

# RESEARCH SPOTLIGHT

## Project Information

**REPORT NAME:** Utilizing Video Analytics with Connected Vehicles for Improved Safety

**START DATE:** February 2021

**REPORT DATE:** January 2024

**RESEARCH REPORT NUMBER:** SPR-1738

**ESTIMATED CONTRACT COSTS:** \$320,000

**COST SHARING:** 20% MDOT, 80% FHWA through the SPR, Part II, Program

## MDOT Project Manager



### Michele Mueller

Connected, Automated and Electrification Manager  
MDOT Office of Intelligent Transportation Systems

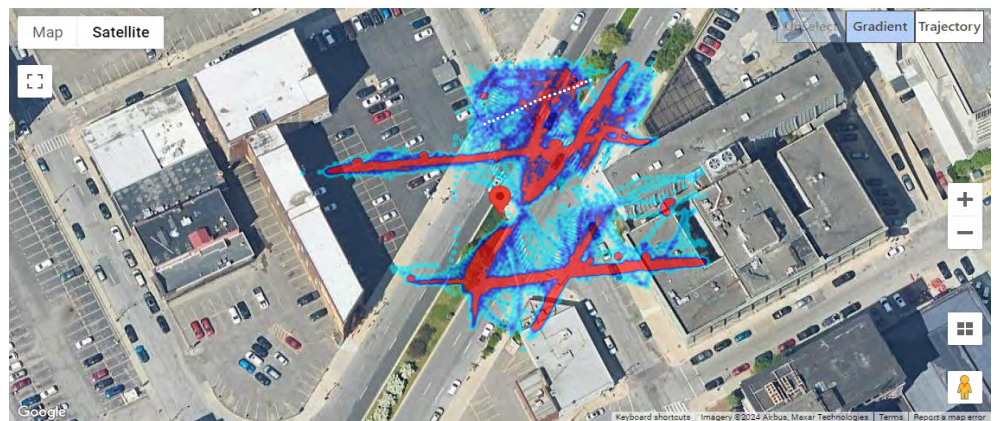
[MuellerM2@Michigan.gov](mailto:MuellerM2@Michigan.gov)  
248-431-1443

### RESEARCH ADVISORY PANEL MEMBERS:

Nathan Bouvy, Josh Carey, André Clover, Caitlin Day, Dawn Gustafson, Stephanie Palmer, Suzette Peplinski, and Aaron Raymond.

## Improving road safety with video analytics technology

An emerging technology that analyzes video information offers a possible solution for transportation agencies to monitor roadway locations that are at increased risk for collisions. Supplementing collision data already collected, these newer tools may also identify near-miss incidents, thereby increasing the amount and type of data available for agencies to use. The Michigan Department of Transportation (MDOT) evaluated these video analytics solutions to understand their current capabilities and then tested them in the field. Study results confirmed the potential value of video analytics to proactively address safety risks and provided guidelines for future assessment and use.



Video analytics can identify pedestrians walking outside of crosswalks, represented by the vivid colors of the heat map. The picture was captured by the Ouster Blue City data analytics platform.

### PROBLEM

To ensure people's safety and mobility on Michigan's roadways, MDOT continually evaluates new technologies for eliminating unsafe roadway conditions. MDOT currently analyzes incidents after the fact, but is not able to capture real-time data or immediately notify drivers of road conditions.

Moreover, lacking real-time information, MDOT cannot respond as quickly to mitigate road hazards. Newer video analytics tools may be able to collect and analyze real-time information while also pushing safety notifications to road users via connected vehicle (CV) technology and dynamic message signs (DMSs). Researchers undertook

*“MDOT is committed to proactively and efficiently address hazardous conditions on our roadways. Though still in development, video analytics technology shows promise in helping us to increase safety for all road users through real-time analysis of road incidents.”*

**Michele Mueller**  
Project Manager

a multistep analysis to evaluate whether the current state of these technologies can support MDOT’s safety priorities.

## RESEARCH

Evaluation of the video analytics tools encompassed a four-step process: a market assessment of existing vendors, development of use cases reflecting hazardous road scenarios, selection of locations to pilot the technology, and a field demonstration.

The market assessment sought vendors offering video analytics tools that use criteria to address MDOT’s highest operational priorities. First, the video analytics system would ideally provide real-time traffic data, including situations of increased risk. One topic of interest was the near-miss scenario, not measurable in collision statistics but a safety indicator for agencies. Second, the system would connect with responders, providing them with the latest road condition information. Third, video data analysis would allow traffic operations to warn road users of adverse conditions. Finally, the data would integrate with CV and DMS devices for driver alerts.

For a pilot demonstration of the available technology, researchers identified use cases that reflect common hazardous road scenarios involving vehicles, pedestrians, cyclists, and other road users. The 16 use

cases clarified process steps and participant roles. To pilot the technology, potential locations were selected that offered ample interactions between various roadway users.

The field demonstration was a partnership between the researchers and six technology vendors. In August 2023, the vendors deployed the equipment in portable trailers at an active intersection in downtown Detroit.

## RESULTS

The market analysis identified 14 video analytics vendors. Designed for traffic analysis, the systems and tools recognize hazardous roadway conditions, including near-miss events, and also provide data to traffic management centers to address incidents and determine road performance improvement. However, the study did not allow for the testing of real-time notifications to road users or for the integration with other connected communication technology, such as CV. But through the collaborative research partnership, the technology vendors received useful feedback about requirements that would further MDOT’s safety goals.

The pilot demonstration required adjustments to the original methodology due to the available field equipment so all six participating vendors received the same recorded video footage of the intersection to analyze. From this footage, they provided their data detecting different incidents of the use cases that they had been asked to identify. Analysis indicated the equipment’s ability to detect certain incidents, its accuracy and the number of missed incidents. The variability among vendor results prompted the development of recommendations for future investigations, such as uniform guidance for study metrics and careful placement of equipment based on vendor input.

## VALUE

Study results confirm the availability of video analytics tools that may be developed further to address MDOT’s safety and mobil-

ity goals. The vendor partnerships created through this research reveal a willingness on the part of technology developers to understand MDOT’s needs. The goal is stronger integration between real-time identification of road incidents and broader communication channels. It includes the ability to better assess where resources are needed for mitigation and the capability to deliver real-time updates through a more fully connected system of road users and transportation professionals. The outcomes and guidance recommendations can benefit future researchers as they explore additional uses for video analytics.

## Research Administration

### Principal Investigator

**Amanda Good**

Project Manager  
Kimley-Horn  
421 Fayetteville St., Suite 600  
Raleigh, NC 27601

[amanda.good@kimley-horn.com](mailto:amanda.good@kimley-horn.com)  
919-653-5849

### Contact Us

PHONE: 517-281-4004

E-MAIL: [MDOT-Research@Michigan.gov](mailto:MDOT-Research@Michigan.gov)

WEBSITE: [Michigan.gov/MDOTResearch](https://Michigan.gov/MDOTResearch)

### The final report is available online at

[MDOTjboss.state.mi.us/TSSD/tssdResearchAdminDetails.htm?keyword=SPR-1738](https://MDOTjboss.state.mi.us/TSSD/tssdResearchAdminDetails.htm?keyword=SPR-1738).

Research Spotlight produced by  
CTC & Associates LLC, September 2024.