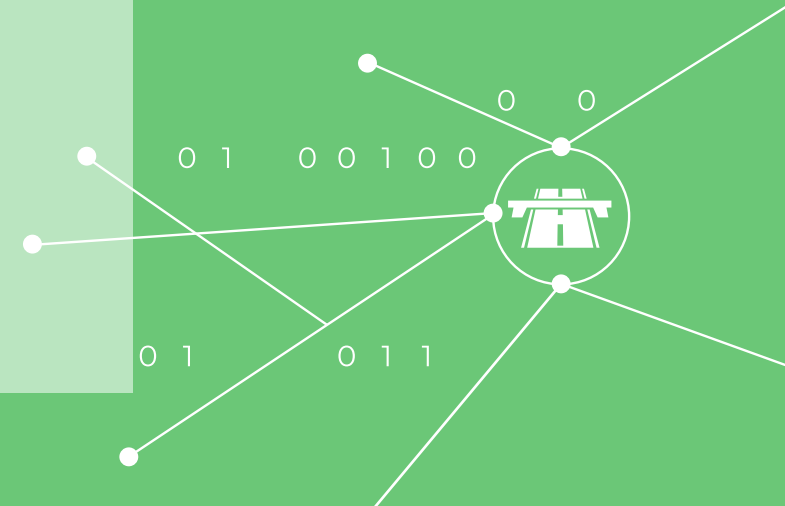
Marge Rangel serves as an Associate Project Manager within the Florida Project Management Team, supporting toll system projects across Florida. With expertise in AET, ORT, Express Lanes, and Conventional toll systems, she is part of the Florida PMO team and oversees the Toll System Implementation

for the Florida Turnpike and Florida Department of Transportation.

In this position Marge is involved in the planning, staging, field installation and maintenance of toll systems throughout the state of Florida. Previously to her role in TransCore, Marge held pivotal roles overseeing financial planning, client relations, and customer services. Her early career featured positions emphasizing project planning, quality control and construction planning.

Beyond her roles, Marge contributes actively to the tolling community, holding leadership positions in WTS

Central Florida and IBTTA Women in Tolling. An Engineer by trade, fluent in English and Spanish, Margelis excels in customer service, problem-solving and team motivation. Today, Marge Rangel continues to shape the tolling industry through expertise, leadership, and commitment to excellence.



## Lead by



**RICHARD JARAMILLO –  
MARYLAND  
TRANSPORTATION  
AUTHORITY**

Richard Jaramillo is currently the Facility Administrator at the Maryland Transportation Authority (MDTA), William Preston Lane Jr. Memorial (Bay) Bridge. Richard joined the MDTA in 2006 as the Assistant Capital Program Manager in the Capital Planning Division. Richard was then promoted to Assistant

Government & Community Relations Manager. Richard was also assigned to oversee the Policies & Procedures section within the Internal Policies & Procedures Division of the MDTA. Richard was promoted to Deputy Facility Administrator at the Bay Bridge in 2012. Richard moved to Utah in 2014 to perform consultant work in the Transportation and Banking & Financial fields. Richard rejoined the MDTA as Facility Administrator of the Bay Bridge in 2016.

Prior to joining the MDTA in 2016, Richard worked in the private sector for the Department of Defense, Zions Bancorporation, and various other companies.

Richard has over 25 years of leadership experience in Transportation; Business and Process Development; Program and Project Management; Information Technology; Legislative and Political Affairs; Organizational Development and structure; Human Resources; Emergency Management; Telehealth Information and Technology; and Policies and Procedures.

Richard has a degree in Information Systems and holds a variety of technical and professional certifications.

Richard also served as an elected official when he was elected as City Councilor and Mayor. Richard has been on and served as President of various organizations and

groups including Boys and Girls Clubs of America, NM Economic Development, Hispanic Chamber of Commerce, and Chamber of Commerce.

Richard is recognized as a builder, innovator and a leader who gets things done, tackling the most challenging issues in both the public and private sector with a commitment to empowering people to successfully resolve operational, analytical, and transformational challenges. Richard focuses on developing strong relationships and believes this is to be the foundation of everything he does, both professionally and personally.



**RYAN RAYA – FAGAN CONSULTING**

Ryan joined Fagan Consulting in 2022 as an experienced toll systems and operations program manager with a wealth of management experience outside of tolling. Ryan provided oversight of projects, including Back Office System implementations and Intelligent Roadside Systems at the SH130, LBJ, and NTE toll roads, the key of which was the integration of HOV Mobile applications into the BOS. Ryan understands how to work with tolling agencies on all aspects

of ETC Systems, including procurement, design, development, testing, change order scope / management, and contract negotiations. Finally, Ryan can rely on outside experience in MEP projects, vendor management, implementation, and commissioning.



**KEITH P MEEHAN – MICHAEL BAKER'S TOLLING SERVICES**

Keith Meehan is a licensed Professional Engineer and Technical Manager within Michael Baker's Tolling Services division specializing in traffic engineering and operations. In his current role, he sits on-site at the PA Turnpike through the General Consulting Engineering agreement supporting a wide range of initiatives across the various departments of the tolling agency. A graduate of the Pennsylvania State University in 2011, Keith has extensive

experience within the traffic and how a transportation agency operates.



**SHAYAN NASSIRI – NORTH TEXAS TOLLWAY AUTHORITY**

Shayan Nassiri is a skilled Business Analyst at the North Texas Tollway Authority (NTTA), specializing in data-driven insights to optimize organizational performance. With expertise in market analysis and strategic planning, Shayan helps drive innovation and efficiency within NTTA.

The North Texas Tollway Authority (NTTA) is a leading transportation agency committed to enhancing mobility in North Texas. NTTA operates a network of toll roads, bridges, and tunnels,

employing innovative solutions to provide safe and efficient travel options. Through collaboration and innovation, NTTA continues to drive economic growth and improve the region's quality of life.

**AI ROADWAY INCIDENT/WORK ZONE DETECTION SYSTEM**

Shayan Nassiri – North Texas Tollway Authority

**IDEA DESCRIPTION**

- Dashboard cameras placed on maintenance vehicles.
- AI software would scan the live feed and identify any incidents or work zones.
- Customers would pay and initial installation fee and a recurring monthly subscription for software support.
- Agencies would need to contract a vendor for these services.

**TIMEFRAME**

- As vendors for this technology and after the POC process, I believe implementation would take several months.

**CONSTRAINTS/ROADBLOCKS**

- No regulatory constraints to my knowledge.
- Budget Constraints.

**POTENTIAL REVENUE / BUSINESS CASE**

- Rapid detection of incidents / workzones could provide cost savings.

## LEVERING AI FOR PREDICTIVE MAINTENANCE OPERATION AND BUDGET ALLOCATION

Ryan Raya – Faga Consulting

### IDEA CONCEPT

- Prioritize Maintenance Needs.
- Technology Integration.
- Asset Management Systems.
- Emergency Response Plans.
- Budget Planning and Allocation.

### CONSTRAINTS / ROADBLOCKS

- Dependencies on other agencies (i.e., parking / mobility as a service).
- Is the technology there?
- Approvals (state, local, board).
- This will require formal procurement, so coordination of procurement, operations, and maintenance departments often limits efficiency and introduces scope creep.
- Any road done in a PPP may require approvals from the government agency if the contractual deliverable of road operations is impacted.

- Any savings or impact to jobs may be complicated by union labor as OT likely would be reduced.
- Any changes in workload, job requirements, or staff reductions/ additions will need to be managed internally regardless of union status.
- AI is a new solution with limited deployment in toll road industry, it may fail or be perceived as a failure, and if so may prevent future innovations so care in vendor selection and requirement development is paramount.
- Changes in organizational appetite with turnover in leadership could derail project.
- New approach does not have an established cost/ benefit model, so assumptions could be off.

### TIMEFRAME

- This is a medium term, likely 2-3 year effort.
- Getting buy-in and support from teams and management will be required for a new predictive maintenance system, especially since it may impact job requirement, this process along with requirement gathering will take at least 3-4 months.
- Time for procurement, approx. 1 year, to procure a Technology solution by which MOMS or any other Asset Management system can also be integrated with BOS data to elicit AI basis for maintenance recommendations.
- Integration and testing may take 6-12 months depending on the customizations needed to pull BOS data alongside MOMS data and determine useful dashboards and associated automatic triggers.



- Any additional equipment needed for traffic monitoring, wrong way detection, unusual flows, degraded roadway, or modernization of equipment could be procured along the same time frame as the software.

#### IDEA DESCRIPTION

- The concept is to integrate AI's ability to trend and make predictive recommendations into daily maintenance operations.
- Typical MOMS and associated ERPs are reactive, this solution would make recommendations for replacing equipment before it is an emergency, suggest safest times to perform maintenance, and notify operations teams in real early stages of trouble using data that may indicate accidents are likely to happen, traffic is about to back up, or any other abnormality that requires advanced prevention or mitigation measures.

- AI likely will make the job of technicians safer, allow work to be done in predictable (non- overtime) schedules, and provide for maximum revenue collection on roadway with advanced equipment mitigation beyond the mean time to failure recommendations of the manufacturer (including perhaps getting more life out of equipment and reduction of O&M costs).
- Additional revenue may only be realized in downtime avoidance, this is mainly a concept to save costs on labor, replacement parts, and improve safety.
- This concept would deliver on-going benefits until the software is obsolete or integrated systems change out.
- The benefit would increase over time with AI learning.
- The concept will require external partners as it is a fairly complex technology integration that would be unique in the industry.

#### POTENTIAL REVENUE / BUSINESS CASE

- Elimination of tolling system equipment downtime, 1-2% revenue increase.
- Reduction of Overtime costs using predictive maintenance driven by AI, 3-5% cost reduction.
- Staff reductions or elimination need to hire additional resources and still get maintenance done in scheduled work week, 3-5% cost reduction.
- Potential greater lifespan of equipment, 1-2% cost reduction.
- Better customer service and staff morale will less injuries and more free flow traffic, non-measurable.
- Overall positive benefit of project 8% to 14%.
- Go-no go decision likely based on today's traffic and revenue volumes as procurement, integration, and go-live will be costly.

# TRAFFIC

## Lead by



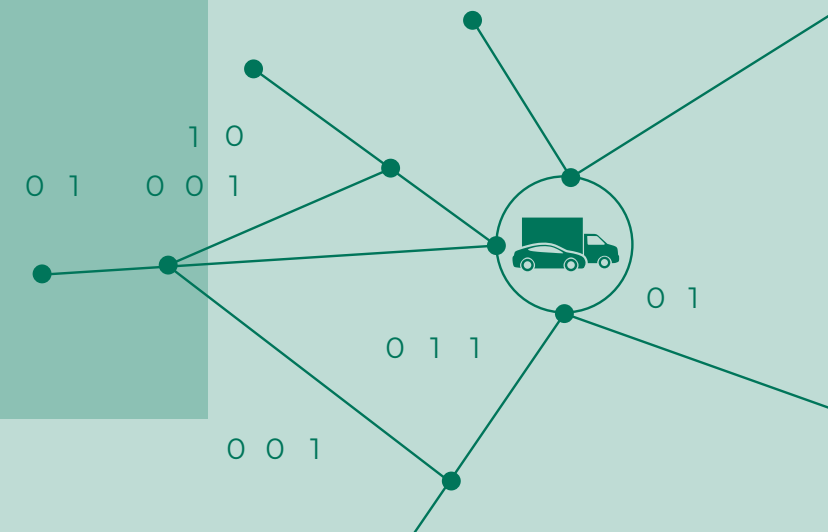
### SAÏD MAJDI – EMOVIS

Saïd Majdi has more than 30 years of experience in the control and management of ITS and ETC programs. In the last eight years he has focused on advising clients on the development of business and technology strategy. He had a primary role in the delivery of New York City's MTA B&T E-ZPass® toll program, Florida's Turnpike SunPass® toll

program, Orlando's OOCEA express toll lane program, and the world's first reversible ORT bridge in Tampa, Florida. This project earned several awards including the 2007 IBTTA President's Award, as well as the 2007 Chairman's Award from TeamFL for the Transportation Innovation Project of the year. He also had a primary role in the delivery of Florida's first HOT lanes on I-95 between Miami-Dade and Broward counties. This project earned the 2009 AASHTO People's Choice Award. He wrote the specification of technology acquisition for the I-80 Eastbound Cordelia Weigh Station in California; ITS America recognized this project with its 2014 Best of

ITS Award in the category of best new innovative product, service or application.

Previously, Saïd played an active role in the standardization of DSRC and RFID equipment at the national and international levels. He was Project Editor of ISO 18000-6, which yielded the current 6C standard.



Lead by



**TUSHAR PATEL – AECOM**

Tushar Patel is a senior project manager and Associate Vice President with AECOM. Tushar has over 30 years of experience in toll road traffic and revenue analysis, transportation planning, and traffic engineering studies. His recent assignment included weekly monitoring of traffic and transit ridership recovery from COVID using Big Data and automation of data visualization using python scripts and Power

BI dashboards. Tushar has a master's degree in civil engineering from the New Jersey Institute of Technology and is a professional engineer in several states.



**DR. ROBERT EDELSTEIN – AECOM**

Dr. Robert Edelstein is a Senior Vice President of AECOM serving as the firm's Practice Leader for Intelligent Transportation Systems. His experience includes projects in over 20 states within the US as well as several countries abroad. His expertise is in the planning, design, and operations of transportation management systems. He has earned a PhD in Transportation Planning & Engineering from the Polytechnic Institute of

New York, is a professional engineer licensed in several states and a Professional Traffic Operations Engineer.

## **NEAR REAL-TIME PREDICTIVE TRAFFIC ANALYSIS**

### **IDEA DESCRIPTION**

Utilizing AI to predict traffic within the next 30-60 minutes and optimize available roadway capacity for smoother flow.

This workstream focuses on developing AI models that predict traffic patterns based on historical and real-time data. By analyzing traffic flow trends, the goal is to dynamically manage available roadway capacity to ensure smoother traffic flow and reduce congestion.

### **TIMEFRAME**

12 months.

### **CONSTRAINTS**

Availability of accurate and up-to-date traffic and network data for model training.

### **BUSINESS CASE**

Improved traffic flow leads to enhanced user experience, reduced travel times, and increased throughput for express lanes, making the toll road system more attractive to users.

### **POTENTIAL REVENUE**

Improved traffic flow and reduced congestion can attract more users, potentially increasing toll revenue.

## **ADAPTIVE SPEED AND LANE MANAGEMENT**

### **IDEA DESCRIPTION**

Implementing AI-driven adaptive speed limits and optimizing traffic flow, capacity, and safety.

This workstream focuses on leveraging AI to dynamically adjust speed limits and optimize lane assignments based on real-time traffic conditions. By ensuring vehicles maintain optimal speeds, traffic flow and safety can be improved.

### **TIMEFRAME**

10 months.

### **CONSTRAINTS**

Integration of AI algorithms with existing traffic management systems.

### **BUSINESS CASE**

Improved traffic flow leads to reduced congestion, minimized crashes, and enhanced safety for users, resulting in increased reliability, user satisfaction and loyalty.

### **POTENTIAL REVENUE**

Enhanced safety and efficiency can lead to a potential increase in toll road usage, generating additional revenue.

## CONGESTION PREDICTION AND TOLL PRICING

### IDEA DESCRIPTION

Predicting and managing congestion points using AI algorithms and dynamic toll pricing.

This workstream aims to predict congestion points using AI models that analyze historical and real-time data. By dynamically adjusting toll pricing based on congestion levels, traffic distribution can be optimized for smoother flow.

### TIMEFRAME

8 months.

### CONSTRAINTS

Implementation of dynamic toll pricing mechanisms within existing toll systems.

### BUSINESS CASE

Efficient congestion management and optimized toll pricing encourage users to opt for express lanes, enhancing travel time reliability, revenue, and user satisfaction.

### POTENTIAL REVENUE

Improved toll revenue.

## INCIDENT DETECTION AND RESPONSE

### IDEA DESCRIPTION

Swiftly detecting and responding to incidents using AI-powered systems.

This workstream focuses on developing AI algorithms to detect incidents in real-time and notify emergency services and users promptly. By providing alternative routes and timely notifications, traffic disruptions and secondary crashes can be minimized.

### TIMEFRAME

9 months.

### CONSTRAINTS

Integration of AI incident detection with incident response protocols.

### BUSINESS CASE

Swift incident response reduces traffic disruptions, enhances safety, and improves user satisfaction.

### POTENTIAL REVENUE

Improved reputation and user trust can lead to increased usage of the toll road system.

## **WEATHER-DRIVEN TRAFFIC MANAGEMENT**

### **IDEA DESCRIPTION**

Utilizing AI to analyze weather data and optimize traffic and response management during adverse conditions.

This workstream aims to use AI to analyze weather data and predict its impact on traffic flow. By adjusting speed limits, lane assignments, and messaging during adverse weather, safety can be improved and traffic disruptions minimized. In addition, AI can be used for prioritizing snowplow operations, where applicable.

### **TIMEFRAME**

7 months.

### **CONSTRAINTS**

Availability of accurate and timely weather data for analysis.

### **BUSINESS CASE**

Enhanced safety during adverse weather conditions improves user satisfaction and encourages usage of the toll road system.

### **POTENTIAL REVENUE**

Improved safety and reliability can lead to increased user loyalty and usage.

## **EVENT AND HOLIDAY TRAFFIC OPTIMIZATION**

### **IDEA DESCRIPTION**

Predicting and managing traffic fluctuations during special events and holidays.

This workstream focuses on predicting increased traffic demand and congestion points during special events and holidays using AI models. By optimizing lane usage and toll pricing, the goal is to accommodate traffic fluctuations and enhance user experiences.

### **TIMEFRAME**

6 months

### **CONSTRAINTS**

Availability of accurate historical event and holiday traffic data.

### **BUSINESS CASE**

Efficiently managing event-related traffic ensures smooth flow, reduces congestion, and improves user satisfaction.

### **POTENTIAL REVENUE**

Enhanced user satisfaction can lead to increased toll road usage and revenue.

## CONSTRUCTION AND WORK ZONE MANAGEMENT

### IDEA DESCRIPTION

Mitigating traffic disruptions and improving safety during construction and maintenance using AI.

This workstream aims to use AI algorithms to predict and manage traffic disruptions and near-miss crash potential caused by construction. By optimizing lane assignments and suggesting alternative routes, traffic flow can be maintained during roadwork.

### TIMEFRAME

8 months.

### CONSTRAINTS

Effective coordination with construction teams and availability of real-time construction data.

### BUSINESS CASE

Minimizing disruptions during construction enhances user satisfaction and reduces negative impacts on traffic flow and safety.

### POTENTIAL REVENUE

Improved user experience can lead to increased usage of the toll road system.

## DRIVER BEHAVIOR ANALYSIS AND INTERVENTION

### IDEA DESCRIPTION

Analyzing driver behavior using AI to predict and address potential disruptions and near-miss crash potential.

This workstream focuses on collecting and analyzing driver behavior data using AI models. By identifying distracted or aggressive driving patterns, real-time warnings can be implemented to mitigate unsafe behavior and enhance traffic flow.

### TIMEFRAME

7 months

### CONSTRAINTS

Availability of accurate driver behavior data from sensors and cameras.

### BUSINESS CASE

Improved driver behavior leads to safer roads, reduced crashes, and smoother traffic flow, enhancing user satisfaction.

### POTENTIAL REVENUE

Reduced crashes and enhanced safety can attract more users and improve the reputation of the toll road system.

## DEMAND FLUCTUATION MANAGEMENT

### IDEA DESCRIPTION

Predicting and managing varying traffic demand using AI-driven strategies.

This workstream aims to predict peak and off-peak traffic periods using AI models. By dynamically adjusting lane assignments and toll pricing, traffic levels can be managed effectively during varying demand.

### TIMEFRAME

5 months.

### CONSTRAINTS

Availability of historical traffic demand data and integration with toll pricing systems.

### BUSINESS CASE

Efficient demand management enhances traffic flow, reduces congestion, and improves user experience.

### POTENTIAL REVENUE

Improved user satisfaction can lead to increased usage and revenue.

## ROADWAY DESIGN OPTIMIZATION

### IDEA DESCRIPTION

Using AI simulations to optimize roadway design for efficient traffic flow.

This workstream focuses on utilizing AI simulations to assess and optimize roadway design. By analyzing traffic flow scenarios, road configurations can be refined for smoother traffic movement.

### TIMEFRAME

7 months

### CONSTRAINTS

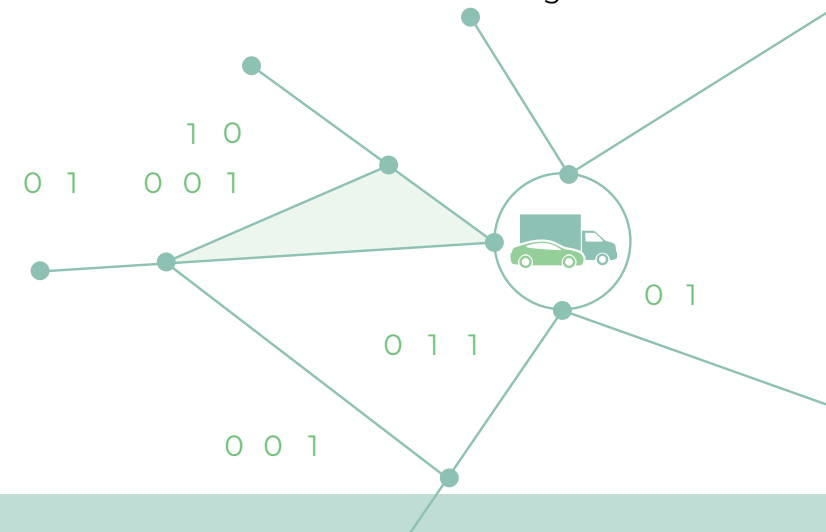
Collaboration with engineering teams for implementation of optimized designs.

### BUSINESS CASE

Optimized roadway design improves traffic flow, safety, and user satisfaction.

### POTENTIAL REVENUE

Enhanced road design can attract more users and increase toll road usage.





## EMERGENCY AND DYNAMIC EVENT RESPONSE

### IDEA DESCRIPTION

Developing AI-powered emergency response systems for efficient traffic management.

This workstream aims to develop AI algorithms for real-time emergency detection and response. By providing alternative routes and timely notifications during emergencies, traffic disruptions can be minimized.

### TIMEFRAME

6 months.

### CONSTRAINTS

Integration with emergency response protocols and systems. Coordination with other local and state agencies on detours and signal systems.

### BUSINESS CASE

Efficient emergency response reduces traffic disruptions, enhances safety, and improves user satisfaction.

### POTENTIAL REVENUE

Improved reputation and user trust can lead to increased usage of the toll road system.

## TMC OPERATIONS

### IDEA DESCRIPTION

Apply AI in developing TMC Operations Decision Support Systems.

This workstream aims to apply AI in developing Decision Support Systems for core TMC staff to use during their day-to-day operations. These “Human-in-the-Loop” tools will align with specific use cases such as active traffic management, integrated corridor management, managed lanes, work zone management, traffic incident management, road weather management, freight management, and others.

### TIMEFRAME

12 months.

### CONSTRAINTS

Data availability to support selected use cases.

### BUSINESS CASE

Delivers the right information, to the right people, at the right time to make the right actionable decisions.

### POTENTIAL REVENUE

Improved performance is anticipated to result in increased toll road usage and revenue.

## TRAFFIC AND REVENUE STUDIES

### IDEA DESCRIPTION

Apply AI to improve the reliability of Traffic and Revenue Studies.

This workstream aims to apply AI algorithms to improve the reliability of Traffic and Revenue Studies by comparing actual versus forecasted traffic volumes, then retraining (or recalibrating) the model to make it more accurate.

### TIMEFRAME

8 months.

### CONSTRAINTS

Availability of appropriate AI tools for this specific purpose. Most agencies do not have “before-after” data and forecasting models used by traffic consultants vary in complexity.

### BUSINESS CASE

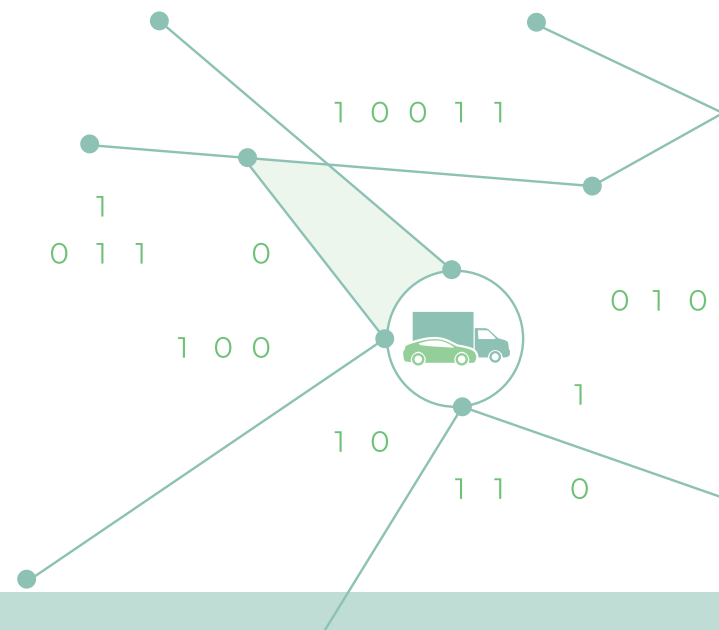
More accurate and reliable traffic and revenue forecasts will enable the Toll Road Authorities to better manage their work programs and budgets.

### POTENTIAL REVENUE

More accurate and reliable traffic and revenue forecasts will enable Toll Road Authorities to better prioritize projects and expenditures based on their ability to cover capital and O&M costs.

This Work Program outlines the goals, tasks, timeline, constraints, business case, and potential revenue for each workstream.

By leveraging AI technologies, the TFM SWG aims to enhance traffic flow, safety, reliability, mobility, and user experience. The successful execution of these workstreams is expected to lead to increased usage of toll facilities, improved user satisfaction, and enhanced revenue generation.



# CYBERSECURITY

Lead by



**SUSAN MOWERS –  
THOUSAND ISLANDS  
BRIDGE AUTHORITY**

Susan Mowers is the Manager of Information Technology for the Thousand Islands Bridge Authority. With over 30 years of experience in the Information Technology (IT) industry, Susan is an accomplished professional with a wealth of knowledge and expertise. Throughout her extensive career,

Susan has held various roles within the IT sector, honing her skills in network administration, systems integration, cybersecurity, and project management.

Susan is a past graduate of the IBTTA Leadership Academy Class of 2020, a participant of the Agency Technology Leaders Forum, a 2024 Graduate of the Professional Development Enterprise Cybersecurity Leadership Academy, a member of Multi-State Information Sharing and Analysis Center (MS-ISAC), the Center for Internet Security (CIS) and a member of the InfraGard Northeast Chapter.



**MARIO TOSCANO –  
DRIVE ENGINEERING**

Mario is the President and Lead ITS/System Engineer at Drive Engineering. He has more than 20 years of experience in Intelligent Transportation Systems, Tolling, Systems Engineering, and Traffic Engineering ranging from preliminary studies to final design and construction services. He holds a PE license in 30 states and is a certified Professional Traffic Operations Engineer

(PTOE) and Connected Vehicle Professional. Mario is currently 1 of approximately 20 representatives from North America serving on the ITS World Congress International Planning Committee. He is currently a member of the IBTTA International Committee and a past graduate of the IBTTA Leadership Academy, Class of 2020.



**ROBERT (BOB) D LAGATTA,  
P.E. – ATKINSRÉALIS**

Robert (Bob) LaGatta, PE, is a seasoned electrical engineer and project director at AtkinsRéalis, National Tolls Group, with over 44 years of experience in engineering and project management. A graduate of Carnegie Mellon University with a strong computer science background, Bob has been at the forefront of innovation in tolling systems, ITS, and data analytics for the past 19 years. His extensive experience spans over 65

tolling projects across the United States and Canada. As a licensed engineer in 19 states, Bob has served as the engineer of record on IT, ITS, tolling systems, lighting protection, and electric infrastructure designs.

Bob's expertise in data analytics, leveraging tools such as Python, SciPy, Pandas, Selenium, Scikit-learn, PyTorch, OpenCV, Alteryx, PowerBI, and others, has been instrumental in streamlining project workflows and leveraging new technologies to solve problems efficiently. In his current role, Bob applies his knowledge of data analysis, machine learning (ML), and artificial intelligence (AI) to drive advancements in tolling projects. As a thought leader in his field, Bob actively contributes to the industry

by serving on the AI/ML and Data Committees for the International Bridge, Tunnel, and Turnpike Association (IBTTA), sharing his insights and shaping the future of tolling technology.

Bob's ability to combine his extensive application engineering experience with a keen understanding of emerging technologies has positioned him as a pioneer in driving the tolling industry thinking. His innovative approach and commitment to attaining actionable data by leveraging data-driven solutions continue to identify new standards for efficiency and effectiveness in tolling.



## AI-DRIVEN NETWORK INTRUSION DETECTION AND PREVENTION

### IDEA DESCRIPTION

Implement an AI-powered network intrusion detection and prevention system (IDPS) to monitor and protect the tolling agency's network infrastructure from potential cyber threats in real time.

Implementing an AI-driven network intrusion detection and prevention system, tolling agencies can significantly enhance their cybersecurity posture, ensuring the confidentiality, integrity, and availability of critical network assets and sensitive customer data. This proactive approach to network security will help agencies stay one step ahead of cybercriminals, maintain customer confidence, and safeguard their revenue streams in an increasingly complex and evolving threat landscape.

- Utilize machine learning algorithms to:
  - Analyze network traffic patterns and identify anomalies indicating unauthorized access attempts, malware infections, or other malicious activities.

- Continuously learn and adapt to new and evolving cybersecurity threats, improving detection accuracy over time.
- Automatically respond to detected threats by blocking suspicious traffic, quarantining infected devices, or alerting security personnel for further investigation.
- Integrate the AI-driven Intrusion Detection Prevention System (IDPS) with existing security information and event management (SIEM) systems, firewalls, and other security tools to provide a comprehensive and coordinated defense against cyber threats.
- Generate detailed reports and dashboards to provide visibility into network security events, threat trends, and the effectiveness of the AI-driven IDPS.

### BENEFITS

- Enhance the tolling agency's ability to detect and prevent sophisticated cyberattacks that may evade traditional rule-based security systems.
- Reduce the time and effort required for manual threat hunting and investigation, allowing security teams to focus on high-priority incidents and strategic initiatives.
- Minimize the potential impact of security breaches by enabling rapid threat detection and automated response capabilities.
- Improve compliance with industry security standards and regulations by demonstrating a proactive approach to network security monitoring and threat mitigation.
- Stay ahead of the ever-evolving cybersecurity landscape by leveraging the power of AI and machine learning to adapt to new threats and attack vectors.

### TIMEFRAME

- 12-18 months for initial system deployment, including data integration, algorithm training, and testing.
- Ongoing updates, fine-tuning, and expansion of the AI-driven IDPS capabilities to address emerging threats and incorporate new data sources.

### CONSTRAINTS/ROADBLOCKS

- Ensuring the availability and quality of network traffic data required for effective AI-driven threat detection and analysis.
- Integrating the AI-driven IDPS with existing security tools and processes while minimizing disruption to network operations.
- Address potential false positives and ensure the accuracy of threat detection to avoid unnecessary blocking of legitimate network traffic.

- Securing the necessary budget and resources to implement and maintain an advanced AI-driven network security solution.

### POTENTIAL REVENUE/BUSINESS CASE

- Reduce financial losses associated with cyber-attacks, data breaches, and system downtime.
- Avoid potential legal and regulatory fines by demonstrating a commitment to network security and data protection.
- Protect the tolling agency's reputation and customer trust by proactively preventing and mitigating cyber threats.



## AI-BASED VULNERABILITY ASSESSMENT AND PATCH MANAGEMENT

### IDEA DESCRIPTION

Employ AI techniques to continuously scan and assess the tolling system's infrastructure, applications, and connected devices for potential vulnerabilities. Leveraging AI and machine learning for vulnerability assessment and patch management, tolling agencies can significantly enhance their cybersecurity resilience, proactively mitigate risks, and safeguard critical assets and customer data. This data-driven approach to vulnerability management will enable agencies to stay ahead of the constantly evolving threat landscape, ensure the continuity of tolling operations, and maintain the trust of their customers and stakeholders.

- Utilize machine learning algorithms to:
  - Identify and prioritize vulnerabilities based on their criticality, potential impact, and likelihood of exploitation.
  - Correlate vulnerability data from multiple sources, including public databases, vendor advisories, and

internal security assessments, to provide a comprehensive view of the system's security posture.

- Recommend the most effective patches and mitigation strategies for identified vulnerabilities, considering compatibility, performance impact, and deployment complexity.
- Scan sites that alert for vulnerabilities in many off-the-shelf programs to alert them of a vulnerability in other industries.
- Automate the patch management process, including the scheduling and deployment of security updates across the tolling system's diverse set of assets and devices.
- Integrate the AI-based vulnerability assessment and patch management system with existing IT service management (ITSM) and configuration management database (CMDB) tools to ensure a seamless and efficient remediation workflow.

- Generate risk-based reports and dashboards to provide real-time visibility into the tolling system's vulnerability landscape and remediation progress.

### BENEFITS

- Proactively identify and address vulnerabilities before they can be exploited by cyber attackers, reducing the risk of data breaches and system compromises.
- Streamline the vulnerability management process by automating the discovery, prioritization, and remediation of security weaknesses across the tolling system's complex IT environment.
- Ensure timely and effective patch deployment, minimizing the window of opportunity for attackers to exploit known vulnerabilities.

- Improve the efficiency and accuracy of vulnerability management efforts, allowing security teams to focus on strategic initiatives and high-impact remediation activities.
- Enhance compliance with industry security standards and best practices by demonstrating a proactive and data-driven approach to vulnerability management.

#### **TIMEFRAME**

- 9-12 months for initial system implementation, including vulnerability scanner integration, algorithm training, and process automation.
- Ongoing updates and refinements to the AI-based vulnerability assessment and patch management system to incorporate new data sources, adapt to evolving threats and optimize remediation workflows.

#### **CONSTRAINTS/ROADBLOCKS**

- Ensuring the compatibility and interoperability of the AI-based vulnerability management system with existing security tools, scanners, and patch management solutions.
- Managing the potential impact of patch deployment on system availability, performance, and functionality, especially for critical tolling applications and infrastructure components.
- Addressing the challenge of prioritizing and remediating vulnerabilities across a large and diverse set of assets and devices with varying levels of criticality and risk exposure.
- Securing the necessary skillsets and resources to implement, configure, and maintain an advanced AI-based vulnerability management system.

#### **POTENTIAL REVENUE/BUSINESS CASE**

- Reduce the financial impact of security incidents and data breaches by proactively identifying and remediating vulnerabilities that attackers could exploit.
- Avoid potential legal and regulatory penalties by demonstrating a robust and effective vulnerability management program.
- Minimize system downtime and service disruptions caused by successful cyber-attacks, ensuring the continuity of tolling operations and revenue collection.
- Strengthen customer trust and loyalty by showcasing the agency's commitment to protecting sensitive customer data and maintaining a secure tolling environment.



## AI-ENHANCED USER AND ENTITY BEHAVIOR ANALYTICS (UEBA)

### IDEA DESCRIPTION

Implement an AI-powered User and Entity Behavior Analytics (UEBA) system to monitor and analyze user and entity behavior within the tolling system's network and applications. With an AI-enhanced User and Entity Behavior Analytics system, tolling agencies can significantly strengthen their insider threat detection capabilities, protect sensitive data, and ensure the integrity of user activities within their IT environment. This proactive approach to user and entity behavior monitoring will help agencies stay ahead of evolving security risks, maintain customer confidence, and safeguard their critical assets and revenue streams in an increasingly complex and dynamic threat landscape.

- Utilize machine learning algorithms to:
  - Establish baseline behavior profiles for users, devices, and other entities based on historical data and typical usage patterns.
  - To identify deviations from the established baselines, monitor user and entity activities, including login attempts, resource access, and transaction patterns.
  - Detect and alert on anomalous behavior that may indicate compromised accounts, insider threats, or malicious activities, such as unauthorized access attempts, data exfiltration, or privilege escalation.
- Integrate the AI-enhanced UEBA system with existing security information and event management (SIEM) and identity and access management (IAM) solutions to comprehensively view user and entity behavior across the tolling system's IT environment.
- Generate risk scores and prioritized alerts based on detected anomalies' severity and potential impact, enabling security teams to focus on the most critical incidents and take timely remedial actions.
- Provide intuitive dashboards and reporting capabilities to visualize user and entity behavior trends, track security incidents, and support compliance reporting requirements.

### BENEFITS

- Enhance the tolling agency's ability to detect and respond to insider threats, compromised accounts, and other user-based security risks that may evade traditional security controls.
- Reduce the time and effort required to investigate user and entity behavior anomalies manually, enabling security teams to focus on high-priority incidents and proactive threat hunting.
- Improve the accuracy and efficiency of incident response by providing contextual insights into user and entity behavior, facilitating faster containment and remediation of security breaches.

- Strengthen compliance with industry security standards and data protection regulations by proactively monitoring and securing user activities and access to sensitive data.
- Enable data-driven decision-making for access control policies, user training programs, and other security initiatives based on user and entity behavior analysis insights.

#### **TIMEFRAME**

- 12-18 months for initial system deployment, including data integration, machine learning model training, and tuning.
- Ongoing updates and refinements to the AI-enhanced UEBA system to adapt to evolving user behavior patterns, incorporate new data sources and address emerging security threats.

#### **CONSTRAINTS/ROADBLOCKS**

- Ensuring the availability and quality of user and entity activity data from various sources, such as network logs, application logs, and security event feeds, to enable accurate behavior analysis.
- Address potential privacy concerns and ensure compliance with data protection regulations when collecting and analyzing user behavior data.
- Managing the complexity of integrating the AI-enhanced UEBA system with existing security tools and processes while minimizing disruption to user productivity and system performance.
- Securing the necessary budget, skillsets, and resources to implement and maintain an advanced AI- powered UEBA solution.

#### **POTENTIAL REVENUE/BUSINESS CASE**

- Reduce the financial impact of insider threats and data breaches by proactively detecting and mitigating user-based security risks.
- Avoid potential legal and regulatory fines associated with unauthorized access to sensitive customer data or failure to detect and respond to security incidents.
- Protect the tolling agency's reputation and customer trust by committing to securing user activities and preventing insider threats.
- Optimize security operations and reduce costs by automating the detection and triage of user and entity behavior anomalies, enabling security teams to focus on high-value tasks and strategic initiatives.

## AI-POWERED SECURITY AWARENESS AND TRAINING

### IDEA DESCRIPTION

Develop an AI-driven security awareness and training program that adapts to individual employee roles, responsibilities, and risk profiles within the tolling agency. With an AI-powered security awareness and training program, tolling agencies can effectively address the human element of cybersecurity, which is often considered the weakest link in an organization's defense against cyber threats. This innovative approach to employee education and engagement will help agencies cultivate a strong cybersecurity culture, reduce the risk of human error, and safeguard their critical assets and customer data in an evolving threat landscape. By investing in the continuous development of their employees' cybersecurity knowledge and skills, agencies can build a resilient and security-conscious workforce that serves as the first line of defense against potential security breaches.

- Utilize machine learning algorithms to:
  - Assess employee knowledge gaps and vulnerabilities based on job functions, access privileges, and historical security behavior.
  - Tailor training content and delivery methods to individual learning styles, preferences, and schedules, ensuring maximum engagement and retention.
  - Simulate real-world phishing attacks, social engineering attempts, and other security threats to test employee readiness and identify areas for improvement.
- Gamify the security awareness and training experience using AI-powered challenges, rewards, and leaderboards to incentivize employee participation and foster a culture of friendly competition.
- Leverage natural language processing (NLP) and chatbot technologies to provide employees with on-demand, interactive support, and guidance on security best practices, policies, and procedures.
- Monitor and analyze employee performance data to measure the effectiveness of the AI-powered security awareness and training program, identify trends, and continuously improve content and delivery.
- Integrate the AI-powered training system with the agency's learning management system (LMS) and human resources (HR) platforms to streamline training administration, tracking, and compliance reporting.

### BENEFITS

- Enhance employee engagement and knowledge retention by delivering personalized, adaptive, and interactive security awareness and training content.
- Reduce the risk of human error and security breaches caused by employee negligence or lack of awareness, strengthening the agency's overall security posture.

- Improve the efficiency and scalability of security awareness and training efforts, allowing the agency to reach a larger audience with tailored content while optimizing resource allocation.
- Foster a strong cybersecurity culture within the organization by promoting continuous learning, gamification, and employee participation in security initiatives.
- Demonstrate compliance with industry security standards and regulations that mandate regular employee security awareness and training programs.

#### **TIMEFRAME**

- 6-12 months for initial program development, including content creation, AI model training, and platform integration.
- Ongoing program updates, refinements, and expansions based on employee feedback, evolving security threats, and changes in the agency's IT environment.

#### **CONSTRAINTS/ROADBLOCKS**

- Ensuring the quality, relevance, and accuracy of the AI-generated training content and simulations, requiring close collaboration between subject matter experts and AI developers.
- Managing the complexity of integrating the AI-powered training system with existing LMS, HR, and security platforms while ensuring data privacy and security.
- Addressing potential employee resistance or concerns regarding using AI-driven training methods and collecting personal performance data.
- Securing the necessary budget, resources, and executive support to implement and maintain an advanced AI-powered security awareness and training program.

#### **POTENTIAL REVENUE/BUSINESS CASE**

- Reduce the financial impact of security incidents and data breaches caused by human error or lack of employee awareness, which can result in significant legal, regulatory, and reputational costs.
- Optimize the allocation of cybersecurity training resources and minimize the need for expensive, in-person training sessions by leveraging AI-driven, self-paced learning methods.
- Enhance employee productivity and job satisfaction by providing engaging, personalized, and convenient security awareness and training experiences.
- Strengthen the agency's competitive advantage and customer trust by demonstrating a solid commitment to cybersecurity education and fostering a culture of security excellence.

## FRAUD DETECTION USING AI AND MACHINE LEARNING

### IDEA DESCRIPTION

- Develop an AI-powered fraud detection system that analyzes transaction data, customer behavior patterns, and vehicle usage to identify potentially fraudulent activities in real time. With the power of AI and machine learning, tolling agencies can proactively combat fraud, protect their revenue streams, and maintain the highest standards of integrity and customer service. Implementing an AI-based fraud detection system will minimize financial losses and strengthen customer confidence in the agency's commitment to providing a secure and equitable tolling experience.
- Utilize machine learning algorithms to detect anomalies and suspicious patterns, such as:
  - Stolen or cloned transponders
  - License plate duplication or misuse
  - Unusual travel patterns or frequencies
  - Inconsistencies in payment methods or customer information

- Integrate the fraud detection system with existing toll collection systems, customer databases, and video enforcement solutions.
- Generate alerts and reports for further investigation by the toll agency's fraud prevention team.

### BENEFITS

- Proactively detect and prevent fraudulent activities, minimizing revenue leakage and enhancing the overall integrity of the tolling system.
- Reduce manual effort in identifying potential fraud cases, allowing the fraud prevention team to focus on high-priority investigations.
- Continuously learn and adapt to new fraud patterns and techniques, staying ahead of evolving threats.
- Improve customer trust and satisfaction by demonstrating the agency's commitment to fair and secure toll collection practices.

### TIMEFRAME

- 12-18 months for development, testing, and integration.
- Ongoing maintenance, updates, and refinements to adapt to evolving fraud patterns.

### CONSTRAINTS/ROADBLOCKS

- Ensuring data quality and consistency across multiple systems and databases.
- Addressing data privacy and security concerns related to collecting and analyzing sensitive customer information.
- Integrating the fraud detection system with legacy toll collection systems and infrastructure.
- Balancing the need for effective fraud detection with minimizing false positives that may inconvenience legitimate customers.

### POTENTIAL REVENUE/BUSINESS CASE

- Recover lost revenue by identifying and preventing fraudulent activities that would otherwise go undetected.
- Reduce costs associated with manual fraud investigations and revenue leakage.
- Enhance the overall efficiency and accuracy of the toll collection process, increasing customer satisfaction and trust.
- Demonstrate industry leadership in adopting advanced technologies to ensure the integrity and fairness of the tolling system.



## AI-SUPPORTED ENTERPRISE CYBER & DATA SECURITY FOR TOLLING

### IDEA DESCRIPTION

Using artificial intelligence (AI) and machine learning (ML) for cyber and data security in the tolling industry can significantly enhance security measures, detect anomalies, and protect sensitive data. By leveraging AI and ML technologies, tolling agencies can enhance their cyber and data security measures and mitigate risks associated with cyber threats and attacks, while providing opportunities to generate revenue, enhance customer satisfaction, and strengthen market competitiveness.

- Use AI/ML tools to ensure data and accounts are secure.
  - AI and ML algorithms can monitor network traffic, user behavior, and system activities to identify abnormal patterns that may indicate security threats or unauthorized access attempts. These algorithms can learn what constitutes normal behavior and raise alerts when deviations occur.
- AI can be employed to collect, analyze, and interpret threat intelligence data from various sources including public databases, security feeds, and dark web monitoring. ML algorithms can then be trained to proactively implement countermeasures to mitigate risks.
- ML algorithms can analyze historical data on security incidents to predict potential future threats and vulnerabilities. This proactive approach allows tolling companies to preemptively strengthen their security posture and allocate resources effectively.
- ML algorithms can improve user authentication mechanisms by analyzing user behavior, biometric data, and contextual information to prevent unauthorized access.
- Implement risk management solutions to protect against cyber-attacks involving social engineering and ransomware (85% of cyber-attacks involve human interaction).
  - AI and ML technologies can analyze user behavior to identify unusual actions or access attempts including insider threats, compromised accounts, or unauthorized access.
- Keep current with Payment Card Industry Data Security Standard (PCI DSS) compliance audits and other cyber security systems to keep toll information secure.
  - AI algorithms can analyze transactional data and user behavior to detect fraudulent patterns and flag suspicious activities such as toll evasion or account manipulation for further investigation.
  - AI can be utilized to strengthen data encryption techniques and ensure the privacy of sensitive information such as customer data and financial transactions.

- Use AI and ML physical security measures applied to toll collection devices and networking equipment. Deploy cameras and equipment cabinet intrusion sensors in these areas to allow for 24/7 security monitoring and alerts for unauthorized access.
- Network Security: AI-powered network security solutions can monitor network traffic in real-time, identify potential threats, and automatically respond to security incidents. ML algorithms can adapt to evolving threats and adjust security policies accordingly to enhance overall network security.
- Use AI/ML to facilitate compliance monitoring and reporting for tolling agencies subject to regulatory requirements such as GDPR, PCI-DSS, or ISO 27001. AI and ML can assist tolling companies in maintaining regulatory compliance by continuously monitoring and identifying compliance gaps.

### **BENEFITS**

- AI/ML will create savings by minimizing the chances of losing revenue because of data breaches that create expensive recoveries and could require recovery of stolen funds. Cost savings will be recurring.
- AI-powered security systems can automate incident response processes by quickly identifying and containing security breaches, thereby minimizing the impact of cyber-attacks.

### **TIMEFRAME**

- TBD dependent on internal agency goals; however, cyber-security should always be regarded as a critical/short term implementation.

### **CONSTRAINTS/ROADBLOCKS**

- Dependent on participation from partnered agencies (ex. E-ZPass network, transit providers, payment application providers, etc).
- Implementation will likely require external development or support, mainly for deployment expediency. However, solutions exist, under COTS and custom development models.
- May require installation of new networking equipment at existing tolling points, and potential reconfiguration of existing networks.
- May require installation of new cameras, sensors, cabinets, etc.
- ISO27001 certification has stringent requirements, requires considerable effort to achieve, and may be cost prohibitive.
- Agency customization will likely be required. Finding “one size fits all” will likely not be possible.



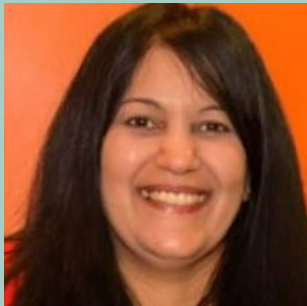
**POTENTIAL REVENUE/BUSINESS CASE**

- Cybersecurity implementation will generate a cost in the short term; however, the implementation can generate savings in the long term (i.e. lower insurance premiums, lower likelihood of paying for cyber-attacks remediation, etc).
  - AI and ML solutions can reduce manual efforts and optimize resource allocation, leading to cost savings by automating security processes and enhancing threat detection capabilities.
- Tolling agencies can leverage AI and ML technologies to analyze the data collected during toll transactions and gain insights. These insights can be monetized by offering data analytics services to stakeholders interested in traffic patterns, congestion management, and infrastructure planning.
- Implementing robust security measures using AI and ML can enhance customer trust and confidence in the tolling service. Customers are more likely to choose a tolling provider that prioritizes data security and privacy, leading to increased customer retention and acquisition.
- AI and ML-powered risk management solutions can help tolling agencies assess and mitigate cybersecurity risks effectively. By offering risk assessment and mitigation services to other businesses within the transportation sector, tolling companies can generate additional revenue streams.
- Tolling agencies can collaborate with AI and cybersecurity firms to develop innovative security solutions tailored to the tolling industry. Revenue-sharing partnerships can be established to commercialize these solutions and tap into new markets beyond tolling.
- Tolling agencies can offer compliance-as-a-service (CaaS) to other organizations seeking assistance with regulatory compliance, generating revenue through consulting fees and subscription-based models.



# CUSTOMER SATISFACTION

Lead by



**USHA MADHOGARHIA –  
PENNSYLVANIA TURNPIKE  
COMMISSION**

Usha has over 21+ years of experience with dedicated expertise in the realm of Quality Management. Throughout her professional path, Usha has gained experience across diverse domains including Tolling Industry, Entertainment, Pharmaceutical, Government, Health Care,

Consumer Products Goods, Pet Products, Telecom, and Banking. Usha’s career journey has provided her with the opportunity to work closely with the Pennsylvania Turnpike Commission, where she has witnessed firsthand the importance of customer satisfaction in driving operational success. Through meticulous attention to detail and a customer-centric approach, Usha has contributed to the development and implementation of software solutions that enhance the overall tolling experience for commuters and commercial drivers alike. Whether it's streamlining toll collection processes, enhancing user

interfaces for online payment platforms, or optimizing backend systems for smoother traffic flow, her focus remains steadfast on delivering tangible improvements that resonate with Pennsylvania Turnpike users. Through her work with the Pennsylvania Turnpike Commission, Usha has come to understand that customer satisfaction is not merely a metric but a reflection of the Commission's commitment to excellence and its ability to deliver value to the communities it serves. As such, she remains dedicated to supporting the Pennsylvania Turnpike Commission in its mission to provide safe, reliable, and efficient transportation solutions,

all while prioritizing the needs and satisfaction of its customers.

## USE OF AI IN PREDICTIVE MODELING

Usha Madhogarhia– Pennsylvania Turnpike Commission

### IDEA DESCRIPTION

An AI based Predictive modeling is a machine learning techniques used to predict future events or outcomes by analyzing patterns in each set of input data. It is a type of data analytics which uses current and historical data to forecast activity, behavior and trends.

- The objectives of implementing AI based Predictive modeling to assist in Traffic Flow and Congestion Prediction, Toll Revenue Forecasting, Maintenance Planning, Weather Impact Assessment, Toll Booth Optimization, Accident Prediction and Response, Customer Service Enhancement, Traffic Diversions and Alternate Routes, Environmental Impact Assessment, Security Threat Detection, Demand Forecasting and Revenue Leakage Prevention etc.
- It's a one-time revenue stream.
- Probably external participation required.

### TIMEFRAME

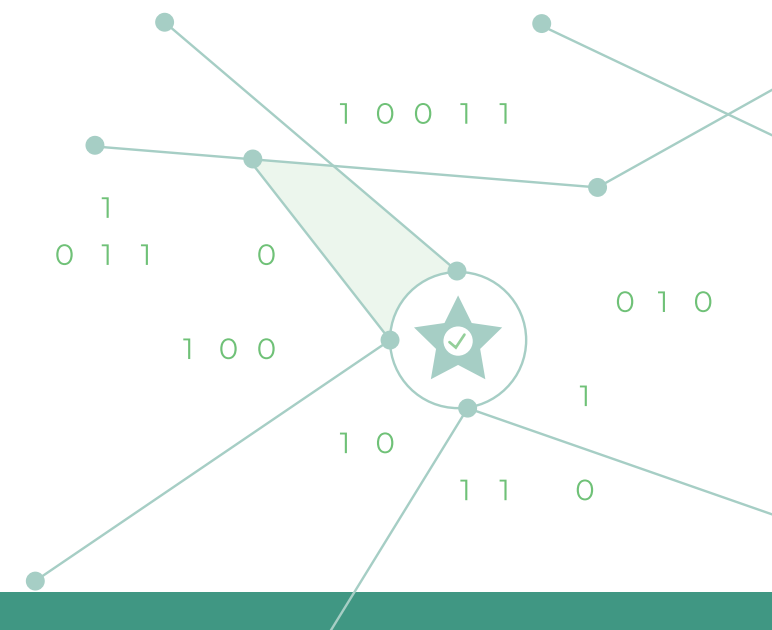
- Probably 6 months to 1 year.
- Medium term.

### CONSTRAINTS / ROADBLOCKS

- High-quality and real-time data sources such as traffic data, toll collection data, weather data etc.
- The Advanced Analytics and Machine Learning Tools.
- The Robust validation procedures to ensure the accuracy and reliability of predictive models.

### POTENTIAL REVENUE / BUSINESS CASE

- Define the business objectives.
- Select a model.
- Model Training and Tuning.
- Integration with existing Systems.
- Deployment, maintenance and domain knowledge expert.



## USE OF AI FOR SENTIMENT ANALYSIS

### Usha Madhogarhia– Pennsylvania Turnpike Commission

#### IDEA DESCRIPTION

Natural Language Processing (NLP) techniques of AI is widely used for sentiment analysis. It helps in understanding public perceptions, identify areas for improvement, and make data-driven decisions to enhance customer satisfaction and service quality.

- The objectives of AI powered sentiment analysis is to turn textual data into actionable insights that can drive informed decision-making, improve products and services, enhance customer satisfaction. It helps organizations to stay attuned to public sentiment in digital and interconnected world.
- It would create the revenue by better understanding of customer feeling, opinion and emotions and any improvement idea or applying new idea.

- It would be a one-time revenue with maintenance work.
- It can be done either by internal or external participation.

#### TIMEFRAME

- Probably 6 months to 1 year.
- Medium term.

#### CONSTRAINTS / ROADBLOCKS

- Integrate real-time data feeds from social media and news sources to ensure that sentiment analysis reflects current opinions and events with AI based sentimental model.
- Create a user-friendly dashboard for stakeholders to monitor sentiment trends, view sentiment breakdowns, and access historical data.
- Integrate sentiment analysis insights into the decision-making processes of the PA Turnpike management and operations teams.

#### POTENTIAL REVENUE / BUSINESS CASE

- Implementing sentiment analysis is a multifaceted task that involves data collection, model development, customization, compliance considerations, and ongoing maintenance. The specific effort required will vary based on project goals, available resources, and the complexity of the sentiment analysis tasks.

## USE OF AI IN CUSTOMER JOURNEY MAPPING

### Usha Madhogarhia– Pennsylvania Turnpike Commission

#### IDEA DESCRIPTION

Using AI into customer journey mapping, the PTC can gain insights into customer behavior, enhance customer satisfaction, optimize operations, and provide a more personalized and efficient travel experience by analyzing customer interactions, touchpoints, and feedback across multiple channels.

- The objective of implementing AI in customer journey mapping is to create more personalized, efficient, and satisfying experiences for customers while achieving operational efficiency and driving business growth with customer satisfaction, Competitive Advantage, Innovation, Cost Reduction, Seamless Multichannel Experiences, Optimized Customer Journeys, Customer Retention etc.

- It would create the revenue analyzing customer interactions, touchpoints, and feedback across multiple channels.
- It would be a one-time revenue with maintenance work.
- It can be done either by internal or external participation.

#### TIMEFRAME

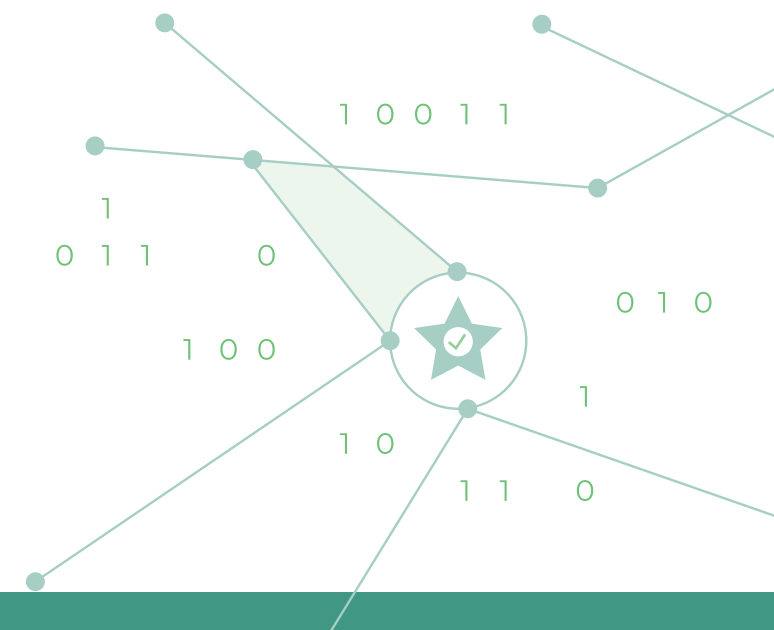
- Probably 6 months to 1 year.
- Medium term.

#### CONSTRAINTS / ROADBLOCKS

Implementing AI in customer journey mapping requires a strategic approach such as Data Collection and Integration, Data Quality and Preprocessing, Data Privacy and Compliance, Scalable Data Infrastructure, AI and Machine Learning Tools, Customer Data Platform, Multichannel Data Integration etc.

#### POTENTIAL REVENUE / BUSINESS CASE

- Continuous Improvement & Technology Stack Selection.
- AI Model Development & Real-time Data Processing.
- Automation and Chatbots & Visualization and Reporting.
- Change Management and Training & Continuous Improvement.



## USE OF AI IN CALL CENTER

### Usha Madhogarhia– Pennsylvania Turnpike Commission

#### IDEA DESCRIPTION

AI in call centers not only enhances customer experiences but also improves agent productivity and overall operational efficiency. It allows organizations to provide more personalized and effective support while optimizing resource allocation and decision-making.

- The objective of implementing AI in a call center is to enhance the efficiency, effectiveness, and overall quality of customer interactions while optimizing operational processes such as efficient call routing, cost reduction, enhanced customer experience etc.
- It would create the revenue by reducing resource and by attracting customers with helpful and accurate information

- It would be a one-time revenue with maintenance work.
- It can be done either by internal or external participation.

#### TIMEFRAME

- Probably 3 months to 6 months.
- Short term.

#### CONSTRAINTS / ROADBLOCKS

Implementing AI in call center requires Robust data infrastructure, AI & ML tools, customer data integration, Real-time data processing, AI Models and Algorithms, Voice recognition system etc.

#### POTENTIAL REVENUE / BUSINESS CASE

- Planning and Strategy & Data Infrastructure.
- AI Model Development & Integration with Existing Systems.
- Agent Training & AI System Customization.
- User Interface Development & Quality Assurance and Testing.
- Change Management & Monitoring and Optimization.





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