

# Catalyst



Accelerating the pace of transportation innovation

SEPTEMBER 2019

RESEARCH  
CONFERENCE

page 2

SMART  
BRIDGES

page 3

EDUCATION  
ACTIVITIES

page 4

SUMMER  
INTERNSHIPS

page 5

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## Taxing ride-hailing services: a framework for state and local governments

Shared mobility is transforming transportation in major urban cities. Ride-hailing services such as Uber and Lyft are popular and growing rapidly, but they also create challenges for policymakers and planners, especially in transportation decision making.

In response to these new challenges, state and local governments are regulating ride hailing

*Ride hailing continued on page 6*

## Examining EMS response to vehicle crashes in American Indian reservations and communities

In American Indian reservations and communities, motor vehicle crash (MVC) fatalities remain a serious concern. Vehicle crashes are one of the highest causes of injuries to American Indian and Alaskan Native populations, and their MVC fatality rate is the highest of any US ethnic or racial group.

To understand and address this high-stakes issue, an exploratory study conducted by Roadway

*EMS continued on page 7*



# CTS research conference looks at urban governance, 'aerotropolis' model of development



The annual CTS Transportation Research Conference will be held November 7 at the Graduate Minneapolis Hotel on the U of M east bank campus. The opening plenary and luncheon presentations are described below, and registration information is available on the event web page.

## Opening Session: Transport and Urban Governance in a Platform-Driven World

Many of the challenges governments and transport authorities grapple with today stem from a broader restructuring of our economy and governance systems driven by private-platform technologies. And these challenges are not entirely new: long before the emergence of digital communication technologies, cities faced questions about how to regulate private-sector innovation in providing public services.

In this presentation, Kevin Webb will explore what we can learn from the history of airline and utilities regulation—as well as retail and consumer finance platforms—and how these lessons can help us manage

emerging digital layers of the public realm.

Webb co-directs SharedStreets, a nonprofit organization that builds tools for public-private collaboration around transport data. Blending technology and policy, SharedStreets is building standards, digital infrastructure, and governance models to support new ways of managing and sharing data about transport systems.

Following Webb's presentation, a panel of Minnesota leaders and experts will share perspectives on managing digital data in today's complex transportation industry.

## Luncheon: Aerotropolis—Shaping Transportation and Regional Development into the Future

Major airports have become key nodes in global production and enterprise systems, offering speed, agility, and connectivity. They are also powerful engines of local and greater metropolitan regional development, attracting aviation-linked businesses to their environs and beyond. The

"aerotropolis" is an urban form where cities are built around airports speedily connecting time-sensitive suppliers, manufacturers, distributors, and business people to distant customers, clients, and marketplaces.

This presentation by John Kasarda will feature the aerotropolis model, its economic rationale, and how it can bring competitive advantages to firms and municipalities in the Minneapolis-Saint Paul region and to the entire state. Illustrations of successful aerotropolis development elsewhere in the world will also be detailed. Concluding the presentation will be a unique video on what a future Minneapolis-Saint Paul aerotropolis might look like in terms of transportation infrastructure and coordinated commercial development.

Kasarda is an academic and airport business consultant focused on aviation-driven economic development. He is the director of the Center for Air Commerce at the University of North Carolina's Kenan-Flagler Business School, the CEO of Aerotropolis Business Concepts LLC, an airport-economy consulting firm, and the president of the Aerotropolis Institute in China.

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for links to research reports and other resources.

## Smart bridges provide data to help keep them healthy



Lauren Linderman had just graduated from college in St. Louis with her bachelor's in civil engineering when the I-35W bridge collapsed in 2007, making international headlines. Little did she know that a decade later, she'd be conducting cutting-edge research in Minnesota on how to increase infrastructure safety—including monitoring the replacement for that very bridge.

Linderman, an assistant professor in the Department of Civil, Environmental, and Geo-Engineering, is one of many faculty members working on smart technology. She discussed her research and its implications in the summer 2019 issue of the College of Science and Engineering's *Inventing Tomorrow* magazine.

Linderman studies smart technology applications in two broad categories: monitoring the stability and performance of structures and buildings, and limiting their response—in hopes of minimizing injury and damage—in catastrophic events like earthquakes. She scrutinizes measurements from hundreds of sensors on the I-35W bridge to glean indications about what kind of changes it's undergoing, potential implications of those changes, and how future bridge design could improve even more.

She's collaborating with Professor Carol Shield on the bridge-monitoring

project. The sensors, placed in 2008 by the Minnesota Department of Transportation, measure responses like acceleration (or vibration), strain, temperature, and displacement.

"There are other structures that have used this technology, but I think this is the only structure where we've had sensors on there since inception that are still operating," Linderman says. "That's been really interesting, because it's allowed us to look at confirming some design considerations."

One such consideration is called "creep." As Linderman explains, "Concrete creeps. In lay terms, what that means is that under constant load, it will continue to get shorter with time. That's really hard to model accurately. Here we were able to capture the long-term creep of the structure over the first 10 years, which is when the majority of the creep happens."

Linderman and Shield believe their analysis suggests that after a decade, the I-35W replacement bridge isn't quite done creeping—a subtle revelation that wouldn't have been accessible without current technology and a growing knowledge of how to deploy it.

The stress on bridges in places with wildly variable temperature and humidity is greater, Linderman says, and the task of monitoring them more complex.

In a related project, Linderman is examining sensor selection and

placement—trying to discern what's the most efficient and cost-effective way to use available smart technology.

"Longer term, our goal is to incorporate the reliability of the sensors into where you put them," she says. "By that I mean, what if a sensor fails? Do I also want something [another sensor] that's redundant?"

Through her work, Linderman often imagines some of the smart tools that don't yet exist.

"There are still sensors that I think would be exciting to develop," she says. "Corrosion sensing [for bridges] is probably the holy grail. One of the big concerns with concrete structures is if the rebar is corroding, or the prestressing strand is corroding, you can't see it." Instead, engineers rely on a complicated process of deduction. "If you could detect that," she added, "that would be pretty cool."

*(Adapted with permission from CSE Inventing Tomorrow, summer 2019; written by Susan Maas; photo by Rebecca Slater.)*

# Camps give students firsthand look at opportunities in transportation



*NSTI students toured the Minneapolis–Saint Paul International Airport.*

CTS helped middle and high school students explore a wide range of transportation topics—from automated vehicles and drones to roadway construction and bridge design—in a series of camps and activities held at the U of M this summer.

In July, CTS hosted 31 campers in our fifth year of the National Summer Transportation Institute (NSTI). This free two-week program, open to students entering grades 7–9, aims to attract a diverse range of students to education and potential careers in transportation. The camp is funded by

the Federal Highway Administration and administered by the Minnesota Department of Transportation (MnDOT).

This year's cohort explored a number of transportation facilities and projects across the Twin Cities during their field trips to the Minneapolis–Saint Paul International Airport, Mississippi Watershed Management Organization (MWMO), Metro Transit, Hennepin County Public Works, CHS Port of Savage, and I-35W MnPASS construction project. These visits offered our campers a behind-the-scenes glimpse of transportation in action and allowed our partners to introduce the next generation of the workforce to key concepts and career opportunities.

"We have found this group to be really fun, inquisitive, and engaged," says Abby Moore, training and community learning specialist at MWMO, which has hosted NSTI tours for the past three summers. "As an organization, we are committed to supporting environmental career exposure and development. For young people who are exploring careers in transportation, it is really important to demonstrate how urban infrastructure and land-use choices ultimately impact water quality and habitat."

In their on-campus and classroom

sessions, NSTI students toured the U of M's bike and pedestrian infrastructure, learned about the dangers of distracted driving from UPS Road Code, got an up-close look at drones during a demonstration by Braun Interotec, and explored how GPS helps make automated vehicles work in an activity led by mechanical engineering research fellow Brian Davis. In addition, campers worked together on a group bridge-building project that was showcased at the camp's closing ceremony.

"My child literally loved all parts of camp so it's hard to pick just one [favorite activity]," one parent said. "She loved the field trips and experiences, learning from the experts and camp staff, and hanging out with kids from all over the metro and from different backgrounds."

CTS also hosted a session for another NSTI camp in July. Eight high school girls participating in the program offered by Red Lake Nation College visited the U of M, where they heard from a transportation career panel featuring members of WTS Minnesota, experimented with MnDOT's bridge-in-a-bag activity, and tried their hands at design in an AutoCAD lesson.

In other summer programs, Brian Davis introduced more students to automated vehicle concepts. In June, he conducted his GPS activity, which included using smartphones to find GPS coordinates on campus, for 25 ninth-grade girls in the Eureka! Program. This partnership between the U's College of Science and Engineering and YWCA Minneapolis helps girls explore STEM-related careers and prepare for next steps in their education.

In August, Davis led a more advanced session for 25 high school students in Discover STEM, a week-long summer camp offered by the U of M's College of Science and Engineering. Students in this camp learned about both automated vehicles and human factors; activities included calculating GPS distances and accuracy, watching a demo of a small automated vehicle, and taking a spin in the HumanFIRST Lab's driving simulator.



*Red Lake NSTI students completed MnDOT's bridge-in-a-bag activity.*

# MnDOT intern takes engineering from Navy seas to Minnesota roads

“The magnitude of serving in the military—and now being a student—is hard to comprehend,” says former US Navy Petty Officer Second Class and University of Minnesota civil engineering senior Deven Leidall. “I sometimes have to remind myself I was in the military and deployed because of all the changes in transitioning from military to civilian life.”

This summer, Leidall participated in the Civil Engineering Internship Program, a partnership between CTS and the Minnesota Department of Transportation (MnDOT) that gives students hands-on professional experience to help them prepare for careers in transportation. Now in its eighth year, the program had 17 interns, including 12 from the U of M.

For Leidall, the MnDOT internship is an opportunity to draw from his education in civil engineering and his experience as a Naval nuclear machinist mate to design metro area roadways, crosswalks, and sidewalks.

“I have learned a lot about how and why our sidewalks and roadways are built the way they are, from where people stand when waiting to cross a road to designing roadways to discourage illegal U-turns,” he says. “The main idea is to create an aesthetically pleasing, highly functional and safe path from the start of a project to the end.”

But there are distinct differences from Leidall’s six years spent as an enlisted sailor maintaining and operating a nuclear reactor and his civilian life now as an intern and a full-time U of M student.



*Deven Leidall (front) and the other MnDOT interns touring an I-35W construction site*

“The [nuclear] reactor was 24/7. It’s what pushes the ship through the water and produces electricity,” Leidall says. “It was a lot of pressure knowing something you do to the reactor could affect so many people on and around the carrier.”

Leidall says his two grandfathers, who served in the Navy, inspired him to join the military as a way to see the world. While he was deployed in the Persian Gulf for nine months in 2014, he says his role as a training petty officer was focused on combat readiness for the sailors in his division.

“There were so many perks that happened throughout my military career I would have never experienced if I hadn’t joined,” Leidall says. “I’d do it all again if I had the chance—joining the

Navy, going to the U of M, and taking this internship.”

“I definitely think I’m a different student now than if I had come here right after high school,” Leidall says, adding that he always knew the U of M would be where he’d continue his education. “It felt like home for me, and I always saw it as the best school—and I wanted to shoot for the best.”

Leidall plans to continue his work at MnDOT during the coming school year and, following graduation, seek a master’s degree at the University or apply for the MnDOT graduate engineer program.

*(Adapted from an article written by Meagan Pierluissi.)*



## Ramsey County interns focus on transportation for all

Six students, including three from the U of M, participated in the second year of the Ramsey County All-Abilities Transportation Network Internship Program this summer. The program, a partnership with CTS, specifically focuses on the county’s vision of a transportation network that equitably accommodates all users.

This year, interns pursuing degrees in majors ranging from civil engineering to geography worked on projects across several Ramsey County departments, such as Public Works, Public Health, and Active Living. Student highlights included participating in public engagement events, cataloging the county’s bicycle and pedestrian network, implementing a new asset management program, and conducting traffic studies at future construction sites to aid in project design.

and imposing a variety of taxes and fees on service providers and users. In a new study, U of M researchers analyzed these taxes and fees in cities across the US.

“We particularly focused on those revenue strategies levied on ride-hailing usage, which generally are on a per-trip basis, as these have a direct impact on users,” says Jerry Zhao, professor in the Humphrey School of Public Affairs and the study’s principal investigator.

“The consensus, though, is that ride-hailing services are more likely to contribute to more miles traveled in vehicles,” Zhao says.

Changes in transportation in turn have implications for state and local public budgets, but there is limited information to date. To help meet this need, Zhao’s team analyzed three main aspects of ride-hailing revenue strategies. First was the usage of the

times—could help planners increase vehicle occupancy and reduce traffic congestion,” he says.

Last, the researchers examined the rationales for imposing a revenue-raising strategy, the perceptions of key stakeholders, and media discussions. According to the study, a common reason to tax ride-hailing companies is to help offset losses from other modes, such as the decline of transit ridership.

Most debates around the adoption of the revenue-raising strategies involved the legislative and executive branches of governments at different levels, ride-hailing companies, taxi businesses, users, and others. Supporters argued that the measures would contribute to customer safety and more equitable transportation options for all residents, while opponents stated concerns about the disproportionate impact on the middle class and low-income populations.

“Our findings provide a framework of current practices to help state and local governments make informed decisions regarding taxes and regulations,” Zhao says. He adds that there is no statewide regulation in Minnesota.

Others on the research team were Humphrey School research associates Camila Fonseca and Raihana Zeerak.



The study was funded by the U’s Transportation Policy and Economic Competitiveness Program.

Previous research has looked at the transportation impacts of ride-hailing services, with inconclusive results. For example, some studies say these services complement public transit, while others find they reduce transit ridership and revenues. Other studies see fewer trips by private vehicles and taxicabs and less congestion, but others observe non-driving trips (such as biking and walking) switching to ride hailing.

revenues. “The majority of localities use them as a mechanism to cover regulatory costs or fill budget gaps,” he says.

“Very few use the proceeds to improve transportation systems and mobility overall.”

Second, the team analyzed the different pricing systems used by localities. Most adopted a fixed fee or surcharge paid per trip; only two localities established differential fees depending on the type of ride. “Setting tiered rates—perhaps charging more for long-distance trips and peak travel

Revenue strategies include **fixed-rate charges**

per trip or per passenger.

The average

**PER-TRIP CHARGE IS**

**37 CENTS.**

## Register for our course on ethics in professional engineering

Are you a licensed engineer or certified planner who needs to meet your training requirements related to professional ethics? Sign up for our fall course focused on commonly encountered ethical dilemmas in professional engineering

and their appropriate solutions.

The course will be held November 19, 2019, from 8:00 a.m. to 10:00 a.m. at the St. Paul Student Center Theater on the U of M’s St. Paul campus. It meets the ethics-related requirements for

engineers (2.0 PDHs) and planners (1.5 AICP Certification Maintenance credits) to renew their credentials in Minnesota.

For more information or to register, visit [cts.umn.edu/events/ethics](https://cts.umn.edu/events/ethics).



Safety Institute (RSI) researchers considers one potential factor in the high fatality rate: the quality of emergency medical services (EMS) for MVCs in American Indian reservations and communities.

“Tribal transportation professionals have said that exploring the role of EMS in the high motor vehicle fatality rate in their reservations and communities is a high-stakes priority for research,” says Kathy Quick, an associate professor with U of M’s Humphrey School of Public Affairs and one of the study’s principal investigators. “In response, we conducted a national survey of transportation safety specialists from tribal governments, first responders, and other key stakeholders who serve reservations and American Indian communities to better understand the EMS issues from the perspectives of people who have valuable knowledge and experience with these issues.”

To generate their findings and recommendations, researchers analyzed

the responses of 189 study participants. This included assessing factors related to the quality of EMS response as well as comparisons between perceived EMS quality for American Indian reservations and communities compared to the surrounding areas. After performing the data analysis, researchers discovered three key findings with recommendations.

First, researchers found a bottleneck at the initial stage of activating EMS response. “When we asked if cell phone signal was adequate for 911 calls, only 42 percent of respondents agreed,” says Guillermo Narváez, founder and principal at Proxemic Insights and study co-investigator. “Because a 911 call is usually the first step in activating EMS response to a motor vehicle crash, with all subsequent steps hinging on this step, this bottleneck is all the more troubling.”

The second key finding was elevated EMS challenges in the Pacific Northwest and Alaska. In these areas, the time to

transfer MVC victims to emergency rooms on average exceeded the “golden hour” that is so important for survival and good outcomes following a traumatic injury. Lastly, researchers found greater optimism among transportation specialists who work for tribal governments. “We found that study participants from tribal governments consistently had more optimistic views about roadway safety and the ability of EMS to adequately respond to emergencies in reservations than study participants without tribal government affiliation,” Quick says.

The team says additional research is merited on dispatch issues in reservations, EMS response times in the Pacific Northwest and Alaska, and differing perspectives between roadway safety stakeholders who are and are not affiliated with tribal governments. In addition, the researchers recommend identifying examples of productive interjurisdictional coordination.

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RESEARCHERS EXAMINE  
**EMS RESPONSE**  
to crashes in  
American Indian communities.

page 1

**CTS RESEARCH  
CONFERENCE**

looks at  
urban governance, regional development.

page 2

Smart bridges  
provide data to help keep them

**HEALTHY.**

page 4



**Taxing ride-hailing services: a framework  
for state and local governments.**

page 1