Request for Research Funding for FY 2024-2025			
Project Number (Research Center Use Only): OET-25-02			
Requesting Office	Emerging Technologies	**Priority**	2 of 8
Proposed Title	Artificial Intelligence (AI) Applications to Enhance Transportation Safety		
Justification	**Background:** On average, the transportation network in Florida experiences about 600,000 crashes and over 3,000 traffic fatalities annually[1]. Improving traffic safety by reducing the frequency and severity of traffic crashes is one of the primary goals of the Florida Department of Transportation (FDOT). Over the last few decades, the Department has focused on integrating the 4 E's (Engineering, Education, Enforcement, and Emergency Medical Services) in highway safety. These strategies assist the Department in moving the needle in the right direction. While traditional safety countermeasures and safety interventions address safety reactively, recent technological advancements focus on proactive safety improvements. The advent of Artificial Intelligence (AI) has transformed the way the transportation industry operates, and highway safety is no exception. Advanced technologies such as machine learning, big data analytics, deep learning, and computer vision have already begun to redefine the transportation sector. Several AI applications, such as autonomous vehicles, collision avoidance systems, real-time traffic management, predictive maintenance, driver monitoring systems, emergency response optimization, proactive weather and road condition monitoring, real-time infrastructure monitoring, etc., are assisting transportation agencies in mitigating traffic crashes. While the existing AI applications are traditionally being deployed to address a specific issue, there is an opportunity for cross-functional and interdisciplinary applications. Furthermore, the existing AI applications are often implemented at a micro level, making it difficult to scale up to the regional or macro level. **Goal and Objectives:** This research effort aims to explore the applications of AI in improving transportation safety from a regional standpoint. The specific objectives include: 1. Identify, explore, and document the existing and upcoming applications of AI in improving safety at both macro- and micro-levels. 2. Identify the opportunities and risks of AI applications in traffic safety. 3. Identify the existing traditional and non-traditional datasets that could be used to develop AI applications to enhance traffic safety. 4. Develop several diverse use cases to demonstrate the feasibility of AI applications in mitigating traffic crashes and improving safety. **Research Tasks:** The objectives will be achieved through the following tasks: *Task 1 - Identify Existing and Potential AI Applications:* This task will focus on identifying the existing and potential AI applications in transportation safety. A detailed and comprehensive internet search will be conducted to identify the AI applications in transportation safety. For each application, this task will document the application objective, data sources, analysis approaches, analysis constraints, success stories, and lessons learned. The scalability of these applications will also be discussed. *Task 2 - Identify Use Cases at the Macro-level:* This task will focus on identifying and documenting several use cases that demonstrate the feasibility of AI applications in improving traffic safety. The task will also explore all the existing and upcoming traditional and non-traditional datasets that could be used to deploy AI applications. The research team will explore several datasets, including but not limited to the following: • Crash data • Traffic volumes and congestion • Transit routes • Freight routes • Hurricane evacuation routes • Work zone safety data • Multi-modal connectivity data • Transportation economics • Built environment and demographics data • Infrastructure • Weather		

[1] Florida Traffic Safety Dashboard - S4Analytics (signal4analytics.com)

	Task 3: Develop Case Studies: This task will focus on developing two case studies targeting a medium to mega-urban region in Florida (e.g., West Palm Beach region, Orlando area, etc.). The task will first identify the safety problem that will be investigated, the stakeholders, and the available data. Potential safety solutions using AI applications will be identified and recommended. The task will also discuss the scalability and transferability of the proposed solutions so that other agencies may replicate them. *Task 4 – Document Best Practices and Way Forward:* This task will focus on documenting the success stories, best practices, and lessons learned and discussing the way forward for the Department. Understanding that AI has the potential to improve safety, this task will prepare a maturity matrix discussing the existing and futuristic AI applications in the transportation industry. Specific safety-focused performance metrics specific to AI applications will also be identified and discussed. **Products:** This research effort will yield the following outcomes and outputs at a minimum. 1. Micro-level analysis of AI applications in improving safety as a case study. 2. Macro-level analysis of AI applications in improving safety at a regional level. 3. Specific performance metrics from a safety perspective. 4. Detailed and specific use cases and success stories of AI deployments. 5. An in-depth discussion on the data sources, challenges, and integration. 6. A maturity matrix discussing the existing and futuristic AI applications in transportation safety.		
Impact	Innovative AI solutions have the potential to improve safety by reducing the frequency and severity of crashes on our transportation network. This project will equip the Department with the necessary information, data, and tools to identify and deploy AI applications to improve safety. If this research is not conducted, the Department will miss out on the opportunity to leverage the existing and upcoming AI tools to enhance the safety of our transportation network.		
Affected Offices/ Districts	Emerging Technologies; State Traffic Engineering and Operations Office; State Safety Office		
Existing Work	Project BED25 977-13 focuses on the applications of AI in TSMO Programs; this proposed project is specific to traffic safety. The proposed research is cross-disciplinary and explores the many facets of transportation engineering.		
Keywords Used In Existing Work Search (Cannot leave blank)	• Artificial Intelligence in Transportation Engineering: 33 records – most of these studies are at the micro-level, discussing a specific problem, while the proposed project is at the regional level.		
Related Contracts (Give contract numbers)	BED25 977-13: It focuses on the applications of AI in TSMO Programs; this project is specific to traffic engineering and incident management. The proposed research is cross-disciplinary, at a regional level, and explores the applications of AI to improve traffic safety on the Florida road network.		
Funding Request	$190,000	**Anticipated Duration**	18 months
Project Manager	Raj Ponnaluri	**Contracting Method**	Direct contract with Florida International University
Equipment	Estimated equipment cost (or N/A)	N/A	
Urgency	1	AI is ever-evolving. New applications and datasets are being generated rapidly, giving the Department a unique opportunity to leverage these applications, tools, and data sources to mitigate crashes.	
Implementability	1	The research results will be readily implementable. The Department could use the results as they become available.	

Project Benefits (Succinct, complete explanation)

This research effort will investigate the applications of Artificial Intelligence (AI) in traffic safety. The research products, especially the performance metrics, case studies, use cases, maturity matrix, etc., will assist the Department in deploying AI applications at a regional level. This project will also provide insights into the policy-level implications of AI deployments. The success stories, best practices, and lessons learned will provide the necessary guidance for agencies interested in deploying AI applications.

Project Benefits **(Select all that apply and explain)**	**Quantifiable Benefits (units, dollars, etc…if applicable)**	**Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits**
o Materials Enhancement		
o **Financial Impact**		This project explores using existing datasets and infrastructure to deploy AI applications to improve traffic safety. This approach will have a certain financial benefit to the Department. Furthermore, since AI applications foster economic development, this project will have a positive financial impact on society.
o **Time Savings**		AI applications have the potential to improve traffic safety. Enhanced safety will also result in improved operational performance of our transportation system.
o **Lives Saved/Injuries Prevented**		AI applications have the potential to reduce crashes. This research will discuss the feasibility of deploying several AI applications from a safety perspective and identify safety-focused performance metrics.
o Other (Explain)		

*Comments should explain and support urgency, financial benefit, and implementability scores