

research review

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Teaming Up Partnership enables analysis of traffic crash data

Even as vehicle-safety technology improves and seatbelt use continued to rise, the number of traffic fatalities in Michigan jumped ten percent last year, from 876 in 2014 to 963 in 2015, according to state data. In the coming months, UMTRI statisticians will analyze Michigan traffic-crash data to identify factors that may have played a role in the increase.

“Because crashes are influenced by so many different factors, it can be challenging to identify why things change from year to year,” says Carol Flannagan, codirector of the UMTRI Center for the Management of Information for Safe and Sustainable Transportation (CMISST). “Was it the weather? Are younger drivers driving more? Are there more bicyclists and pedestrians on the road? Was there more speeding or less belt use? All of these factors could play a role.”

The CMISST group will look closely at patterns in the data, including changes over longer and

shorter time periods. The statistical analysis of traffic-crash data is accomplished through an ongoing partnership between UMTRI researchers and the Michigan Office of Highway Safety Planning (OHSP).

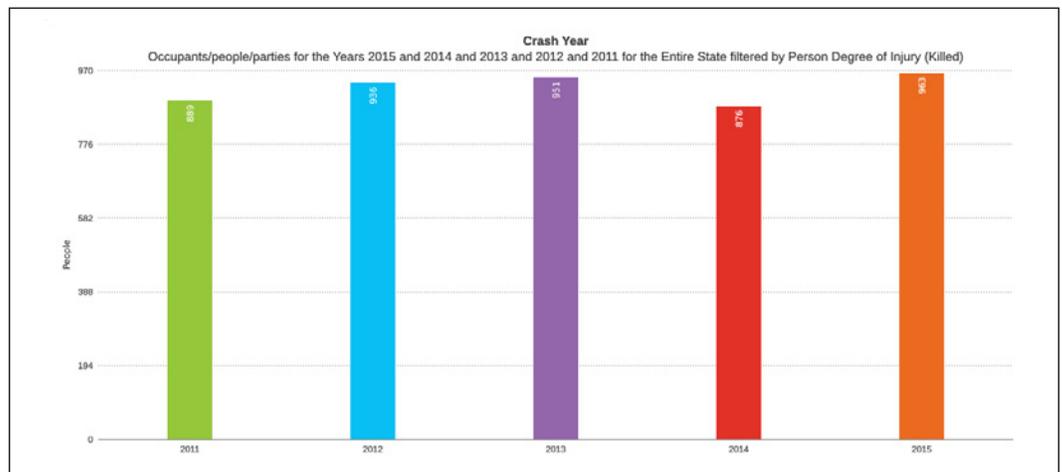
Looking for Patterns

Every spring, the OHSP receives crash data from the Michigan State Police Criminal Justice Information Center, which compiles the raw crash data based on individual crash reports sent in from police officers around the state.

Preliminary data released this year on May 9 reveals that alcohol-involved, bicyclist, teen, and motorcyclist traffic deaths were all up more than twenty percent. The largest increase was among bicyclist fatalities, up 57 percent from 21 in 2014 to 33 in 2015. [See sidebar.]

Once final data is released, the UMTRI CMISST team begins its work.

(Continued on page 2)



The bar chart shows five years of traffic fatalities in Michigan (2011-2015). Credit: CMISST

Teaming Up (Continued from page 1)

CMISST statisticians Patrick Bowman and Prabha Narayanaswamy divide their time between UMTRI and the Michigan OHSP to create and analyze traffic crash datasets. Bowman, in his third year of data analysis, gives an example:

“For instance, this year we might want to know why bicycle fatalities are higher. We could look at time of day, day of the week, or day of the month,” said Bowman. “We perform data queries and statistical analysis to see how many lives can be saved.”

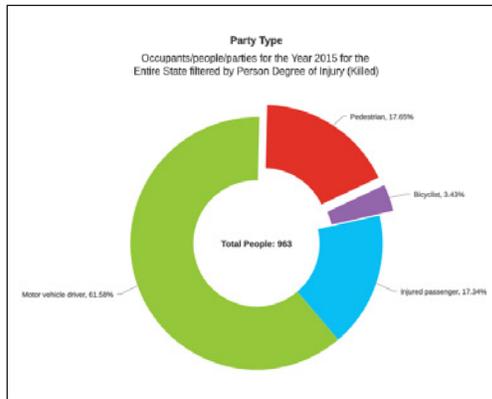
Flannagan puts it this way: “As a tool, statistics helps us distinguish real patterns of change from random variation. It also helps us isolate potential causes of the increase and point to possible interventions.”

Public Resource: Michigan Traffic Crash Facts Website

The CMISST team recently uploaded the 2015 traffic-crash data to the Michigan Traffic Crash Facts website—a valuable trove of crash datasets (going back to 2004) and other reports on Michigan crash data (going back to 1992). Best of all, anyone can use the website to query the data.

With funding from the Michigan OHSP, the CMISST team recently redesigned the website to be more easily accessible to users—including the public. The team consists of project manager Lisa Park, statisticians Bowman and Narayanaswamy, programmers Mauriat Miranda and Jared Karlow, and research technician Helen Spradlin.

Launched live at the Michigan Traffic Safety Summit in March, the restructured site is both a data query tool and a publication resource. All fact sheets, graphs, and tables have been redesigned to be more meaningful and useful



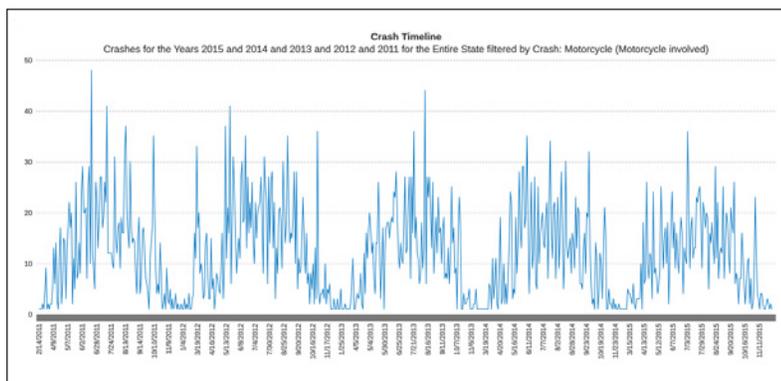
The pie chart shows 2015 traffic fatalities in Michigan by party type (motor-vehicle driver, injured passenger, pedestrian, and bicyclist), with vehicle drivers and injured passengers grouped to represent motor-vehicle occupants. Credit: CMISST

to police officers, state and local officials, as well as the public. Overall, the site is more intuitive to users and is now mobile friendly.

“We are pleased to see that a number of other states provide open crash data on the web, but we think MTCF is the most user-friendly tool out there,” said Flannagan. “MTCF has been voted Best Traffic Website in 2005, 2007, 2010, 2012, and 2014, every time we were allowed to enter the competition. Having a user-friendly tool is not just a gimmick but encourages and enables everyone to work with the data and to use it to answer their particular questions.”

Next steps are to add framework data to help users look at specific road sections or mile markers, making it easier to pinpoint the exact location of crashes. The work supports the goal of identifying causes of traffic crashes, mitigating the risks and, ultimately, saving lives. 🚗

To access the website, visit Michigantrafficcrashfacts.org



The timeline contains all motorcycle crashes in Michigan over a five-year period and shows the seasonality of motorcycle crashes. Credit: CMISST

Preliminary traffic-crash data was released on May 9 by the Michigan State Police Criminal Justice Information Center. Among the data:

- ▶ Bicyclist fatalities increased 57 percent, from 21 in 2014 to 33 in 2015.
- ▶ Motorcyclist fatalities were up 29 percent, from 107 in 2014 to 138 in 2015.
- ▶ Alcohol-involved fatalities were up 28 percent, from 236 in 2014 to 303 in 2015.
- ▶ Drug-involved fatal crashes spiked 19 percent, up from 150 in 2014 to 179 in 2015.
- ▶ Teen traffic deaths (ages 13–19) were up 23 percent, from 80 in 2014 to 98 in 2015.

Despite increase in nearly all areas, fatalities involving commercial motor vehicles dropped 19 percent, down from 105 in 2014 to 85 in 2015.

In other areas:

- ▶ Pedestrian fatalities increased 15 percent, from 148 in 2014 to 170 in 2015.
- ▶ Cell-phone-involved crashes increased 13 percent, from 666 in 2014 to 753 in 2015.
- ▶ Deer-involved crashes increased 3 percent, up from 45,690 in 2014 to 47,001 in 2015.

“There are a lot of socio-economic and environmental variables that can affect these numbers, including the economy, gas prices, changes in travel habits, weather, as well as driver behavior,” said Michael L. Prince, director of the Michigan Office of Highway Safety Planning.

Source: Michigan Office of Highway Safety Planning, http://www.michigan.gov/msp/0,4643,7-123-72297_64773_64776-384421-,00.html

Driver-Distraction Research:

Important for parents to model safe driving behavior

A panel session on distracted driving at the 2016 Michigan Traffic Safety Summit featured research conducted by UMTRI's Young Driver Behavior and Injury Prevention Group (YDBIP).

Led by UMTRI research professor Ray Bingham, the YDBIP group partnered with Toyota Motor Sales USA, Inc., in a 2012 study that revealed a significant correlation between parent and teen driving-distraction behaviors, suggesting that parents play an influential role by the type of driving behavior that they model.

“Children look to their parents for a model of what is acceptable,” said Bingham.

“Parents should know that every time they get behind the wheel with their child in the car they are providing a visible example that their child is likely to follow.”

As part of the study, UMTRI and Toyota researchers surveyed more than 2,600 newly licensed U.S. drivers ages 16-18 and nearly 3,000 parents of drivers in this age group, including 400 pairs of teens and parents from the same households, during August and September 2012. They found that parents who more frequently engage in driving-distraction behaviors have teens who engage in distracting behaviors more frequently than other young drivers.

A key finding, however, is that what teens think their parents do while driving has a greater impact on teen behavior than what parents actually report they do. For example, if a teen's parent reports dealing with passenger issues while driving, the teen is twice as likely to do the same. But if a teen thinks his or her parent deals with passenger issues while driving, the teen is five times more likely to do so themselves.

Likewise, if a teen's parent reports looking for something in the vehicle while driving or reports eating or drinking while driving, the teen is twice as likely to do the same, but is four times more likely if he or she thinks his or her parent looks for something in the vehicle while driving and three times more likely to eat or drink behind the wheel.



Credit: Photo courtesy of UMTRI Young Driver Behavior and Injury Prevention Group

“Overall, teens think that their parents engage in distracted driving behaviors more often than may be the case, which may allow them to justify certain high-risk behaviors behind the wheel,” Bingham said.

Another major finding from the study is that parents may underestimate how much their teens text while driving. More than a quarter of teens (26 percent) read or send a text message at least once every time they drive, although only 1 percent of their parents said their teen did this.

The study, sponsored by Toyota's Collaborative Safety Research Center, was designed to shed new light on frequently discussed driving risks and to identify effective recommendations to help keep teens safe and help parents serve as more effective driving role models. It also looked at a range of risk factors that receive less public attention, but pose great risks on the road, as well as the role parents and peers play in encouraging distracted-driving behaviors.

“Driver education begins the day a child's car seat is turned around to face front,” said Tina Sayer, CSRC principal engineer and teen safe-driving expert. “As the study shows, the actions parents take and, by extension, the expectations they set for young drivers each day are powerful factors in encouraging safe behavior behind the wheel. Seat belts and good defensive driving skills are critical. However, the one piece of advice I would give to parents to help them keep newly licensed drivers safe on the road is to always be the driver you want your teen to be.” 🚗

Source: Adapted from “Driver Distraction: Do as I Say, Not as I Do (or What You Think I Do)” by Bernie DeGroat, Michigan News, 2012, <http://ns.umich.edu/new/releases/21000-driver-distraction-do-as-i-say-not-as-i-do-or-what-you-think-i-do>

Evolution of the UMTRI Library

The UMTRI Library established itself early in UMTRI's history as one of the world's leading collections of literature on highway safety.

The collection reflected the multidisciplinary nature of UMTRI research and provided access to books, articles, conference papers, research reports and other "grey literature" on vehicle dynamics, driver behavior, crash-data analysis, occupant protection, and a whole range of related disciplines.

The collection still holds many documents that can be found nowhere else. However, the UMTRI Library has followed the trend toward the curation of digital content that so many research libraries have followed, particularly those connected with major universities. After fifty years in operation, the UMTRI Library has moved its print collection to an offsite storage facility.

Although the books are not in the building, they are still accessible upon request. According to Bob Sweet, UMTRI's

information resources manager and head of the library, "We remain as committed as ever to connecting our researchers and the broader transportation-research community with the information resources they need, wherever they can be found and in whatever format. The services we provide are still paramount. The digital environment in which we now operate provides unprecedented access to materials to support research."

The UMTRI Library space is being developed to serve a variety of constituents and purposes. As a flexible, multiuse, collaborative information center, it will be used for large and small meetings and workshops, helping to further UMTRI's commitment to education and expanding the impact of our research. 📖



Dynamics of Heavy-Duty Trucks

Thirty-six people attended the 2016 professional certificate program Dynamics of Heavy Duty Trucks, held May 16–19 at the University of Michigan.

The course is offered through the U-M College of Engineering, Integrative Systems & Design.

Several UMTRI researchers are among those who teach the course every year and also serve as guest lecturers, including senior research specialist Steve Karamihas, associate research scientist David LeBlanc, senior research scientist emeritus Chris Winkler (pictured), senior research scientist emeritus Paul Fancher, and research professor emeritus Tom Gillespie (retired).



The three-part course reviews the fundamentals of vehicle dynamics, examines details of truck components and their properties and then merges these

two subjects to reveal the special dynamic behavior of heavy truck systems.

Much of the information in the Dynamics of Heavy-Duty Trucks course is based on research from the U-M Transportation Research Institute. Since 1965, UMTRI has been the leader in research, testing, and innovation of heavy vehicles and heavy vehicle safety. Current heavy-truck research areas include cab ergonomics, crash causation and countermeasure analysis, heavy-vehicle rollover, rollover protection for hazardous-materials tank trucks, and stability-control systems. 📖

For more information, see <http://isd.engin.umich.edu/professional-programs/dynamics-of-heavy-trucks/index.htm>

Liu: Next Generation Traffic Control

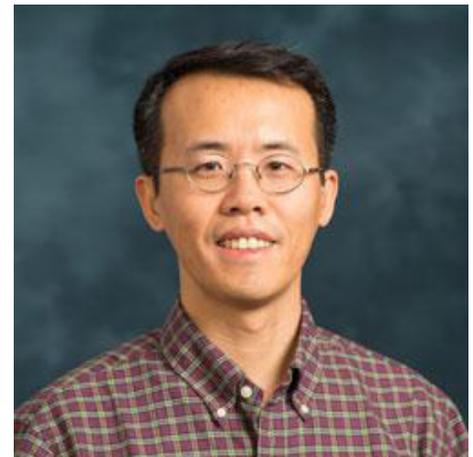
Henry Liu, UMTRI research professor and professor in the U-M Department of Civil and Environmental Engineering, presented research on next-generation traffic-control systems on June 2 as part of the UMTRI Speaker Series, cosponsored by the ATLAS Center.

Liu discussed the opportunities and challenges for traffic control systems in managing a varying percentage of connected and automated vehicles. Liu and his team work with the massive data set collected from the UMTRI-led Safety Pilot Model Deployment project and Ann Arbor Connected Vehicle Test Environment, both supported by USDOT.

Using connected-vehicle data, Liu is interested in finding ways to develop detector-free signals. He explains that instrumentation and maintenance of traditional, infrastructure-based vehicle-

detection systems is costly, so most of the traffic-signal systems in the field are being retimed every two to five years. Connected-vehicle technology has the potential to eliminate the need for vehicle detectors and makes traffic signals detector-free, which will significantly reduce their operational cost.

Liu says the length of the transition period from the present time—with a variety of mixed vehicles, many of which are not connected, to a future where nearly all are connected or automated, and intersections are signal-free—is uncertain.



However, he adds, it is important for both traffic-management agencies and the traffic-control industry to understand what might be happening during the transitional process and how we can better prepare and facilitate the transition. [M](#)

Murphey: Personalized Route Prediction

Yi Lu Murphey, associate dean for graduate education and research and professor in the Department of Electrical and Computer Engineering at the University of Michigan – Dearborn, presented research on personalized route prediction on April 28 as part of the UMTRI Speaker Series, cosponsored by the ATLAS Center.

Professor Murphey is actively involved in funded research in the areas of machine learning, computer vision, and intelligent systems with applications to engineering diagnostics, optimal vehicle-power management, text data mining, and robotic vehicles.

Murphey's presentation addressed personalized route prediction as an important technology in many applications related to intelligent vehicles and transportation systems. Current route

prediction technologies used in most navigation systems are often based on either the shortest or the fastest route-selection strategies.

Route prediction for personal travel has become a challenging big-data problem, as trips are getting longer and variations in routes growing. It is particularly challenging for real-time in-vehicle applications, since many embedded processors have limited memory and computational power. As an alternative to this process, Murphey



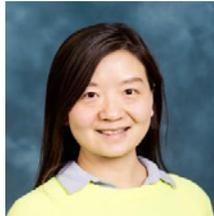
presented a machine-learning algorithm for modeling route prediction based on a Markov chain model, and a route-prediction algorithm based on a probability-transition matrix. [M](#)



UMTRI Faculty Promotions

Three UMTRI faculty promotions were approved at the May 19 meeting of the U-M Regents. The following promotions are effective September 1, 2016:

Shan Bao, assistant research scientist in the Human Factors Group, has been promoted to associate research scientist. Bao's research interests



focus on driver-behavior modeling, driver distraction, naturalistic-driving-data analysis and driver-simulator study. Specifically, she has developed models of driver following and lane-keeping behavior using statistical and methodological techniques. She has also performed extensive analyses of various naturalistic driving databases to identify driver-behavior patterns and to identify predictors of crashes and near crashes that can be associated with different driver populations. 

Carol Flannagan, associate research scientist in the Biosciences Group, has been promoted to research associate professor. Flannagan is



codirector of UMTRI's Center for the Management of Information for Safe and Sustainable Transportation (CMISST). Her research interests include ergonomics in automotive design and crash-database analysis. Specifically, Flannagan has developed models of driver-selected posture and position in passenger vehicles using statistical and methodological techniques that uniquely apply to modeling occupant accommodation. She has also performed extensive analyses of various crash databases to identify injury patterns and trends and to identify predictors of injuries in different types of crashes. In addition, she often provides statistical expertise to other UMTRI divisions. 

Jonathan Rupp, research associate professor in the Biosciences Group, has been promoted to research professor. Rupp also holds



positions in the Department of Biomedical Engineering, and the Department of Emergency Medicine. He is codirector of UMTRI's Center for the Management of Information for Safe and Sustainable Transportation (CMISST). Rupp's research involves innovative uses of transportation datasets and combinations of transportation datasets to assess the performance of vehicles and safety systems; development of tools to enable broad access to transportation datasets and automated generation of user-defined data subsets; characterizing human response and tolerance to impact loading; and developing tools that safety engineers can use to assess the performance of occupant-protection systems. 



The Road to Autonomous Vehicles

UMTRI director Jim Sayer was among the featured speakers at a May 6 conference hosted by Macomb Community College's Center for Advanced Automotive Technology in Warren, Michigan.

Highlighting the conference theme, "The Road to Autonomous Vehicles," speakers discussed the many legal, insurance, and cybersecurity concerns that must be addressed by industry and government before full implementation of autonomous vehicles can occur. Sayer's presentation addressed the infrastructure requirements of automated- and connected-vehicle technology.

The conference was geared toward automotive-industry workforce-development representatives, secondary and postsecondary automotive educators,

counselors and school administrators, as well as representatives from government agencies and automotive professional associations.

Keynote speaker was Jeff Klei, president, NAFTA region, for Continental Automotive Divisions. His remarks addressed the current state of the auto industry, including why connected and automated technology in vehicles is one of the most exciting areas of new technology.

In addition to the keynote address, three "Tech Talk" sessions discussed the challenges, infrastructure needs, and



cybersecurity of automated and connected vehicles.

The conference was cosponsored by the Center for Automotive Research (CAR) and the Design and Manufacturing Alliance (DMA). 



UMTRI In The News

Vehicle automation: Most drivers still want to retain at least some control

<http://ns.umich.edu/new/releases/23935-vehicle-automation-most-drivers-still-want-to-retain-at-least-some-control>

Switch cars, help save the planet: Column

<http://www.usatoday.com/story/opinion/2016/03/24/climate-change-reducing-emissions-residential-vehicles-fuel-efficiency-column/82158748/>

Ann Arbor Vehicle Test Environment

<http://www.freep.com/story/money/cars/2016/04/13/toyota-ann-arbor-employees-technology/82977876/>

Road less traveled: Teens aren't in a hurry to get driver's license

<http://www.nbcnews.com/nightly-news/video/road-less-traveled-teens-aren-t-in-a-hurry-to-get-driver-s-license-648305219744>



Upcoming Events

ITS America 2016

June 12–15; San Jose, California
www.itsa.org

Powertrain Strategies for the 21st Century

July 20; Ann Arbor, Michigan
<http://umtri.umich.edu/who-we-are/research-groups/automotive-futures>

Applied Human Factors and Ergonomics

July 27–31; Walt Disney World, Florida
www.ahfe2016.org

CAR Management Briefing Seminars

August 1–4; Traverse City, Michigan
www.cargroup.org

Transportation Planning and Air Quality Conference

August 4–5; Minneapolis, Minnesota
<http://register.extension.iastate.edu/2016tpaq>

ITE Annual Meeting and Exhibit

August 14–17; Anaheim, California
<http://www.ite.org/annualmeeting/>

Innovations in Transportation Conference

August 16; Ames, Iowa
<http://intrans.iastate.edu/events/innovations/index.cfm>

Meeting the Challenges of Safe Transportation in an Aging Society

September 14–15; University of Michigan
www.ATLAS-Center.org

UMTRI Transportation Safety Research Symposium

October 6; University of Michigan
www.umtri.umich.edu

European Transport Conference

October 5–7; Barcelona, Spain
<http://etcproceedings.org/>



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UMTRI's Strategic Intent

To be the leader in transportation systems research integrating vehicles, people, and infrastructure to achieve a highway transportation system where:

- ▶ Fatalities and injuries are eliminated
- ▶ People and goods flow efficiently
- ▶ Reliance on nonrenewable energy is reduced

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