THE WHITE HOUSE
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AI ASPIRATIONS

An AI Aspiration for Transportation

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IMAGINE IF…

…. drivers on rural roads, construction workers on the job, freight operators on the interstate, children walking or biking to school, and people using wheelchairs to reach their destination were all safer on our roadways. Imagine if the U.S. transportation system could more quickly and proactively address safety priorities along with reducing the climate impact of transportation, maintaining resilient infrastructure, improving efficiency, spurring economic activity and opportunity, and ensuring system benefits are equitably distributed to all. With critically important safeguards in place to protect security and personal information, and to ensure equitable distribution of benefits and access to these new technologies to all users, AI can dramatically increase the capabilities and impact of transportation planners' ongoing efforts to address these complex and interconnected demands, starting with the most pressing issue of all – safety.

Today

The United States is grappling with a transportation safety crisis. The number of people killed on U.S. roads rose sharply over the last decade, rising to more than 40,000 lives lost annually since 2020. The hopeful news is that we've seen a downward trend in deaths over the past seven consecutive quarters, but so much work remains to get to zero. While many agencies at the state, regional, and local levels are doing groundbreaking work to address safety priorities, we must accelerate action.

Progress on transportation safety requires anticipating risk, instead of only tracking where fatalities and serious injuries occur; designing, planning, and implementing proactive solutions to meet multiple performance criteria; and scaling the most effective solutions at a national level. Today, most transportation professionals lack comprehensive data about our transportation system. Determining what, where, and how to make safety upgrades requires detailed information about the U.S. transportation system's complex needs, including infrastructure, vehicle speeds, traveler volumes, and the surrounding built and natural environment. Although various data about these elements is available, it is fragmented, siloed, proprietary, or expensive to obtain, and of varying quality, fidelity, and geographic reach. These data shortcomings often preclude the use of advanced analytical tools.

AI opens the door

By leveraging AI capabilities, we can dramatically accelerate the planning, design, and implementation of safety projects. AI has already demonstrated progress on tasks like large-scale data collection, data fusion, and data generation. AI is already in use in limited geographies and contexts to help identify, aggregate, anonymize, and map fine-grained data about our transportation system. From aerial images and dashboard camera feeds, to video and lidar sensors, researchers and private companies are already using AI to digitize transportation infrastructure and behavior information.

Specific AI models that support this work include computer vision, deep learning, complex pattern recognition, natural language processing, and large language models. From recognizing fixed objects like sidewalks and lane markings, to measuring the curvature of roads and the slope of curb ramps, to reading the parking restrictions or speed limits on signs, to counting the number of cars and people on a street, AI

tools that can sense, characterize, and locate infrastructure data are essential to this work. Industry has already created many robust mapping capabilities that support vehicle activity including navigation and automation features. Using these vast data resources while making sure that privacy is rigorously protected can help unlock the potential of AI for transportation planning and project prioritization.

Looking ahead, AI capabilities can transform raw data into new sources of useful information for transportation practitioners. Vehicle probe data, sensors, and video feeds can be combined with advanced analytic techniques to provide counts, speeds, and aggregated driving patterns of people in vehicles, on foot, riding bicycles and transit, or using micromobility or assistive mobility devices. As these more detailed capabilities grow, robust privacy protections will become more and more important. Synthetic data generated by AI, based on real counts and models, can help us predict traveler volumes and modes into the future, based on a variety of parameters. National-scale data generation would harness AI, leveraging sensing tools that collect raw data, and AI fusion tools to extrapolate and produce refined data sets that reflect a complete representation of what exists on the ground.

The work ahead

In order to execute on this AI Aspiration, a demonstration and pilot deployment of the data and tools would unlock practitioners' ability to plan and develop transportation safety projects, with co-benefits for climate resiliency, accessible mobility, economic growth, and equity. Potentially transformative elements could include:

1. Configure a secure database for a prototype "National Transportation Infrastructure Observatory" of U.S. roadway infrastructure and activity data. This platform would be designed and operated to support public and private use for proactive, network-scale planning and project prioritization. With datasets representing key features of the entire U.S. surface transportation system, practitioners in communities of all scales and contexts would have access to the information needed to unlock proactive, risk-based decision-making capabilities.

2. Demonstrate applications for transportation planning, analysis, and project prioritization. Establishing a national observatory of standardized data across the entire country would facilitate an ecosystem of app builders to develop analysis, prediction, and visualization tools, and integrate with existing planning and asset management tools. Federal R&D would draw on app contributors from across sectors—those at transportation agencies, planning and engineering firms, research and advocacy organizations, and software companies. Capabilities and insights from apps made for one purpose or jurisdiction would be highly translatable to communities across the country.

Potential Demonstration Applications could include:

Rural road safety: Transportation agencies need to be able to proactively identify high-risk curves and aggregated, anonymized driver behavior trends, among other hazards in rural settings. Analytics tools could determine a set of strongly correlating features that indicate high-risk road segments. Agencies would be able to prioritize among high-risk sites, develop a menu of applicable safety countermeasures, and suggest the highest-value combination of interventions based on available resources.

An AI-powered intersection safety toolkit: Computer vision models could turn existing aerial and street-level imagery of intersections into digital representations that include details like sidewalk width, crosswalk and bus stop locations, curb cuts, lane widths, parking spaces, street trees, and furniture. Sophisticated models fed by aggregated and anonymized vehicle probe data and location-based data, as well as camera and lidar data, could unlock granular network-wide movement counts, behaviors, and conflict areas across transportation modes. Aiding planner-led design interventions, apps using AI models would tap into national-scale datasets to match potential interventions to specific intersection risk profiles based on their

characteristics, helping to ensure safety and usability for all users, including those with mobility impairments and other disabilities.

Comprehensive network-level sidewalk analysis: These tools would help planners prioritize sidewalk investments across a range of uses including: adding a full network of pedestrian facilities to a mixed-use development that currently lacks sidewalks; ensuring all schools, transit stops, parks, and main streets are walkable by sidewalk within a neighborhood; and ranking the projected use that certain sidewalk investments would yield based on underlying land use data. A more sophisticated set of fixed and mobile lidar sensors could generate detailed information about sidewalk condition, cross slope, and obstacles that impact accessibility for people with disabilities and those using mobility devices, to prioritize improvements.

Using AI to identify project comparables at outset: With nationwide datasets in the observatory, planners and traffic engineers would easily be able to identify comparable examples of similar projects from other locations across the country to support their proposed projects, rooting planning and community engagement in data and outcomes from domestic, real-world examples.

Major hurdles and societal risks

Building the national transportation infrastructure observatory would require four major steps, each with its own challenges. It would require national data standards, methods to merge raw data from many different sources to create refined data, methods to validate that refined data, and a platform to serve the data layers for end users in the application ecosystem. The federal government is uniquely poised to convene the public, private, research, and non-profit sectors to complete these steps, leveraging AI capabilities at a national scale.

The national transportation infrastructure observatory and application ecosystem must protect individual privacy throughout. Any use of commercial vehicle or pedestrian count data would be aggregated and anonymized at the source to prevent reidentification. Data from existing sensors or operational camera feeds in the transportation system would leverage privacy-protecting approaches, such as edge computing, that only return aggregated information about volumes and speed across the system. Further, AI-tools would need safeguards and validation to ensure they do not reinforce existing biases and disparities. Algorithms that make predictions and inferences would be more easily validated when built upon widely available data.

A transformative national capability

The U.S. surface transportation system provides exceptional access and mobility, but currently it also contributes to serious injuries and fatalities. Every American has experienced the risks of our system. This effort could help give people safer access to the places they want to go by ensuring transportation professionals can leverage national datasets on transportation infrastructure, behavior, and context. This would give practitioners far better insight into these risks and, along with community input and vision, help guide them to prioritize transportation capital and operational projects that improve safety outcomes, as well as advance other important local and national goals.

Americans everywhere would benefit from projects in their communities that are guided by national-scale data to help inform planning, community engagement, design, and project prioritization, allowing practitioners to take proactive steps to solve safety and other priorities at a network-scale.