March 2025 | Prepared by: Athey Creek Consultants

ENTERPRISE

Role of Artificial Intelligence in Intelligent Transportation Systems

ENTERPRISE TRANSPORTATION POOLED FUND STUDY TPF-5(490)

FINAL REPORT

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipients Catalog No.	
ENT-2025-1			
4. Title and Subtitle Role of Artificial Intelligence (AI) in Intelligent Transportation Systems (ITS)		5. Report Date March 2025 6. Performing Organization Code	
7. Author(s) Jeremy Schroeder		8. Performing Organization Report No.	
9. Performing Organization Name and Address Athey Creek Consultants 2097 County Road D, Suite C-100 Maplewood, MN 55109		10. Project/Task/Work Unit No. 11. Contract (C) or Grant (G) No. 2023-0171	
12. Sponsoring Organization Name and Address ENTERPRISE Transportation Pooled Fund Study TPF-5(490) Michigan Department of Transportation (Administering State) PO Box 30050 Lansing, MI 48909		13. Type of Report and Period Covered Final Report 14. Sponsoring Agency Code	
15. Supplementary Notes Final Report: https://enterprise.prog.org/download/role-of-artificial-intelligence-ai-in-intelligent-transportation-systems-its-final-report-project-summary/			

16. Abstract

A number of intelligent transportation systems (ITS) products and approaches have used “machine learning” for decades. Building on this foundation, recent artificial intelligence (AI) products and increased availability of AI have increased use cases for AI in transportation.

This project was conducted to introduce ENTERPRISE members to AI and facilitate understanding about how AI is being (and may be) applied to transportation, as well as the potential uses, benefits, and challenges of AI. Specifically, this report:

- Provides a definition and high-level context of AI compared to other solutions;
- Documents and synthesizes available national materials;
- Summarizes state-level AI policies to document themes and additional considerations;
- Identifies considerations for transportation agency practitioners interested in using AI in operations; and
- Documents example use cases of AI in transportation operations.

17. Document Analysis/Descriptors		18. Availability Statement	
Artificial intelligence, AI, intelligent transportation systems		No restrictions.	
19. Security Class (this report) Unclassified	20. Security Class (this page) Unclassified	21. No. of Pages 28	22. Price

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March 2025

Published by:

ENTERPRISE Transportation Pooled Fund Study TPF-5(490)
Michigan Department of Transportation (Administering State)
PO Box 30050
Lansing, MI 48909

Acknowledgements

This *Role of Artificial Intelligence in Intelligent Transportation Systems* report was prepared for the Evaluating New Technologies for Roads Program Initiatives in Safety and Efficiency (ENTERPRISE) Transportation Pooled Fund Study TPF-5(490) program (https://enterprise.prog.org). The primary purpose of ENTERPRISE is to use the pooled resources of its members from North America and the United States federal government to develop, evaluate, and deploy ITS.

The cover page image is provided courtesy of ArtTower from Pixabay.

Project Champion

Charles Tapp from the Texas Department of Transportation was the ENTERPRISE Project Champion for this effort. The Project Champion served as the overall lead for the project.

ENTERPRISE Members

The ENTERPRISE Board consists of a representative from each of the following member entities.

- Illinois Department of Transportation
- Iowa Department of Transportation
- Kansas Department of Transportation
- Michigan Department of Transportation
- Minnesota Department of Transportation
- Ontario Ministry of Transportation
- Texas Department of Transportation
- Wisconsin Department of Transportation

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Chapter 1: Introduction

The advances and rapid evolution of artificial intelligence (AI) make it a hot topic of interest globally and in many industries. As with any new technology, the full extent of benefits and negative impacts remain unknown, despite many voiced advantages and risks by various stakeholders.

This project was conducted to introduce ENTERPRISE members to AI and facilitate understanding about how AI is being (and may be) applied to transportation, as well as the potential policy and implementation considerations related to AI.

At the same time, the term AI is inconsistently used and not universally understood by many practitioners. For instance, the term AI may be applied for marketing purposes in ways that enhance the appeal and make a product seem more advanced and novel than it actually is. However, a number of intelligent transportation system (ITS) products and approaches have used "deep learning" and "machine learning" for decades and some "new" AI approaches may be repackaged or enhanced versions of machine learning.

A number of recent AI products, combined with the increased availability of data and AI overall, have increased the number of use cases for AI. Building on this foundation, recent AI products and increased availability of AI have increased use cases for AI in transportation. However, a lack of knowledge, experience, and policy related to AI may cause a lot of uncertainty for practitioners. This effort was undertaken to introduce ENTERPRISE members to AI by:

- Providing a definition and high-level context of AI compared to other solutions;
- Documenting and synthesizing available national materials;
- Summarizing state-level AI policies to document themes and additional considerations;
- Identifying considerations for transportation agency practitioners interested in using AI in operations; and
- Documenting example use cases of AI in transportation operations.

Figure 1 provides overall key project findings with a list of policy considerations for AI use in transportation operations as well as considerations for agencies implementing AI in transportation Operations.

Policy Considerations for AI Use in Transportation Operations

- Interpretability and transparency
- Accountability and human review
- Privacy and confidentiality
- Equity and fairness
- Review and ongoing assessment

Considerations for Agencies Implementing AI in Transportation Operations

- Quantity and availability of quality data
- Managing increasing data volumes
- Supporting agency and workforce needs
- Trained workforce
- Institutional policies
- State of practice and technology transfer
- Computational resources
- Pilot versus full-scale deployment tradeoffs

Figure 1. Key Project Findings

1.1 Report Organization

This report includes the following sections:

- Chapter 2: Defining Artificial Intelligence – Provides definitions of AI and an explanation of various sub-fields and types of AI.
- Chapter 3: Considerations for Agency Use of AI in Transportation – Leverages identified documents to summarize policy recommendations for agencies to consider AI in transportation operations, identifies considerations for transportation agencies interested in using AI in operations, and documents example use cases of AI in transportation operations.
- Chapter 4: Available Resources – Documents available national AI resources and summarizes state-level AI policies.
- Chapter 5: Project Summary and Implementation – Presents a summary of key project findings and how to use these to support implementation.

Chapter 2: Defining Artificial Intelligence

Many definitions of AI are available. The National Conference of State Legislatures[1] defines AI as "*the use of computer systems to perform tasks that normally require human intelligence, such as learning and decision-making*." More detail is included in this explanation from the Congressional Research Service:[2]

> *"AI can generally be thought of as computerized systems that work and react in ways commonly thought to require intelligence, such as the ability to learn, solve problems, and achieve goals under uncertain and varying conditions, with varying levels of autonomy. AI is not one thing; rather, AI systems can encompass a range of methodologies and application areas, such as natural language processing, robotics, and facial recognition."*

More specific to transportation, two United States Department of Transportation (USDOT) ITS Joint Program Office (JPO) resources, Identifying Real-World Transportation Applications Using Artificial Intelligence (AI): Summary of Potential Application of AI in Transportation[3] in 2020 and Artificial Intelligence (AI)-Enabled Intelligent Transportation Systems (ITS) Capability Maturity Model (CMM) and Readiness Checklists[4] in 2024, recommended the following definition of AI that was stated to be consistent with US government definitions.

> *"Artificial Intelligence (AI) refers to processes that make it possible for systems to replace or augment routine human tasks or enable new capabilities that humans cannot perform. AI enables systems to: (1) sense and perceive the environment, (2) reason and analyze information, (3) learn from experience and adapt to new situations, potentially without human interaction, and (4) make decisions, communicate, and take actions. Examples of AI include machine learning, natural language processing, and object recognition.*
>
> *"Machine learning (ML) is a broad subfield of AI in which computers learn from data, discover patterns and make decisions without human intervention. The ML field is broadly categorized into supervised, semi-supervised, unsupervised and reinforcement learning. In ITS, AI can be used to replace or augment actions of field, handheld and remote sensing devices, connected and automated vehicles, TMC operators, transit and freight operators, decision-makers, and travelers. For example, AI can be used to identify objects and images, recognize speech and audio, process large amounts of data to recognize patterns, learn from experience, and adapt to new environments to predict traffic phenomena, provide situational."*

This definition alludes to the different levels of AI or related sub-fields. As seen in Figure 3, machine learning (ML) and deep learning are each subsets of AI.

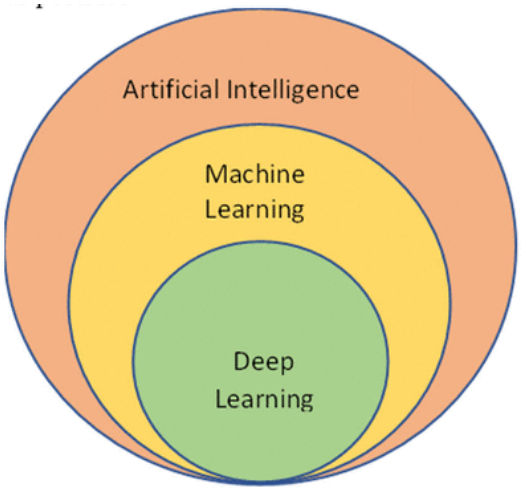

Figure 2. AI includes the fields of deep learning and machine learning. Source: NCHRP 23-12.[10]

To emphasize this point, IBM[5] refers to AI as the overarching system that:

> *"…is used to classify machines that mimic human intelligence and human cognitive functions like problem-solving and learning. AI uses predictions and automation to optimize and solve complex tasks that humans have historically done, such as facial and speech recognition, decision-making and translation."*

Examples and specific sub-fields and types of AI are defined by the USDOT in Figure 3. Additionally, the Texas DOT AI Strategic Plan[6] has defined various types of AI:

- Computer vision: a field of AI focused on enabling computers to interpret, understand, and make or inform decisions based on visual data from the world. It involves developing algorithms and models that can process and analyze images and videos to extract meaningful information, recognize objects, track movements, and performs other tasks related to visual perception.
- Generative AI: a field of AI focused on systems that can generate new, original content based on the data they have been trained on. This content can include text, images, music, videos, and other forms of media.
- Machine learning: a field of AI that focuses on the development of algorithms and statistical models that enable computers to learn and make or inform decisions from data without being explicitly programmed for each specific task.
- Natural language processing (NLP): a field of AI focused on the interaction between computers and human (natural) languages. The main goals of NLP are to enable computers to understand, interpret, and generate human languages in a way that is both meaningful and useful.
- Robotic AI: the integration of AI with robotics, enabling robots to perform tasks autonomously, intelligently, and interactively. This field combines the physical capabilities of robots with the cognitive capabilities of AI to create systems that can perceive their environment, make or inform decisions, learn from experiences, and perform complex actions.

Given the various types and levels of AI applications that have been used in transportation applications for many years, the emphasis of this effort focused on the bigger picture AI practices and applications that are new, innovative, and untested, and which also have the potential for greater risks and greater benefits. Consequently, these new AI applications for transportation also warrant greater scrutiny to ensure that they are used appropriately.

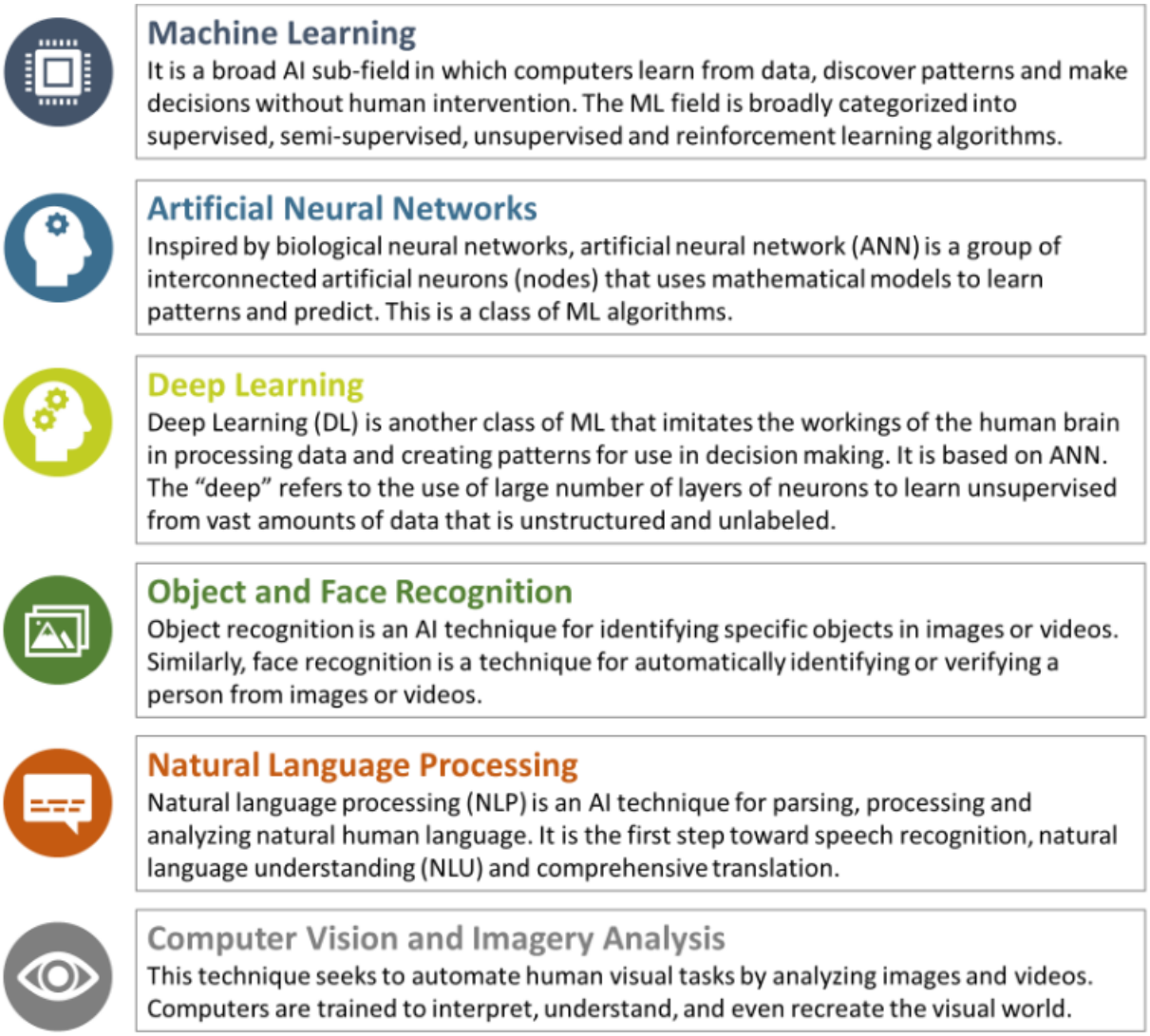

Figure 3. Examples of AI sub-fields and techniques defined by the USDOT ITS JPO. Source: USDOT.[3]

Chapter 3: Considerations for Agency Use of AI in Transportation

This section presents considerations for agencies interested in using AI in transportation operations. Specifically, considerations for developing an AI policy, implementing AI, and specific AI use cases in transportation operations are described in the three subsections below.

3.1 Considerations for Agency Policies about Using AI

This section summarizes high-level considerations for agency policies about using AI in transportation operations. Existing State DOT AI policies are a good starting reference for practitioners (those enacted by Florida,[7] Massachusetts,[8] and Texas[6] were identified as a part of this effort and presented in Section 3.2.1). Supporting resources, like the National Institute of Standards and Technology (NIST) AI Management Framework[9] that was used as a basis for the Massachusetts Executive Office[8] AI policy and Texas DOT AI Strategic Plan,[6] are also valuable and presented in Section 3.1.

Policy considerations for AI use in transportation operations that are included in existing state DOT AI policies are:

- ***Interpretability and transparency*** to explain how AI makes decisions for government uses (e.g., selecting a signal timing pattern, what is displayed on a traveler information map at a particular zoom level, basis for estimated travel times). Labeling or explaining the use of AI will inform the public about when they interact with AI or AI outputs. At the same time, this can help reduce the possibility that copyrighted material is released without proper attribution and reduce agency liability.
- ***Accountability and human review*** to ensure AI is producing valid results and complying with applicable policies, laws, and regulations. Agency staff review may be considered for some or all content that is generated by AI, depending on the nature of the output. Accountability considerations may also include vendor disclosure about how AI learns from mistakes, what corrective actions are made, and how often mistakes and corrective actions are made.
- ***Privacy and confidentiality*** can be maintained by minimizing the use of AI with personally identifiable information (PII) or other restricted data. It may be beneficial to restrict specific uses of AI in various contexts (e.g., automated enforcement or tolling applications).
- ***Equity and fairness*** to ensure AI recommendations represent all users and are not biased toward certain user groups.
- ***Review and ongoing assessment*** to determine the appropriateness and compliance of an AI service with an AI policy prior to procurement. Additionally, an approach to re-examine policy and agency uses of AI may be included to help the agency adapt to a rapidly changing field and ensure that both policy and uses of AI are appropriate and responsive to the current state of practice.

3.2 Considerations for Agencies Implementing AI in Transportation Operations

Considerations for an agency interested in implementing AI in transportation operations are described in this section. Note that agencies without a formal AI policy may also wish to think through and incorporate the AI policy considerations described above when implementing AI in transportation operations.

NCHRP 23-12 Artificial Intelligence Opportunities for State and Local DOTs – A Research Roadmap[10] (2023) provides a variety of considerations for agencies interested in using AI. These include considerations for agency capabilities, such as:

- ***Quantity and availability of quality data*** for AI model training and testing. Quality data will also be needed for AI to make appropriate decisions, particularly for automated functions.
- ***Managing increasing data volumes*** is a potential role for AI to serve. Specifically, an unprecedented (and increasing) volume of data is generated and accessed daily, presenting a significant challenge to DOTs with limited resources. When applied appropriately, AI may help an agency manage this volume of data.
- ***Supporting agency and workforce needs*** should be an important prerequisite for an agency interested in using AI. If not used for a specific agency need, using AI could create additional workload for staff. Instead, AI should be used to support staff and help them conduct work activities more efficiently. Having agency staff available to verify some or all of the AI outputs will be important as AI tools are initially implemented and refined, particularly in the near term, until they become more trusted.
- ***Trained workforce***, either in-house or agency consultant services, with knowledge to understand:
    - How to evaluate, develop, and adopt AI.
    - How AI is used by vendors and consultants.
    - Pitfalls and risks in AI deployment.
- ***Institutional policies***, including data privacy, restrictions, transparency about where and how AI is being used, the resources available for research, risk management, and AI-bias to ensure equity and fairness.
- ***State of practice and technology transfer*** from other agencies on lessons learned and benefits.
- ***Computational resources***, including hardware and ample storage for rapid data processing and storage.
- ***Pilot versus full-scale deployment*** tradeoffs for duration, risk in case of failure, and ability to test effectiveness.

Additionally, NCHRP 23-12[10] recommends that agencies planning to implement AI best practices gradually build AI capabilities by starting small. This can help agency staff learn more about the AI, how it operates,

potential benefits, and potential shortcomings in order to understand appropriate use cases that will meet agency needs and add value. Agency gaps in resources, data storage, and staff capabilities should be considered for implementing a pilot that can help address a need or improve efficiencies, and then the pilot findings can demonstrate value for making a case to scale up.

It is worth noting that many AI services and tools have not yet been extensively tested and are still being refined. As such, practically speaking, AI should be explored for purposes that meet agency needs and can augment workforce tasks to more efficiently provide actionable and useful outputs.

3.3 Example Use Cases of AI in Transportation Operations

There are many use cases in transportation operations where AI has the potential to provide great benefits. A variety of resources are available that describe these applications, some of which are highlighted in Figure 4 and summarized in Table 1. In fact, as noted earlier, some types of AI have been used in transportation operations for many years. However, more recent developments in AI are providing greater opportunities for agencies to test, pilot, and institutionalize increased use of AI. Example use cases are presented below for:

- 2.3.1 Signal Operations.
- 2.3.2 Highway Operations.
- 2.3.3 Road Weather Management.
- 2.3.4 Asset Management.

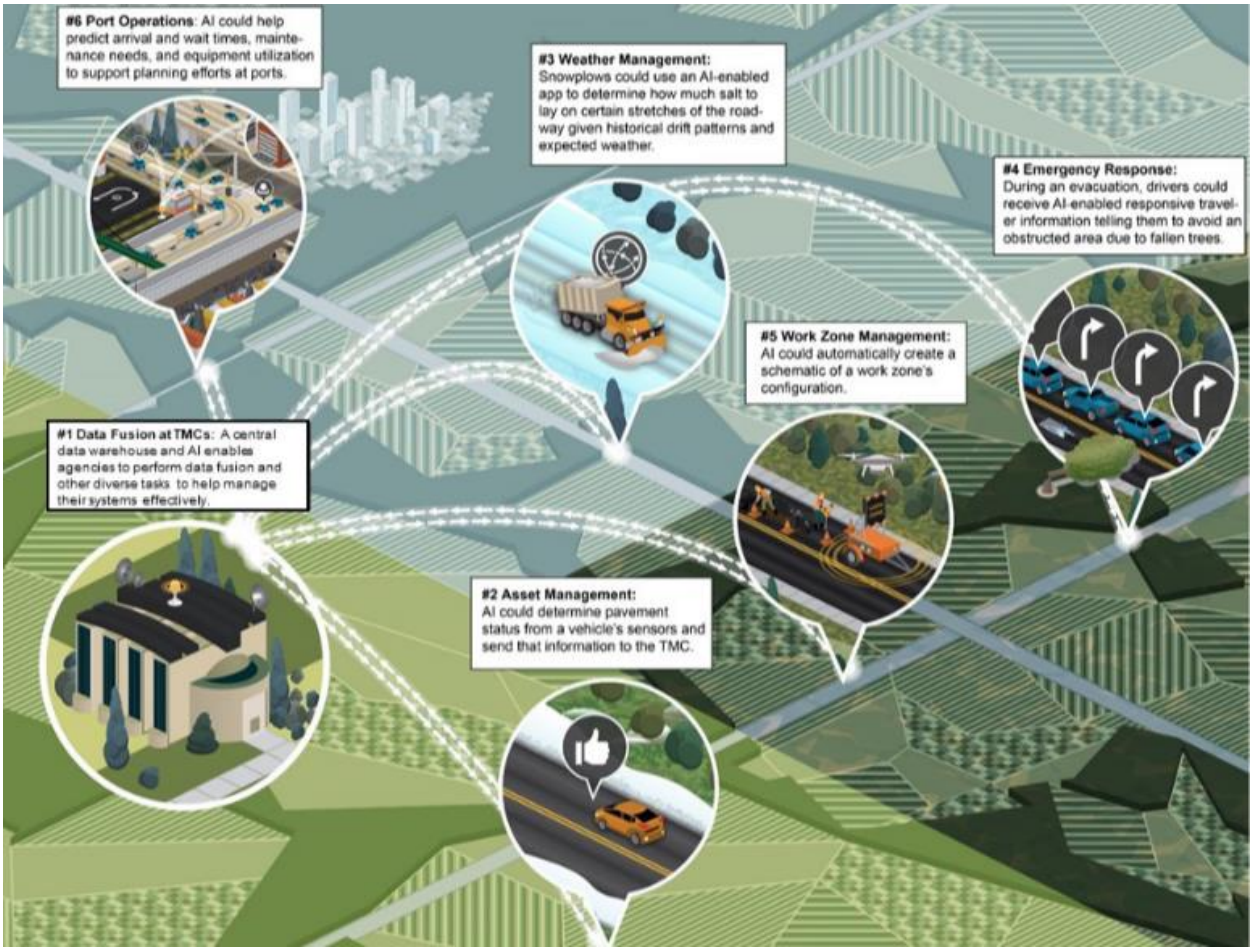

Figure 4. Examples of AI Uses to Support Transportation Systems Management and Operations. Source: USDOT.[3]

Table 1. Identified Real-World Scenarios and Applications. Source: USDOT.[4]

Scenario	Application
Urban arterial network	- Traffic signal coordination plan optimization - Real-time traffic signal optimization - Traffic signal decision support subsystem - Misbehavior detection system - Comprehensive traffic modeling - Crash and incident detection - Pedestrian, cyclist, and micromobility detection - Safety metrics assessment - Transit signal priority optimization - Demand response transit network optimization - Identification of unauthorized bus lane usage
Urban multimodal corridor	- Interagency collaboration - Detection of multimodal failures and incidents - Prediction of multimodal corridor delays - Personalized dissemination of multimodal travel information - Multimodal corridor demand management - Integrated payment for multimodal corridor - Real-time demand responsive traffic management and control
Regional system management	- AI for asset condition monitoring - AI for weather prediction and response - AI for incident detection and response - AI for work zone safety and information dissemination - AI for data fusion in transportation management centers - AI for port operations and planning
Rural freeway corridor	- AI for crash and emergency detection - AI for wildlife detection - AI for emergency planning - AI for road weather management - AI for safe asset health inspections - AI for predictive asset maintenance - AI for work zone management - AI for smart truck parking information systems - AI for distracted driver behavior detection - AI for freight traveler information - AI for decision support system
Vulnerable road users and underserved communities	- AI-enabled routing and wayfinding tools for pedestrians - Navigation applications with augmented reality and localized points of interest - AI interpretation of user input - Environmental mapping and guidance - AI-enabled payment assistance - AI-powered safety monitoring and alerts - Virtual reality for testing - AI-powered assistive robotics

3.3.1 Signal Operations

A more frequently deployed use case of AI at this time is to improve signal operations. Some agencies have leveraged an AI platform called NoTraffic, which leverages AI including computer vision sensors, machine learning algorithms, and predictive analytics to optimize traffic flow and reduce congestion on highways and roads. Additionally, Seattle DOT partnered with Google "Project Green Light" to optimize traffic signal timings using AI, and the City of Bellevue, Washington has used AI to improve safety at signalized intersections.

The transportation management center in Arlington, Texas[11] receives signal analytics (e.g., vehicle wait times and pedestrian wait times), safety data (e.g., times that vehicles are more likely to run red lights and the total numbers of these instances), and classification data of vehicles and pedestrians from NoTraffic, including a live feed of intersections and real-time traffic patterns, to help manage signalized intersections. In Arlington, the AI module sits on top of the controller and is currently used at 11 signalized intersections, with plans to expand the system to about 40 signalized intersections to support traffic signal timing adjustments based on real-time conditions.

A similar but broader, statewide use case by Florida DOT[12] is implementing the NoTraffic platform statewide after a successful pilot in Miami-Dade County. Specifically, Florida DOT observed an overall travel time reduction of 9.36 percent for eight corridors after implementing AI for adaptive traffic signal timing.[13] The platform uses AI to improve traffic flow by optimizing traffic signals, thereby helping to reduce wait times at intersections and improve safety. In Florida, the system collects data from traffic cameras, sensors, and GPS devices, analyzes traffic patterns, and delivers real-time data and analytics to the Transportation Management Center (TMC) that help to predict traffic congestion, identify crashes, and alert staff to potential hazards like road obstructions.

Seattle DOT[14] leverages Google "Project Green Light" to optimize traffic signal timings and make traffic flow more efficiently. This technology uses AI and driving trends from Google Maps to model traffic patterns and make recommendations for optimizing existing traffic light plans. Changes to traffic signal timing plans as a result of the AI outputs can be made within five minutes.

The City of Bellevue[13] has used AI video-based analytics at 40 signalized intersections to conduct a network-wide conflict and speed analysis. Traffic volume, road user speed, and near-crash event data from video cameras were used by the AI to generate findings that helped staff to identify issues at signalized intersections and causal factors in order to understand what improvements would improve safety.

Finally, Nevada DOT, Nevada Highway Patrol, and the Regional Transportation Commission of Southern Nevada[13] used AI software to reduce traffic crashes at intersections with higher-than average crash rates in Southern Nevada, which successfully contributed to a 17 percent reduction in primary crashes.

3.3.2 Highway Operations

Some agencies have implemented AI to support TMC operations for highways. Tennessee DOT[15] implemented an AI-based decision support system (DSS), illustrated in Figure 5, to support highway operations on the I-24 SMART Corridor near Nashville. The AI supports TMC operators by ingesting and processing available data and automating processes, including variable speed limit operations (which can be overridden by TMC operators, if needed). The agency has found the AI-based DSS has been helpful for maximizing resources and improving operational responses, while not overloading TMC staff.

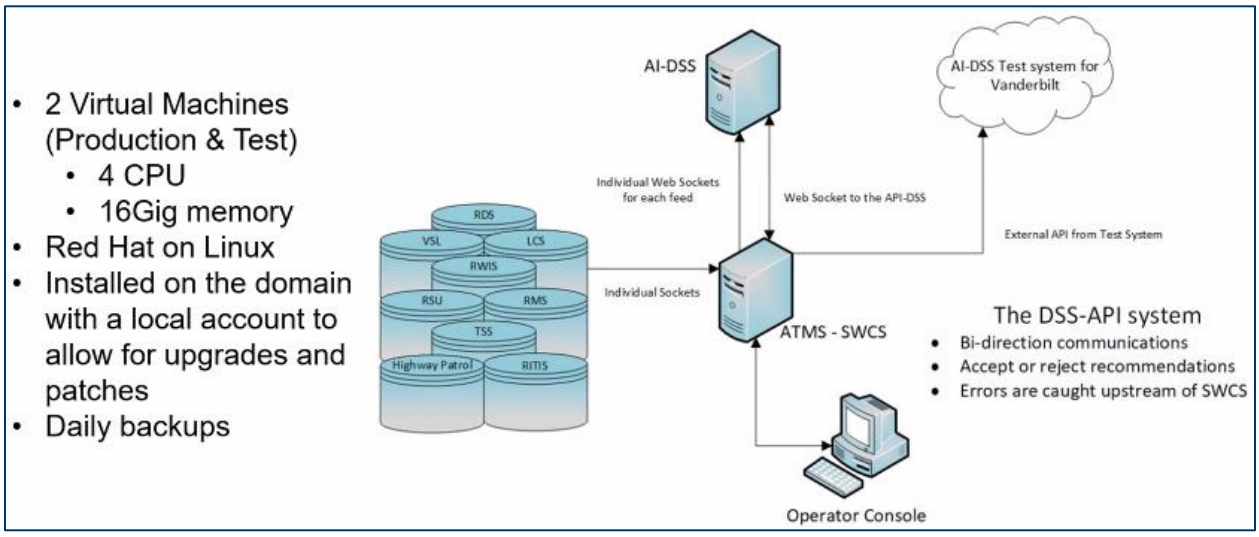

Figure 5. Tennessee's AI-based Decision Support System. Source: Tennessee DOT.[15]

3.3.3 Road Weather Management

A future use case for AI is road weather management. Automated classification of weather and road surface conditions could reduce the need for manual reporting (e.g., by snowplow operators) and improve operations and maintenance responses ranging from more responsive variable speed limit displays according to real-time conditions to better decision making for winter maintenance routes and treatment, leading to improved safety and mobility for broader areas.

Both Wyoming[16] and New York State[17] are conducting efforts to train AI to detect road weather conditions from camera images. In Wyoming, work has been conducted to train machine learning and deep learning models to classify both road surface conditions and weather conditions from still video camera images, such as those shown in Figure 6. New York State conducted similar work using images from cameras around the state. In both instances, more work is needed to improve accuracy, particularly when using images from locations not included in the dataset. Additionally, New York State noted improved accuracy by including additional data such as the number of days or hours since the previous precipitation.

Figure 6. Seven categories of weather used to train AI in Wyoming. Source: Wyoming DOT.[16]

3.3.4 Asset Management

AI can be used to support transportation asset management and understand asset condition as well. Many states conduct periodic scans of their roadway network to assess pavement condition with video analytics, and similar scans can be conducted to manage and assess roadway signing, guardrail, and other roadway assets. An example of AI conducting asset identification in support of asset management activities is shown in Figure 7.

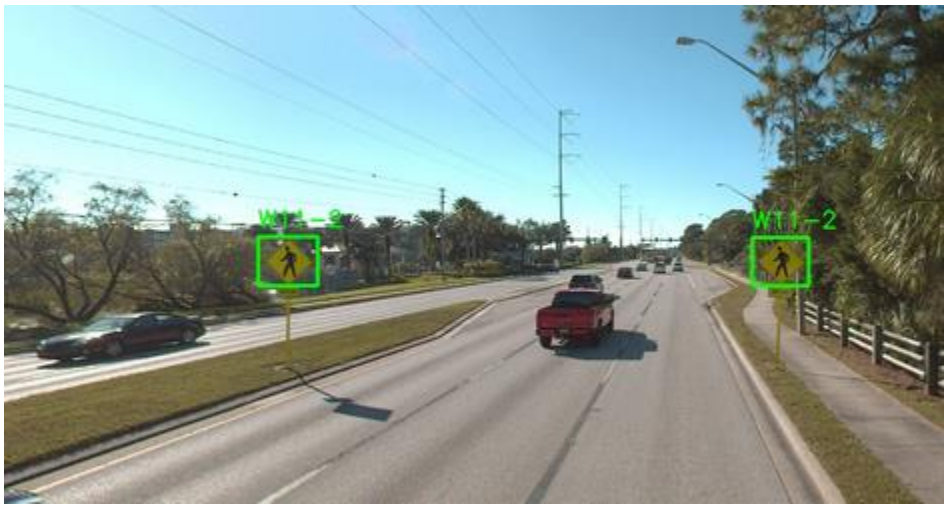

Figure 7. AI can Identify Road Signing in Support of Asset Management Practices. Source: iEngineering.[18]

Chapter 4: Available Resources

This section documents and synthesizes available national AI resources and summarizes state-level AI policies to document themes and additional considerations.

4.1 National AI Resources

This project was conducted over a presidential administration transition, where each administration had competing priorities. Given the transitory nature of politics at the Federal level, resources from both Democratic- and Republican-led administrations are included below for context and reference.

- The Biden administration issued an **Executive Order (EO) on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence**[19] on October 30, 2023, that includes eight overarching "guiding principles and policies", which provide contextual foundations for the use of AI. A subsequent fact sheet was issued with **Key AI Actions**[20] on April 29, 2024.

- On January 23, 2025, the Trump administration rescinded the Biden administration's EO on Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence and issued a new **EO on Removing Barriers to American Leadership in Artificial Intelligence**.[21] This EO directs administration officials to submit an action plan on AI within 180 days, directs agencies to revise any policies based on the former Biden administration's AI policies to fit the new guidance, and calls for the removal of any requirements that hampered companies or stifled innovation in the AI sector.

- The Congressional Research Service issued **Artificial Intelligence: Overview, Recent Advances, and Considerations for the 118th Congress**[2] in August 2023. This document may be used to guide legislative priorities into the 2025-2026 session of Congress. Current Federal laws are described, as well as risks and benefits of AI technologies and perspectives on regulating AI.

The USDOT ITS JPO has published several AI resources:

- **Artificial Intelligence (AI)-Enabled Intelligent Transportation Systems (ITS) Capability Maturity Model (CMM) and Readiness Checklists**[4] (2024) provides an AI-enabled ITS CMM as an approach for organizations to self-assess their strengths and weaknesses for incorporating and mainstreaming AI into their ITS programs and operational processes. This CMM provides a more rigorous assessment via comprehensive readiness checklists compared with CMMs developed by commercial technology companies. Specifically, a level zero maturity is included to represent organizations that have no awareness or capability within certain AI dimensions or subdimensions at this time, while a level 2 (out of 4) maturity denotes organizations that have made the proper steps to achieve AI-enabled ITS readiness but not yet deployed AI-enabled ITS solutions.

- **ITS Deployment Evaluation Executive Briefing: Artificial Intelligence and Machine Learning for Transportation**[13] (2021) provides a high-level overview on the potential of AI in ITS to enhance transportation safety, efficiency, and mobility, including examples of AI applications, benefits, and best practices.

- **Identifying Real-World Transportation Applications Using Artificial Intelligence (AI): Summary of Potential Application of AI in Transportation**[3] (2020) identifies broad categories of AI-enabled applications that can be applied to address specific transportation problems and needs and summarize existing and potential applications enabled by AI under each category based on a review of literature.

The **National Institute of Standards and Technology (NIST) AI webpage**[22] is a valuable resource for practitioners seeking information on AI. Specifically, NIST conducts research and promotes the use of AI in ways that can leverage the full benefits while managing and protecting against risks. In particular, available resources include:

- An **AI Risk Management Framework (RMF)**[9] to help mitigate risks and build trust into the design, development, use, and evaluation of AI products, services, and systems.
- NIST also has a **testing platform**[23] to help government agencies and small businesses evaluate developers' claims about the performance of their AI systems against cyber threats.

The Transportation Research Board (TRB) National Cooperative Highway Research Program (NCHRP) has several AI-related projects that are completed or underway.

- **NCHRP 23-16 Implementing and Leveraging Machine Learning at State Departments of Transportation**[24] (2024) developed research products on how to select and implement appropriate ML techniques, by identifying promising applications, assessing costs, benefits, risks, and limitations, and by developing a roadmap for an agency ML program that includes implementation best practices. Project activities included developing:
  - A literature review and state department of transportation (DOT) survey on ML state of the art and practice;
  - Case studies with five state DOTs;
  - Compiling illustrative available codes and tools for major use cases of ML;
  - A guide on how to select and implement appropriate ML techniques; and
  - An executive summary and presentation slides highlighting the ML opportunities.
- **NCHRP 23-12 Artificial Intelligence Opportunities for State and Local DOTs – A Research Roadmap**[10] (2023) provides strategic guidance for DOTs to develop guidance, policies, and standards, and ensure a knowledgeable workforce to effectively understand, develop, and apply AI solutions to improve operations and solve transportation problems (e.g., improving safety, alleviating traffic congestion, assisting in real-time systems management, accommodating connected/automated vehicles, preserving the infrastructure, improving organizational efficiency, and customer service).
- **NCHRP 07-34 AI for Transportation Systems Management and Operations (TSMO) Applications**[25] is in progress. Understanding that AI can process multiple-sourced, large-scale, real-time data to model system behaviors, predict traffic conditions, and evaluate system performance, which aligns with key functions of DSSs, this research will support state DOTs to select and deploy AI technologies in DSSs for TSMO applications. This effort will develop a guide, including implementation roadmaps, to help

state DOTs and other transportation agencies in developing and deploying next-generation, data-driven, and AI-enabled DSSs for TSMO applications, while assessing reliability and scalability of AI-based solutions.

- **NCHRP 23-46** **Impact and Opportunity of AI and Automation on the Transportation Workforce: Exploring Skill Gaps, Competency Requirements, Mindset Shifts, and Transportation Agency Strategies**[26] is a pending project. Understanding that transportation agencies need to understand and prepare for the transition of the transportation workforce into the era of combined AI and automation, this effort will research the impact and opportunities of AI and automation on the transportation workforce by exploring workforce skill gaps, competency requirements, mindset shifts, and strategies for transportation agencies. This effort will develop guidelines, actionable strategies, and materials for DOTs and other agencies to help understand, navigate, and succeed in the transformation of the DOT transportation workforce influenced by AI and automation.

4.2 State-Level AI Policies

This effort researched state-level policies related to AI, including those applied for all state agencies and those issued by the DOT itself. Identified policies are presented below and were used to inform considerations for AI that are presented in the next chapter.

4.2.1 State DOT AI Policies

Three AI policies were identified in this effort that were either developed by or apply to state DOT operations, as described below. Additionally, Minnesota DOT and Iowa DOT both have developed draft AI policies that have not yet been finalized and released.

- **Texas DOT (TxDOT) Artificial Intelligence Strategic Plan**[6] (2024). The AI Strategic Plan establishes a vision, principles, and roadmap to integrate advanced analytics and intelligent systems into TxDOT's operations and transportation system. The plan includes strategic priorities, use cases, best practices, and recommendations to guide TxDOT's adoption of AI over the next 3 years. The focus is on high impact applications that enhance human decision-making, streamline processes, and provide new insights from data.

- **Massachusetts Executive Office Enterprise Use and Development of Generative Artificial Intelligence Policy**[8] (2025). Guidelines that are intended to establish minimum requirements for the development and use of generative AI by Commonwealth Agencies and Offices. The goal of these guidelines is to foster public trust, support business outcomes, and ensure the ethical, transparent, and accountable development and implementation of generative AI technology by Commonwealth Agencies and Offices. This document includes principles that are largely based on the NIST AI Risk Management Framework.

- **Florida DOT Artificial Intelligence (AI) Policy**[7] (2024). (Note the policy is shown on slide 5 of a presentation.) This policy provides eight boundaries for how AI should be used at the Florida DOT in

order to be responsible, transparent, and ethical with human accountability. Boundaries emphasize keeping a human in the loop when AI is used, protecting information and safeguarding privacy, and transparency and disclosure for when AI is fully or partially used.

4.2.2 Enacted AI-Related State Legislation

A number of states have enacted legislation relating to various topics pertaining to AI. Table 2 presents enacted legislation that relates to these AI-related topics. Related resources include:

- A 2024 Council of State Governments article entitled "What Does AI Policy Look Like?"[27] provides additional details about the enacted legislation summarized by Table 2, and also provides a series of guiding principles for successful AI legislation.
- An interactive map[28] current as of June 7, 2024 by Bryan Cave Leighton Paisner provides a state-by-state look at AI legislation.
- A 2025 Center for Democracy and Technology article entitled "State Government Use of AI: The Opportunities of Executive Action in 2025"[29] provides links to executive actions taken by 13 states on AI to date (AL, CA, MD, MA, MS, NJ, OK, OR, PA, RI, VA, WA, WI), and identifies AI-related challenges and needs.
- The National Conference of State Legislatures Artificial Intelligence Policy Toolkit[30] includes a variety of resources about recent state AI policies and activities.

Table 2. Enacted Legislation that Relates to AI

Topic of Enacted Legislation	Intent of Legislation	Locations Enacted
Interdisciplinary collaboration	Ensure the design, development and use of AI is informed by collaborative dialogue with stakeholders from a variety of disciplines, typically by creating a task force, commission or similar.	IL, NY, TX, VT
Protection from unsafe or ineffective systems	Protect individuals from any unintended, yet foreseeable, impacts or uses of unsafe or ineffective AI systems.	CA, CT, LA, VT
Data privacy	Protect individuals from abusive data practices and ensure that they have agency over how an AI system collects and uses data about them. Abusive data practices include the inappropriate, irrelevant or unauthorized use or reuse of consumer data.	CA, CO, CT, DE, IN, IA, MT, OR, TN, TX, VA
Transparency	Ensure that individuals know when and how an AI system is being used.	CA, IL, MD, New York City
Protection from discrimination	Protect individuals from discrimination and ensure that AI systems are designed in an equitable way; this includes algorithmic discrimination, whereby an AI system contributes to the unjustified different treatment of people based on their race, color, ethnicity, sex, religion or disability, and more.	CA, CO, IL
Accountability	Ensure that those developing and deploying AI systems are complying with the rules and standards governing AI systems and are being held accountable if they do not meet them.	CA, CO, CT, DE, IN, IA, MT, OR, TN, TX, VA, WA

Chapter 5: Project Summary and Implementation

This ENTERPRISE Pooled Fund Study project was conducted to introduce agency practitioners to AI and facilitate understanding about how AI is being (and may be) applied to transportation operations, as well as the potential uses and considerations related to AI.

The term AI is inconsistently used and may not be universally understood by practitioners. For instance, the term AI may be applied for marketing purposes in ways that enhance the appeal and make a product seem more advanced and novel than it actually is. At the same time, the advances and rapid evolution of artificial intelligence (AI) makes it a hot topic of interest globally and in many industries. As with any new technology, the full extent of benefits and negative impacts remain unknown, despite many voiced advantages and risks by various stakeholders.

To help address this knowledge gap, this effort identified available AI-related materials, documented example use cases related to AI to provide considerations for policy and procurement of AI services, and provided definitions of AI and an explanation of AI types and sub-fields to help inform agency practitioners about AI.

5.1 Implementation

The research resulted in several resources that ENTERPRISE member agencies can use to help in considering, procuring, and implementing AI in transportation operations. This includes:

- A definition of AI and explanation of various sub-fields and types of AI to help provide policy recommendations for agencies to consider AI in transportation operations (Chapter 2)
- Considerations for transportation agencies interested in using AI in operations (Chapter 3).
- Example use cases of AI in transportation operations (Section 3.3).
- Available national AI resources, state-level AI policies, and enacted AI-related state legislation (Chapter 4).

Transportation agencies can implement the results of this research in several ways. Recommended implementation steps could include the following actions:

1. Distribute the report to agency decision makers and operators at ENTERPRISE agencies to inform their understanding of AI and potential ways to implement AI.
2. Support agency development of AI-related policies and plans.
3. Support the agency procurement of AI services.

Overall, the research conducted for this project can support ENTERPRISE member agencies' decisions for considering and procuring AI services to enhance transportation operations.

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