

NTC Information Highway

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The Nebraska Transportation Center's Information Highway newsletter keeps you up-to-date on the latest in transportation research, news, and events happening right here at NTC. Information Highway is about big ideas, students with big potential, and NTC's big impact on transportation in Nebraska, and beyond.

Fall 2019



Huong Pham at the 5th International Conference on Geotechnics, Civil Engineering Works and Structures in Hanoi, Vietnam.

COE Travel Award Sponsors Ph.D. Student's Research Trip to Hanoi, Vietnam

NTC's Huong Pham, PhD student and Graduate Research Assistant at the University of Nebraska-Lincoln, received one of the fall 2019 travel grants from the College of Engineering. The award requires applicants to be enrolled in a MS or PhD program in UNL's College of Engineering and must be a first-author on a technical poster or paper for a remote conference or meeting to be presented there. Huong was able to use the fellowship towards her CIGOS (Congrès International de Géotechnique - Ouvrages - Structures) conference trip in Hanoi, Vietnam.

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The 2019 CIGOS, held from October 31 to November 1, provides an international platform where researchers, practitioners, policymakers, and entrepreneurs can present recent advances and exchange their knowledge and experience on the theme of innovation for sustainable infrastructure. Submitted papers are reviewed by relevant experts before being chosen to present at the conference and are automatically submitted to the book series “Lecture Notes in Civil Engineering”.

Huong’s paper, titled “[Review of Unmanned Aerial Vehicle \(UAV\) Operation and Data Collection for Driving Behavior Analysis](#)”, examines the use of UAVs for transportation data collection with an emphasis on their use for speed behavior analysis, gap acceptance, and merging behavior. Her presentation focused on the challenges and opportunities when using UAVs for data collection in developing countries with specific applications to Vietnamese conditions.

In addition to attending the conference, Huong visited Hanoi University of Transport and Communications (UTC). There she attended the Leader Board meeting where her advisor Dr. Rilett discussed potential partnerships with university leadership. The meeting was attended by the Vice Chancellor of Hanoi UTC as well as the chairmen in the Department of Technology and Science Development, Department of International Cooperation, and the Department of Civil Engineering of Hanoi UTC. This was a great opportunity as it allowed Huong to meet some key personnel she might work with as part of her dissertation project.

During her trip Huong toured the Drone research lab at Hanoi UTC and discussed potential collaboration as part of her PhD. She got an in depth look on their work with the DJI Phantom 4 for Highway traffic data collection. The Vietnam government has had successful investments with traffic safety research in recent years and Huong is looking forward to future research collaborations with Hanoi UTC.



Top: Ms. Huong uses the DJI Phantom 4 drone outside of the Drone research lab in Hanoi, Vietnam.

Bottom: Ernest Tufuor.



Best Paper Award Presented to Ernest Tufuor at 2020 TRB Meeting

Transportation System Engineering PhD student and NTC research associate Ernest Tufuor was the first author on a paper that received the 2019 Best Paper Award from the Transportation Research Board (TRB) Committee on Highway Capacity and Quality of Service. The paper was chosen from the top-ranked papers accepted for publication in TRB. After being presented to the committee at the 98th TRB annual meeting in 2019, “[Validation of the Highway Capacity Manual Urban Street Travel Time Reliability Methodology using Empirical Data](#)” was selected as the best paper.

The 6th edition of the Highway Capacity Manual (HCM-6) predicts travel time reliability by using historical data of weather and volume fluctuations with empirical data, such as a volume count for one day, to provide users with average travel time for a traffic facility over an extended period of time. The research goal is to validate the

HCM-6 urban street reliability methodology by comparing the distribution variation and the mean travel time values to those received from a Bluetooth travel time data set over a set period of time.

There was a gap in literature on testing the HCM-6 methodology and the project goal was to create a method for examining the prediction technology. When comparing the mean of the predicted HCM-6 travel time distribution and the mean of the Bluetooth empirical distribution, results found there were minimal practical differences, but significant statistical differences. The HCM-6 estimated distribution had considerably less variation than the empirical distribution, and the HCM-6 model underestimated the travel time reliability metrics, that is the buffer index and planning time index.

At the end of the research, two augmentation strategies were proposed for the HCM-6 methodology. Those would be calibrating the model to local conditions and allowing for disaggregate input data. Work on the specifics of these strategies is currently ongoing. At the completion of the study, it is expected to provide ways to reduce estimation errors in the HCM-6 methodology and guide HCM-6 users to understand the sensitivity of the methodology to the type of data inputs.

Ernest would like to acknowledge his advisor, Dr. Laurence Rilett, on his supervision of this research, the City of Lincoln for access to data, and NTC staff members Amber Hadenfeldt and Madison Schmidt for their editorial work. Ernest and Dr. Rilett were presented the award certificate at the Washington D.C. TRB meeting in January 2020.

Nebraska Department of Defense Project Offers Challenges, Experience, and Graduate Success

Santos Ramos, a Ph.D. graduate student at the University of Nebraska-Lincoln, finished his dissertation project summer 2019 with the Nebraska Department of Defense. In his last step towards graduation he presented and defended the project early August to his advisor Dr. Laurence Rilett, and professors Dr. Aemal Khattak and Dr. Albert Ratner.

The project's goal was to create a software model using SimTraffic/Synchro 9 that the Department of Defense (DOD) can use to simulate changes in Entrance Control Facilities (ECFs) to improve their effectiveness and efficiency. The product is used to analyze traffic behavior and capacity. The DOD can use the models to simulate changes that could be made to improve the efficiency and effectiveness of ECFs.

Santos has been working on the project since the summer of 2017, as the project was starting phase four. He worked with micro and macrosimulation and statistical analysis to achieve the desired result. This was the first time Santos worked with SimTraffic/Synchro 9 and after grasping the program he learned to push it past the limits, since it wasn't made to monitor ECFs. The software was primarily chosen out of DOD request, since it already had their certificate of networkiness.

Santos gave credit to Dr. Rilett for showing him that just doing the basics was not enough, and it paid to go further. As advisor, Dr. Rilett would check Santos's work, making sure the numbers made sense and the template behavior looked correct. With an extra eye on the project Santos could make sure the project was always focused on DOD's original goal.

Share your News with NTC!

If you are a student, faculty member, or other affiliate of the Nebraska Transportation Center, we are eager to share news of your work and accomplishments.

Send your information to Madison Schmidt at mschmidt24@unl.edu, and it could appear in the next issue as well as NTC's [website](#), [Facebook](#), and [Twitter](#).

He also got to see the side of researching that is not discussed in classes, that is working with a client. Rather than research for research's sake, the project is done to produce an end result for the sponsor of the project. This requires regular meetings and a time constraint to make sure the project is on track. There were four to five meetings a year with advisor Dr. Rilett and two engineers from DOD in attendance. Santos learned to confidently present the work that had been done and explain the next steps.

UNMC collaborated on the project, using their facilities to conduct driving behavior tests by creating in the lab what was proposed in the simulations to see what the situation would look like in real life.

The greatest things he took away from the project was learning how to conduct research that makes an impact, and being able to assess a proposal to know whether it is significant or not. "It's cool that their actually going to be using this" Santos says with great anticipation of the finished product. DOD was happy with the project, and Santos suspects it is already in use based on their enthusiasm for its implementation.

Santos Ramos.





Student Attendance Best Yet at Annual LOCATE Meet and Greet

MATC partners with Lincoln-Omaha-Council Bluffs Association of Transportation Engineers (LOCATE) every year for a meet and greet between its members' organizations and transportation engineering students. This was one of our best turn outs with the booths staying busy for the duration of the meet and greet. Open to graduate and undergraduate students, many NTC participants were present to speak to companies and organizations that conduct research and business with similar interests. Word continued to spread beyond NTC to all transportation related classes at UNL, with the result a large attendance of interested students.

The meet and greet was comprised of companies, including MATC, at tables in Whittier that showcased their production in research and outreach, and their influence in the community in general. Overall there were 10 Nebraska organizations, plus the Iowa Department of Transportation. Many of the companies participate as sponsor organizations during the MATC intern program, and some students that would later be a part of the 2019 summer program first met their sponsors at this event.

LOCATE encompasses the counties of Washington, Douglas, Dodge, Sarpy, Cass, Saunders, and Lancaster in Nebraska and Mills and Pottawattamie in Iowa. It is made up of professionals in the public and private sector that specialize in transportation related fields. The organization, established in 2005, is dedicated to professional development and connection within the member group, but also takes participation in outreach with academia and the safe driving campaign.

After the meet and greet students were invited to attend the LOCATE annual meeting on site. At the meeting, Steve Ingracia from the Nebraska Department of Transportation presented on a variety of topics concerning LOCATE, including INFRA Grant Application, Electric Vehicle Accommodation, and Recent Flooding. It gave the students a chance to get an inside picture on LOCATE as a transportation research and information sharing organization they may take part of in their future.



Top: Students, companies, and organizations mingle together and make connections.

Bottom: Steve Ingracia gives his presentation to a room packed with students and organization representatives.

Five Students Win National Eisenhower Award

In Fall 2019 five graduate students, each conducting research at the Midwest Roadside Safety Facility (MwRSF), were awarded a Dwight D. Eisenhower Transportation Fellowship. The award is merit based with 150-200 winners annually, making five from the same university a significant acknowledgement.

Applicants, enrolled in any accredited U.S. Institution of higher education, must be pursuing a degree in a full-time program in a transportation-related discipline and have at least one full year remaining in their studies. Winners are selected through a competitive process including a national selection panel and university panels.

MwRSF sponsors many transportation projects headed by UNL graduate students. These five students are part of projects dealing with guardrails, bridge rails, and test vehicles. Under advisor Dr. John Reid, Ryan Bickhaus is developing guidelines for a flaring approach to guardrail transitions away from the traveled roadway. Michael Sweigard is working on the Development of a V2I Guidance System with advisor Dr. Cody Stolle, and Kellon Ronspies is working with Dr. Stolle on MASH Test Vehicle Selection. The prize will go towards the students' individual projects.

Throughout their time at UNL, the grad students have been developing specificity and interests towards their future careers. Jacob DeLone, currently working on the development of a MASH

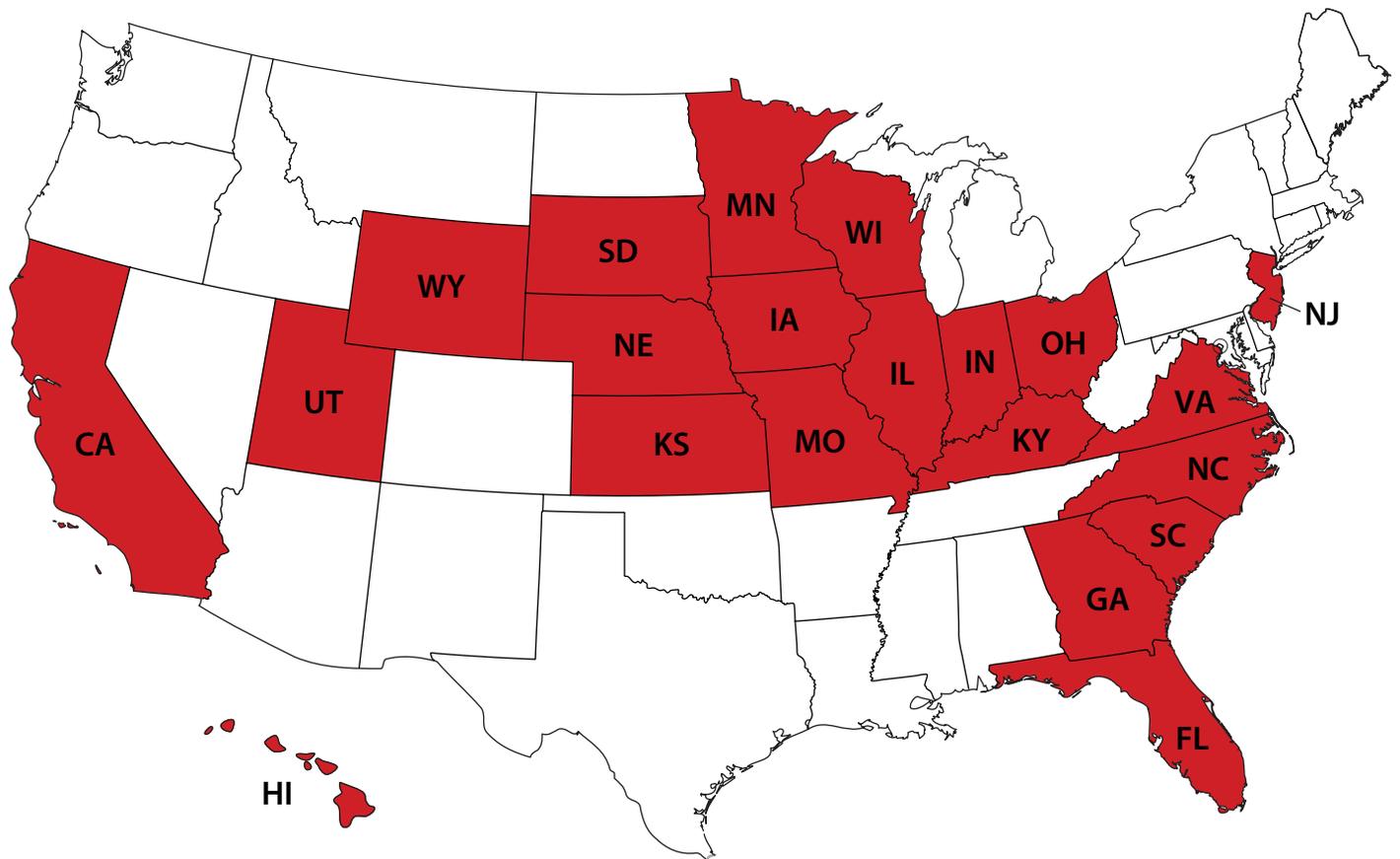
TL-4 open concrete bridge rail at MwRSF, plans to work as a bridge engineer upon graduation on either highway or railway bridges, utilizing his specialization in structural engineering design and analysis. Ricardo Jacome has spent much of his graduate career developing a V2I guidance system and would like to continue to work at a research institute upon graduation, possibly with the Department of Transportation or other federal agencies.

The students detailed why they chose UNL, saying the professors and opportunity to work and research at MwRSF were major factors. Jacob says "I knew that at the graduate level these professors' teaching styles would ensure I develop into a talented and well-rounded engineer, and I would say it definitely has." The students credit MwRSF researchers and advisors Jennifer Rasmussen (Schmidt), John Reid, and Cody Stolle for the opportunities and guidance generously offered that will lead to their bright careers in transportation.

The five students are currently pursuing Master's degrees. Jacob is pursuing a degree in Civil Engineering, while Ryan, Ricardo, Michael, and Kellon are pursuing Master's in Mechanical Engineering. Ryan and Ricardo are also past Eisenhower winners, and all the students attended the Transportation Research Board (TRB) conference in January 2020 to network and learn from professionals in the industry.

From left to right: Jacob DeLone, Ryan Bickhaus, Ricardo Jacome, Michael Sweigard and Kellon Ronspies.





Nationwide Roadside Safety Research Headed by Midwest Pooled Fund Research Program

As an integral part of the Midwest Pooled Fund Research Program, Midwest Roadside Safety Facility (MwRSF) has been a leader in the development of crashworthy safety structures across the United States. The program meets twice a year, one webinar and one in person, to review progress on existing research and discuss projects for the upcoming fiscal year.

The Midwest Pooled Fund Research Program, administered by the Nebraska Department of Transportation, is a collaborative program between state Departments of Transportation (DOTs) and MwRSF dedicated to sponsoring roadside safety research. The program is able to address roadside safety needs of the state DOTs and solve problems of similar interest, standardizing safety features across state borders.

The program has seen tremendous growth since its beginning in 1990. The first year started with three member states and three projects, with a little over \$150,000 in funding. Now, at year 29, there are 21 member states and eight projects with over \$1.25 million in funding.

Midwest Roadside Safety Facility conducts all the research efforts funded through the program. The SAFER Barrier for use on motorsport speedways is one of MwRSF's most notable achievements, along with the MASH three beam bullnose median

terminal. They conduct safety performance evaluations of various roadside features, such as bridge and road barriers, while developing new and innovative design concepts and hardware technologies for use along U.S. and international highways and road ways. The projects result in detailed research reports and are often published in refereed journals and presented at national meetings and conferences.

A recent project is the developing, testing, and evaluation of the Midwest Guardrail System (MGS), the strong-post W-beam guardrail system that increases safety for impacts with higher center-of-mass vehicles while providing the same level of safety for smaller vehicles. This was an update to the standard 27 in. and 27 ¾ in. high W-beam guardrail systems and are recommended by the federal highway administration and installed across the United States.

The Midwest Pooled Fund Research Program has many benefits to members including addressing and prioritizing safety topics critical to member states, collaboration opportunities with an extensive group of professional researchers, and service on key transportation research committees and panels. Most important, with 21 states focused on safety for their roads, the innovative researchers at MwRSF are able to provide a safer environment for drivers nationwide.

Dr. Khattak Leads Two Projects for Nebraska Department of Transportation in 2020

Dr. Aemal Khattak, a professor of Civil Engineering and transportation expert at the University of Nebraska-Lincoln, is investigating two research projects sponsored by the Nebraska Department of Transportation (NDOT) expected to be completed in 2020. NDOT has made safety a priority when it comes to the daily experiences of Nebraskans, much as UNL researchers have made safety a key part of their research. The first project, titled Research on School Zone Safety, investigates motorist speeds in school zones. School zones are areas designated by flashing lights at elementary and sometimes middle schools requiring motor vehicle drivers to slow down beyond the usual speed limit, thus providing a safer walking environment for children. Motorists must obey the lower speed limit on the sign “when flashing” for 30 minutes in the morning and 30 minutes in the afternoon when the school day begins and ends.

As part of the project, the research team led by Dr. Khattak collected motorist speed data around 18 schools along with other pertinent information on the characteristics of the streets, schools, and observed motor vehicles. These schools represent a variety of conditions in terms of speed limit reductions (e.g., reduction from 35 mph to 25 mph, 40 mph to 25 mph, 30 mph to 15 mph, etc.), whether or not a school is visible from the street, presence of a fence around a school, and where loading and unloading zones are in relation to the street. All of these factors could affect motorists’ speeds in school zones.

Since collecting data at these schools, the research team is in the data analysis stage of the project. The NDOT, City of Lincoln traffic engineers, and others are being consulted as the project moves forward to ensure appropriate recommendations on motorist speed limit guidelines in school zones.

The second project, Nebraska Rail Crossing Safety Research, has two main goals: to update the NDOT rail crossing crash prediction model and to assess uniformity in driver expectancy with respect to traffic safety measures at rail crossings in Lancaster County, Nebraska. The rail crossing crash prediction model is used for screening rail crossings for further safety investigation. However, the current model is based on crash data from the 1990’s. Since then there have been significant changes in rail crossing characteristics such as train and vehicular traffic, signage, etc. Consequently, crash characteristics have changed and there is a need to update the model to provide better crash predictions. Currently the research team is assessing the latest crash and rail crossing inventory data that will be used for the update.

Some rail crossings in Lancaster County are designated as “Quiet Zones”, where oncoming trains are not required to sound horns, thus reducing noise pollution. Supplemental Safety Measures (SSMs) are put in place at such rail crossings to compensate for the reduced safety that may result from lack of horn sounding. However, rail crossings in proximity of quiet zones that are not designated as such usually do not have SSMs. This disparity among crossings in relative proximity can potentially violate motor vehicle driver expectancy and lead to unsafe conditions. In consultation with NDOT and the Lincoln/Lancaster County Railroad Transportation Safety District, the research team is in the process of assessing different rail crossings in terms of uniformity with respect to SSMs and will provide recommendations on improving safety at rail crossings in Lancaster County to NDOT and the Lincoln/Lancaster County Railroad Transportation Safety District upon project completion.





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