Distributed by UW News Service, March 24, 2025

Link to original story: <https://uwm.edu/news/uwm-researchers-work-is-transforming-traffic-data-into-road-safety-solutions/>

**UWM researcher’s work is transforming traffic data into road safety solutions**

Written by Laura Otto

Every time you drive a vehicle, one aspect of your safety comes from something you have little control over – other drivers. What if risky driving behaviors could be tracked as they are happening and immediate warnings delivered to drivers nearby?

“The idea is that drivers may be able to take a defensive stance to avoid crashes if they could be alerted to risky driving in their vicinity,” said Tom Shi, an assistant professor of civil and environmental engineering at UWM. “Or police could discover where the most dangerous locations are and intervene.”

Members of Shi’s lab have completed the first step in a multi-pronged data science project aimed at improving road safety by analyzing video for predictive modeling.

Since he was looking for traffic data, Shi partnered with the UWM Police Department, which maintains a large network of surveillance cameras pointed at roadways all around the campus.

**Extracting answers from data**

The lab members began by collecting the incidence of risky driving behaviors on certain stretches of road or at intersections at various intervals. Then, they built a digital map of what happened using a detection algorithm they developed.

“We use deep learning methods to extract characteristics from vehicle footage, and these characteristics help us identify distracted driving behavior, such as using a phone or taking your eyes off the road,” Shi said.

A video of one of the researchers’ digital maps shows cars as 3D boxes moving along the street where pedestrians are visible, marked in yellow.

The algorithm provides the time-stamped location of the objects and their GPS coordinates, the object’s speed and the size of each – whether it’s a car, truck or even bike.

“Given all those parameters, we can use data science to answer questions like, “How often does speeding occur and under what circumstances?” Shi said. “The lab members assigned a score from the safest conditions to the worst scenarios. So, the algorithm is using the data to pick out the unsafe anomalies.”

**An unsafe pedestrian hotspot**

From traffic footage that spans Maryland Avenue from the Student Union to Edgewood Avenue, a long corridor that includes three intersections, the researchers have used the modeling to help them understand and analyze the interaction between the pedestrians and vehicles.

For example, Shi’s students developed a video that re-constructs traffic moving along Maryland Avenue in front of Hartford Elementary School from data collected by a camera mounted to the northeast corner of Lapham Hall.

The group found that drivers approaching the crosswalk there often follow the car in front of them very closely in order to avoid stopping when pedestrians are present. That leaves pedestrians wondering who will stop and who won’t.

**The final step**

Shi said his work includes both the data science needed to clarify traffic problems and the development and testing of new technologies to address them.

The final step in this project will be to create an intervention that would send out a warning of driving aberrations happening at a location in real time.

Although the warning product has not yet been created, one idea is an audible signal on a driving app, he said. The research has the potential to lead to new products.

Further in the future, for example, the warning product can leverage the existing cellular network. This technology is called cellular-vehicle-to-everything (C-V2X) communication.

“We do plan to install a C-V2X roadside unit at the Hartford-Maryland intersection,” Shi said. “Currently, it requires the vehicle to have a C-V2X onboard unit to receive the command we broadcast. In the future, this will be equipped on vehicles by the manufacturer.”