FACT SHEET

Current Status of Transportation Data Analytics and Pilot Case Studies Using Artificial Intelligence (AI)

RESEARCH PROJECT TITLE

NETC 20-2: Current Status of Transportation Data Analytics and Pilot Case Studies Using Artificial Intelligence (AI)

STUDY TIMELINE

May 2021 – December 2023

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MORE INFORMATION

https://www.newenglandtransportationconsortium.org/projects/netc-20-2/

The New England Transportation Consortium, a cooperative effort of the transportation agencies of the six New England States, funded this research. Through the Consortium, the states pool professional, academic and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation and maintenance of the region's transportation system.

Introduction

Data is becoming increasingly important to state Departments of Transportation (DOTs) for strategic and day-to-day decision-making. This project aims to (1) provide a clear and comprehensive picture to DOTs regarding their data assets and needs, data analytics, and other data practices related to Transportation Systems Management and Operations (TSMO); (2) offer strategic and practical recommendations to prepare DOTs for future transportation data analytics; and (3) conduct case studies using Artificial Intelligence (AI) and emerging data sources to improve TSMO.

Methodology

This research began with a comprehensive review of data and data sources, followed by interviews with domain experts. Based on the review and interviews, recommendations regarding transportation data analytics were provided. Three case studies were conducted to demonstrate how AI and data from advanced radar and thermal camera sensors, along with emerging sources, can help DOTs understand driver speed and lane-changing behavior on horizontal curves and prior to a highway work zone. The first case study focused on speed behavior on highway horizontal curves. The second case study investigated how drivers adjust speed and change lanes when approaching a work zone equipped with flashing speed limit signs and portable changeable message signs. The final case study integrated probe data and road inventory data to model speeding activities on horizontal curves and ramps at a network level.

Conclusions

Connected vehicles and mobile devices offer a maintenance-free option for DOTs to collect samples of detailed data elements, such as vehicle trajectories, at a large scale. Advanced roadside sensors complement such data by focusing on specific sites but covering all passing vehicles. AI and edge computing will continue to expand their footprint in transportation data collection, reduction, analysis, and inference, requiring DOTs to invest in workforce development. The three case studies illustrated the benefits of utilizing detailed vehicle trajectories collected by a portable platform and how datasets from various sources can complement each other, providing a comprehensive view of driver behavior to improve highway traffic operations and safety.

Implementation

The results can help state DOTs understand the current status and future trends of transportation data analytics and applications of AI, assisting them in making informed decisions related to data. The case study results can be extended to additional sites to confirm the preliminary findings in this research, which will guide DOTs in developing future work zone temporary traffic control plans and strategies to address speeding on curves and ramps.