Transportation Institute

North Carolina Agricultural and Technical State University

CATM Sponsored Research

Evaluation of Web-Based Driving Feedback for Teens and Their Parents

Teen drivers are some of the most vulnerable of all road users. In the past, driver education and on-the-road, real time monitoring systems have proven to be useful in improving teen driving safety. However, there is one catch. The success of any program has hinged on parental involvement.

Dr. Sheila "Charlie" Klauer, a research scientist and leader of the Training Systems Group in the Division of Vehicle, Driver, & System Safety at Virginia Tech Transportation Institute and an associate professor in the Industrial and Systems Engineering Department at Virginia Tech, designed a study to determine if researchers can create a program that improves teen driving and safety without relying so heavily on parental involvement.

With the assistance of graduate student and Lab and Research Specialist, Joshua Radlbeck, Klauer is collaborating with General Motors Company (GM) to be able to incorporate and access OnStar data for the project. OnStar is a subsidiary of GM that provides subscription-based communications, in-vehicle security, emergency services, turn-by-turn navigation, and remote diagnostics systems. It collects detailed information about driver behavior.

Improving Air Mobility in Emergency Situations

Emergency situations in aviation can pose serious risks to life and result in huge compounding negative impacts on air mobility, causing, in turn, significant economic and reputation loss to airlines and airports. However, the decisions to deal with emergencies are usually made by local flight dispatcher personnel according to their specific experiences. Unfortunately, oftentimes, these employees make decisions that can have national repercussions considering local-view optimization only — without taking the larger picture into account. Therefore, there is an urgent need to design and implement a decision-making assistant system to alleviate the negative impact of local specific disturbances to aviation air mobility on a broader global level.

In this project, researchers are working to develop a framework based on machine learning that uses the recorded patterns of past

Improving Air Mobility in Emergency Situations *(continued from page one)*

emergency situations to guide and facilitate fast and accurate decision making in the event of an emergency which optimizes operation schedules for maximum air mobility efficiency at both the micro- and macro-level. The long-term goal of the project is to develop a pre-alert and decision-aid system for passengers and airport staff to use in an emergency that assists in the quick recovery of functional air mobility with the least disruptions.

Embry-Riddle Aeronautical University Assistant Professor of Data Science, Yongxin (Jack) Liu, Ph.D., is the lead project investigator for the study which began in October 2021, and is expected to conclude at the end of this summer. With the help of students, the data collection phase of the study is complete, and the data has been analyzed using deep learning to predict resulting traffic volume and delays due to local emergency events. Researchers are currently using a virtualized airspace system, Blue Sky air traffic simulator, to train reinforcement learning agents to perform airspace reconfiguration and emergent air route rescheduling by integrating varying information along with an acceptable amount of decision latency. (*above left: Yongxin Liu*)

The scientists had to resort to using a simulated scenario because the dataset for emergent air situations is limited and insufficient to train complicated neural networks. "The lack of availability of data sets, benchmark models, and data sharing protocols shows the air mobility domain still needs a lot of infrastructural work to get ready for the era of AI and big data analytics," expressed Liu.

So far, the results have the researchers convinced that artificial intelligence (AI) and related technology can significantly reduce the work previously done by humans in a more accurate and timely manner. However, researchers do acknowledge that they can't simply throw away heuristic approaches because it is currently still too expensive to train AI deep neural networks to generalize to complicated scenarios. Conventional heuristic models are easily generalizable to various scenarios, but the computational costs will eventually grow to be larger than deep learning. Deep learning tends to perform well in common scenarios but performs poorly on rare scenarios where data is not sufficient. Ideally, researchers could determine a "sweet spot" where the integration of the two approaches yields the best results. According to Liu, his goal at this point is to:

"...investigate a way to integrate the conventional heuristic method with the state-of-art deep learning-based approaches and simplify the complicated flight rescheduling process to leverage AI's capability to assist humans in rescheduling airlines or providing emergent evacuation flights. The resulting system could automate the complicated flight rescheduling process while minimizing costs and returning to regular schedules quicker."

Right: image The confusion matrix of a congestion prediction network shows that the deep neural network tends to learn and bias toward scenarios with more training samples (the top left block) and neglect the rare cases (lower right block).

North Carolina Agricultural and Technical State University
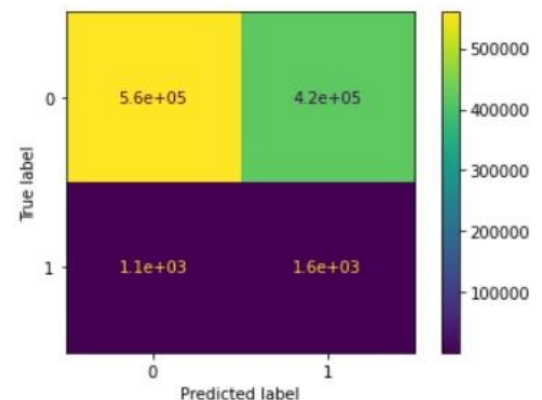
Web-Based Feedback for Teens and Parents *(continued from page one)*

The study, which was delayed by COVID, started recruiting subjects in March. GM and OnStar sent communications to thousands of customers encouraging interested people to contact VTTI directly. Study subjects are located throughout the U.S. and receive monetary compensation and a free year of OnStar service in return. The study will run for a minimum of eight months and end by December 2023. (*Left: Dr. Charlie Klauer*)

Teen drivers taking part in the study have their car key fob paired with GM's "teen driver settings program" and OnStar collects the data it normally would for teen settings. VTTI researchers have developed a website which analyzes this information and gives individualized feedback and suggestions to the study subject. During the first and last month of the on-the-road portion of the study, the drivers will not receive any feedback from the website.

VTTI researchers will compare the data from the first month and the last month to see if the feedback had any effect on driving habits. The usability and acceptability of this feedback will also be measured by analyzing the number of website logins and the duration of time spent on the website. Parent and teen focus groups and/or interviews are also conducted to obtain qualitative data on user preferences and acceptability. Klauer expressed:

"I am anxious to get this project started. I think it is going to be a very important study. If there are ways that we can incentivize and engage teen drivers to help them learn to drive more safely on their own, I think we will have something very valuable. This program could be broadly deployed and make a huge impact on teen driving safety."

CATM Webinar

Rural Older Adult Driver Tailored Research Integrated Plan (Road Trip)

On December 1, 2022, Jon Antin, Ph.D., CHFP, CATM research program manager and leader of the Vulnerable Road Users Safety Group at Virginia Tech Transportation Institute (VTTI), and Brian Wotring, MS, Research Associate at VTTI discussed their research and results thus far.

Their research aims to develop a program to provide individualized transportation solutions to rural older adults designed to help them retain mobility and provide enhanced access to vital services and activities. You can view the webinar here.

Other Transportation News

N.C. A&T Transportation Institute Awarded NCDOT Research Grant

Each day in the United States, an average of three people are killed or injured while traversing railroad properties. According to the Federal Highway Administration, this behavior resulted in more than 1,100 pedestrian fatalities in 2017 alone. With more than 190,000 miles of tracks in America in 49 states, railroads are a vital part of the transportation infrastructure reaching almost every part of the country. The economic and social costs of railroad fatality and injury totals billions of dollars each year. The urgency and importance of understanding pedestrian and railroad interactions better to improve safety cannot be overemphasized.

Dr. Rongfang (Rachel) Liu, director of the N.C. A&T Transportation Institute, and staff have been awarded a North Carolina Department of Transportation (NCDOT) Research & Development grant to study the relationship between rail noise propagation and trespass strikes. Liu will be the Principal Investigator and lead a team of rail safety, travel behavior, and community outreach experts. Cross Spectrum Acoustics, Inc., a national acoustic modeling expert and advisor to the Federal Railroad Administration, will model sound propagation using data collected at various locations in the state.

With more than three thousand miles of railroad tracks, North Carolina ranks 23rd in the nation for total miles of railroad but ranks 12th in pedestrian casualties in and around railroad properties. The need for this research was championed by Roger Smock, the NCDOT's Safety & Outreach Consultant in the Rail Division's Engineering Coordination & Safety Branch. Smock noticed an alarming number of pedestrian strikes in which the pedestrian, who did not intend self-harm and usually wasn't wearing headphones or ear buds, did not see, hear, or feel a locomotive's approach or hear its horn until it was too late. In turn, he began advocating for funding to discover the cause of these tragic strikes and bring North Carolina one step closer to eliminating rail incidents altogether.

The N.C. A&T team will establish a baseline understanding of public beliefs and attitudes on the danger of railroad environments, the characteristics of rail noise propagation, and their awareness of railroad trespassing laws through literature review and public survey. The researchers will identify a list of factors that affect rail noise propagation that they will then evaluate in the modeling effort.

Working with the NCDOT's Rail Safety Staff and Project Steering and Implementation Committee, the N.C. A&T team will collect field data, generate sound propagation models, test various scenarios based on factors identified earlier in the research and visualize the sound propagation/decomposition processes.

The project's goal is to help the NCDOT understand how the propagation and decomposition of rail noise contributes to rail trespass strikes and produce information that not only helps engineers create safer designs but also helps educate the public on the dangers of rail trespassing behavior.

North Carolina Agricultural and Technical State University

N.C. A&T Transportation Institute Exhibits at N.C. Transportation Summit

On January 18-19, Nick Allen, program manager for the N.C. A&T Transportation Institute and project director of the Summer High School Transportation Institute, and Audrey White, administrative associate for the Transportation Institute, represented the department at the N.C. Transportation Summit in Raleigh, North Carolina.

N.C. A&T Transportation Institute Awarded SS4A Grant

On Feb. 1, U.S. Transportation Secretary Pete Buttigieg announced $800 million in grant awards for 510 communities across the nation through the first round of funding for the Safe Streets and Roads for All (SS4A) grant program. The 2022 awards include 473 Action Plan Grants and 37 Implementation Grants. The Greensboro Urban Area MPO Safe Streets and Roads for All Application, in which Dr. Rongfang (Rachel) Liu, director of the N.C. A&T Transportation Institute participated in submitting, received $755,504 in funding. (go here for more information)

NCDOT Research and Innovation Summit

Rongfang (Rachel) Liu, Ph.D. director of the N.C. A&T Transportation Institute, and Venktesh Pandey, Ph.D., assistant professor in the Department of Civil, Architectural, and Environmental Engineering at N.C A&T attended and exhibited at the NCDOT Research and Innovation Summit March 29-30 in Raleigh, N.C.

Student Honors

N.C. A&T's Hadi Khoury Named 2022 University Transportation Center Outstanding Student of the Year

Hadi Khoury was named a University Transportation Center "Student of the Year" and traveled to Washington, D. C., in January to receive the honor at the 2023 CUTC Awards Banquet.

Khoury received his bachelor's degree in May of 2021 and a master's degree in December of 2022, both in civil engineering with concentrations in transportation, from N.C. A&T. Originally from Lebanon, Khoury moved to the U.S. at 16-years-old in eleventh grade and graduated from West Forsyth High School located in Clemmons, North Carolina.

After graduating with his bachelor's degree, Khoury worked remotely as a hydraulics intern for the North Carolina Department of Transportation.

Hadi Khoury, UTC Student of the Year *(continued from page five)*

While there, he gained valuable skills, such as using MicroStation to delineate drainage areas, determine pipe sizes and write reports. In 2022, he went to work for Davenport, an engineering, design and consulting firm, in Winston-Salem, North Carolina, as a roadway designer. There he gained exposure to the different stages of project planning, QA/QC process and cost estimation.

Ever since he was young, Khoury has been fascinated with the idea that he could design something strong and functional and get to see it materialize and people utilizing it. He works at Davenport now as a Project Engineer I and aspires to experience other areas of engineering, such as structural and construction, and go on to open his own business one day — whether engineering or something else. After a long and successful career, he plans to earn his PhD and teach at the college level.

While at A&T, Khoury was a campus tour guide, lab instructor, teaching assistant, and four-time recipient of the Chancellor's list award, and he became Lean Six Sigma White Belt Certified. In his private life, he is active in his church and makes spending time with friends and family a priority. Khoury said that he follows this advice:

"Work with the best of the strength that God has given you."

(from L to R: Firas Ibrahim, Ph.D., P.E., structural engineering researcher at Federal Highway Administration's Turner-Fairbank Highway Research Center, Hadi Khoury, and Ceasar Signh, P.E. Director, U.S. Department of Transportation's University Transportation Centers Grants Program)

Education News and Student Activities

2022-2023 Dwight D. Eisenhower Transportation Fellowship Program Awards

N.C. A&T students Keshawn Johnson and Anusha Neupane received grants totaling $18,500 from the Dwight David Eisenhower Transportation Fellowship Program (DDETFP). The awards were procured under the recommendation of N.C. A&T Transportation Institute program manager Nicholas Allen. The funds contributed to 2022-23 academic school year tuition assistance, a stipend and expenses to attend the 102nd Transportation Research Board annual meeting, which the students attended Jan. 8-12 in Washington, D.C.

Keshawn Johnson, originally from Nashville, Tennessee is a senior majoring in marketing. In addition to this honor, Johnson is a Thurgood Marshall College Fund Scholar and a National Sales Network Fellow recipient. During his time at A&T, he has been active in and served on the boards of student organizations, including the American Marketing Association and Family & Consumer Science Club and has interned for the Council of Presidents.

His DDETFP research paper titled, "Marketing Towards a Sustainable Future" focused on creating a correlation between consumer purchasing behavior and influential marketing. Specifically, he looked at how marketing can influence consumers to make more environmentally conscious vehicle purchases, such as electronic vehicles, to help slow down global warming.

2022-2023 DDETFP Award Recipients *(continued from page six)*

Johnson gained sales and marketing experience by competing in case competitions, such as the Cisco National Sales Competition, 2022 NSN Sales Pitch Competition, A&T National Sales competition, Intuit HBCU National Sales Competition and more. He placed third in the Thurgood Marshall College Fund Innovation Challenge and received an "outstanding" recognition in the 2021-2022 Amazon Prime Student Case Competition.

Johnson completed internships with Altria Distribution Group and the Public Relations Student Society of America. He started his own clothing brand in July of 2022, and he and friends formed a non-profit organization to help provide needed resources to underprivileged youth in the Triad Area.

Anusha Neupane is a senior earning her undergraduate degree in civil engineering with a minor in computer science. During the 2021 and part of the 2022 school year, Neupane worked as an intern with Dr. Venktesh Pandey, assistant professor in the Department of Civil, Architectural and Environmental Engineering researching and developing a prototype trip planning algorithm that could be integrated into a cell phone application using datasets available for the state of North Carolina.

Neupane was lead author on a paper selected for presentation at the 2022 Undergraduate Consortium at the ACM Knowledge, Discovery, and Data Mining Conference, and was a CATM summer intern in 2022. Neupane is originally from Nepal and has been living in the U.S. for five years. She plans to start an engineering career and go to graduate school at some point in the future.

2022-2023 CATM Student Scholars

Since its inception in November of 2016, CATM has awarded scholarships to students to support and encourage pursuits in educational paths that lead to careers in the transportation industry. The transportation scholars' award is open to transportation/supply chain majors who are interested in participating in experiential learning and extra-curricular activities and events organized by CATM and the Transportation Institute. Award recipients receive between $1,000 and $5,000 based on GPA and engagement in transportation/supply chain activities. The 2022-2023 CATM scholars are:

Brandon Daye, originally from Burlington, North Carolina, is a senior double majoring in Supply Chain and Agribusiness and Food Industry Management. Daye was a 2021-2022 Dwight D. Eisenhower Transportation Fellow, Thurgood Marshall College Fund HBCU Scholar and CATM Scholar. He has previously served as President of the Student Food Advisory Board; development coordinator of the Leadership Engagement and Development Staff; chair of the Get Out to Vote and Excitement Workgroup for the University Civic Engagement Coalition, chair of the Campus Life Committee; senator for the College of Agriculture and Environmental Sciences for the Student Government Association.

North Carolina Agricultural and Technical State University

2022-2023 CATM Scholars *(continued from page seven)*

Daye is an active member of The Village Mentoring, Inc. and Supply Chain Aggies and acts as the student equipment manager for the N.C. A&T football team.

Daye has worked as a global field sales engineer intern for Cisco, global sourcing and compliance intern for Qorvo, logistics and business analyst intern for Apple, purchasing intern for Volvo, production manager for McDonalds, and a sales associate for Cole Haan. In the summer, Daye will begin working as a product supply chain business analyst at Nike.

Miles Durant is a junior from Durham, North Carolina, studying marketing and supply chain management. Durant is active in extracurricular activities on and off campus and is a member of Supply Chain Aggies and the American Marketing Association. He serves as a mentor and mentor coordinator for Village Mentoring Inc. Durant is also a part of the Milken Institute HBCU Strategic Initiative and Fellowship Program and the Thurgood Marshall College Foundation Meta Scholars Program.

In the past, Durant interned with KPMG, Lenovo, and Woodforest Bank. While he is still undecided on the exact field in which he wants to pursue a career, he aspires to work in brand consulting, procurement, and digital supply chain management.

Claudia Duverglas, of Boston, is a junior Supply Chain Management major. Duverglas was recognized as the first place winner in the Thurgood Marshall College Fund's "Moguls in the Making" competition, second place winner in the Thurgood Marshall College Fund's "The Pitch" competition, and third place winner in the Amazon Prime's "Video Case Study Career Prep Scholar for Management Leadership of Tomorrow" competition. In 2021, she was named a Revolt TV Summit Panelist, MSM Bright Suns Scholarship, and #RISE TMCF Highlight Student. In both 2021 and 2022, Duverglas was a Thurgood Marshall College Fund Leadership Institute scholar and a Capital One HBCU Build to Best Early Talent participant.

Duverglas has accumulated a rich variety work experience already including: 2023 - incoming supply chain analyst intern at Cisco; 2022 - branding strategy & business analytics extern at Beats by Dre, marketing & recruitment chair for Supply Chain Aggies (Fall), retail fulfillment operations intern at Apple, logistics monitor intern at Volvo Group, market intelligence extern at Meta and nonprofit extern at PricewaterhouseCoopers.

Outside of professional and collegiate activities, Duverglas is passionate about wellness and traveling and has plans to backpack through Europe in April.

2022-2023 CATM Scholars *(continued from page eight)*

Jaylin Roberts, from Miami, Florida, is a senior majoring in supply chain management. He is currently employed at the N.C. A&T Farming Center near campus conducting research to help farmers. In the past, he has worked as a sourcing intern for General Mills and a procurement intern for Wolfspeed. Roberts was "Mr. Supply Chain Aggie" in Spring of 2021 and president of Supply Chain Aggies for the 2021-2022 school year.

After graduation, Roberts already has employment lined up to work as a business analyst for Kearney Consulting in Washington, D.C. Roberts aspires to eventually have a career in the textile and clothing industry.

Josette Stewart, of Cleveland, Ohio, is a senior supply chain management major. She is a CATM Scholar and president of both the Supply Chain Aggies and Midwest Aggies student organizations. A member of Beta Gamma Sigma Honor Society and National Society of Leadership and Success, she has been on the Dean's or Chancellor's list every semester, served as a math tutor for the Exceptional Black Males in Business program in the Willie A. Deese College of Business and Economics and contributes time to the Cleveland Muny Football League as a lead volunteer and mentor. She is also active in many other organizations on campus.

Stewart has interned with Apple as a service supply chain operations intern and with IBM as a procurement professional. Additionally, she is the CEO and founder of her own business, JB Signature Collection LLC, which is a fashion accessories line she started in 2015 at age 13. Since the business' inception, Stewart has donated a portion of her profits to various charities because she "hopes to inspire other teens to follow their dreams of becoming entrepreneurs."

## Students Attend Transportation Research Board Annual Meeting

Seven N.C. A&T undergraduate students attended the TRB Meeting in Washington D.C. on January 8-12.

(from L to R): Josette Stewart, Keshawn Johnson, Miles Durant, Bryan Daye, Anusha Nupane, Brandon Daye, and Jaylin Roberts.

North Carolina Agricultural and Technical State University

Student-to-Student Workshops

On March 28, N.C. A&T students, Brandon Daye and Keshawn Johnson visited Dudley High School and talked to students about STEM, supply chain and transportation educational paths and careers and their personal experiences and aspirations. On March 27, N.C. A&T students, Taylor Wherry-Rice and Joshua Edwards, participated in N.C. A&T STEM Early College's Curriculum Night, and on April 6, Bryan and Brandon Daye spoke to classes at Cummings High School.
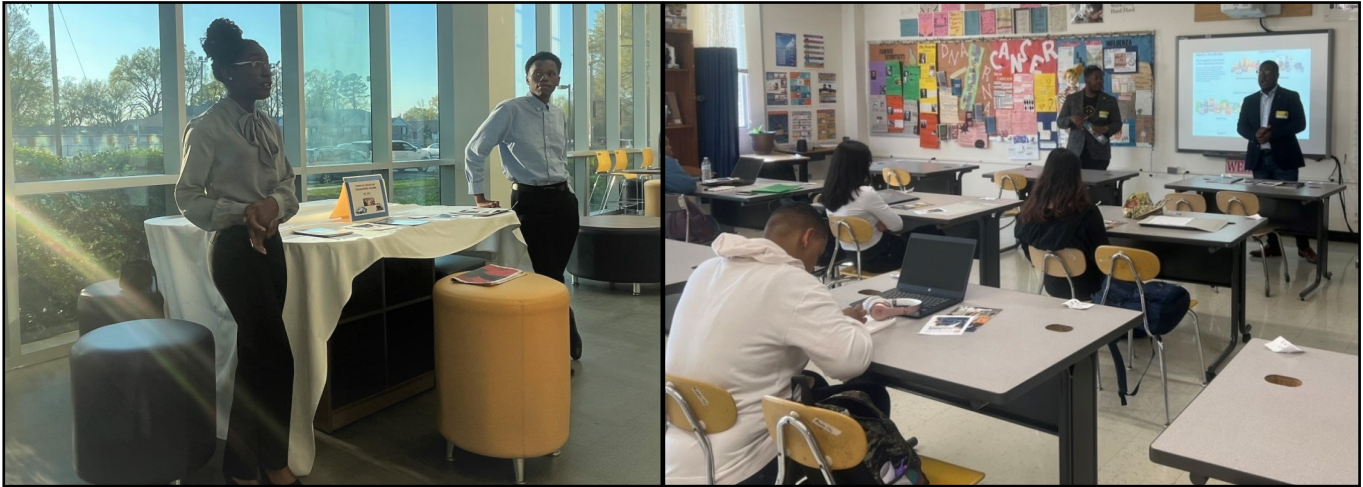
From left: Taylor Wherry-Rice and Joshua Edwards at N.C. A&T STEM Early College .

From left standing: Bryan and Brandon Daye talk to a class at Cummings High School.

N.C. A&T
Transportation Institute
Willie A. Deese College of Business and Economics
402 Craig Hall
Greensboro, NC 27411
Phone: 336-334-7745
Fax: 336-334-7093

bit.ly/ncatthetransportationinstitute

North Carolina Agricultural and Technical State University