



CATM Research News

High-Speed Rail in the US: Intention to Use and Mode Choice Behavior



High-speed rail (HSR) has become a popular mode for domestic travel, offering a fast, comfortable and convenient travel experience valued by travelers. HSR is the fastest and most efficient ground-based method of commercial transportation; however, due to requirements for large track curves, gentle gradients and grade-separated tracks, the construction of high-speed rail is more costly than conventional rail. While there is no single international standard for HSR, new train lines having speeds in excess of 250 kilometers per hour (km/h), or 160 miles per hour (mph), and existing lines in excess of 200 km/h (120 mph) are generally considered to be high speed.

Many countries in Europe and Asia have developed HSR for passenger travel, and some systems also offer it for freight services. Due to generous funding from the Chinese government, HSR in China has developed rapidly over the past 15 years. China currently accounts for over two-thirds of the world's total HSR, with over 37,900 km (23,500 mi) of HSR on its networks. ([continued on page 2](#))

Detecting Early Stage Dementia Using Naturalistic Driving

The U.S. population is aging rapidly. According to U.S. Census Bureau projections, older adults will outnumber children for the first time in U.S. history by 2034. Seniors, especially those with mild cognitive impairment (MCI) represent some of our most vulnerable road users. MCI is a stage of the normal cognitive decline expected with aging and can be the first signs of the onset of more serious symptoms of dementia developing. [Studies](#) have found that between four and five percent of seniors in their 70s and 80s have non-amnesic MCI. The percentage increases with age and the raw numbers will grow as the population does.

Driving behaviors may be able to correctly detect MCI early — even before medical professionals or cognitive tests can diagnose the condition. Identifying drivers with MCI symptoms pre-diagnosis would not only help the individuals but could also yield substantial safety benefits for other drivers. ([continued on page 3](#))

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High Speed Rail in the US *(continued from page one)*

According to the article, [Fact Sheet | High Speed Rail Development Worldwide](#), China's HSR rail now carries more than twice as many passengers as its domestic airlines. Japan has a network of nine HSR lines serving 22 of its major cities, stretching across its three main islands, with three more lines in development. It is the busiest high-speed rail service in the world, carrying more than 420,000 passengers on a typical weekday. Its trains travel up to 320 km/h (200 mph), and the railway boasts that, in over 50 years of operation, there have been no passenger fatalities or injuries due to accidents.

The United States lags far behind other countries in HSR development, and the federal government's new commitment to infrastructure did not allocate funds to HSR. This situation is expected to change given the shifting mode-of-travel preference in the US -- especially for youth and senior populations, the new normality for travel in the post pandemic era and more importantly, the US government's verbal commitment to focus on HSR in the future, which could reshape domestic transportation in the US.



Any re-balance of the transportation system calls for in-depth research of HSR in the US. The existing literature in this area, however, is limited -- particularly regarding the behavioral intention of American travelers toward HSR. This study, conducted by Jing Yu Pan, Ph.D., assistant professor in the School of Graduate Studies in the College of Aviation at ERAU, aims to fill this important gap by investigating:

1. Passengers' choice among car, air, and HSR for domestic travel in the US and
2. Key determinants of American passengers' intention to use HSR and how they differ from what has been observed in other countries.

The basic outline of this research would include a background introduction of high-speed rail (HSR) globally and in the US, a comprehensive literature review, methodology and data interpretation, discussion, conclusions, and recommendations. This study contains four phases – literature review, data collection, data analysis, data interpretation and conclusion-making.

Currently, data collection is completed, and Pan is in the process of data analysis. Constructs validated in previous studies will be used for model development. Preliminary research findings show that certain factors, such as convenience in transport and total travel time, are significant in the choice among air, HSR and car in some high-demand transport market in the US. One surprising conclusion thus far is that COVID-19 has had a strong impact on the public's perception and potential use of HSR in the US.

A new theoretical framework will be proposed based on the theory of planned behavior. Pan said,

“By providing empirical evidence from the lens of passenger intention and behavior, this study can provide useful implications of how HSR can be promoted in the US, especially in the post-pandemic era where people's travel behavior/preference may have been fundamentally changed by the pandemic.”

Detecting Early Stage Dementia Using Naturalistic Driving *(continued from page one)*



Jon Antin, Ph.D., CHFP, CATM research program manager and leader of the Vulnerable Road Users Safety group at Virginia Tech Transportation Institute, received funding from CATM and the National Surface Transportation Center for Excellence to study this issue. Brian Wotring, MS, at VTTI is assisting with the research. The primary objective of the study, which began in July of 2020 and was delayed because of COVID constraints, is to examine natural driving behaviors and performance of pre-MCI adults driving their own vehicles equipped with advanced driver assistance systems (ADAS) and compare the data to a similar-aged control group of individuals with no indication of MCI. For the control group data, Antin is using data from the SHRP 2 Natural Driving Studies (NDS). The research is in the data analysis stage. Antin said:



“Considering our aging society, this project will provide invaluable insight into how people with pre-MCI drive. Is their safety compromised in any way? Are there any behavioral differences compared with older adults without cognitive complaints? Do they use advanced driver assistance systems (ADAS) in the same way others do, and, if so, do these technologies help to prolong their ability to drive safely? And can their driving performance be used as an early warning system by detect subtle cognitive changes which have not yet been formally diagnosed?” (Top left : Jon Antin Bottom left: Brian Wotring)

The study is building upon prior research done by Antin and others at VTTI, [“Examining Senior Drivers Adaptation to Level 2-3 Automated Vehicles: A Naturalistic Study”](#) that looked at the integration of ADAS technology. ADAS includes electronic functions like road sign recognition, adaptive cruise control, parking assistance, blind spot warning, lane departure warning and surround view camera.

CATM Researcher Wins “Outstanding Young Investigator” Award

Hyoshin (John) Park, Ph.D., an assistant professor in the Department of Computational and Data Science at N.C. A&T, has been named the Outstanding Young Investigator at the university for 2022. The honor is due, in part, because of his multiple CATM sponsored research projects. Park has been awarded two patents in the last two years as a result of his technology-focused research which will prove useful as the automotive industry increasingly employs mixed-autonomous safety features. Park expressed:



“I am honored to have my research recognized and hopeful that it will eventually allow predictive digital twin and proactive decision making through scientific machine learning.”

Dr. Liu Joins N.C.A&T as Director of the Transportation Institute

Rongfang (Rachel) Liu, Ph.D., joined N.C. A&T University's Willie A. Deese College of Business and Economics as the Director of the Transportation Institute and UPS Endowed Professor in Marketing and Supply Chain Management in August of 2021.



Established in 1970, the Transportation Institute is an interdisciplinary research, training and technology transfer unit that draws faculty, staff and students from various departments within the Deese College and throughout the entire university. Its mission is to serve as a national, regional and local clearinghouse for transportation education, research and outreach.

A transportation engineering professor for more than two decades, Liu has extensive experience in the area of intermodal transportation planning and engineering, travel demand forecasting and simulation modeling and supply chain management. She has managed long-range transportation plans for different federal, state and local government agencies and private sector clients. She gained this broad-based experience through her positions with consulting firms, higher education institutes, and government agencies, as well as her extensive involvement with transportation research board committees and modeling development task forces.

Liu earned her B.S. in geo-environmental science and her M.S. in environmental engineering from Beijing University, her M.S. in urban and regional planning from Florida State University and a Ph.D. in transportation engineering from the University of South Florida-Tampa.

While she plans to continue heavily emphasizing programs and activities to attract, motivate, and support students in the transportation and supply chain educational paths, Liu has already put in place an infrastructure to encourage more research and grant procurement in these areas. About her plans for the future direction of the department, Liu said:

“Building on a solid tradition of education outreach, the Transportation Institute will elevate the N.C. A&T standing in transportation research not only by increasing the size of grants and number of researchers but also by serving as a hub for faculty members, students and practitioners.”

Since assuming the role at N.C. A&T, Liu has been awarded a rapid response grant for US Department of Transportation, “Independent Evaluation of implementation of Aviation Manufacturing Jobs Protection Program by USDOT” and has presented to the Senior Advisory Council of the Aviation Manufacturing Jobs Protection Program. Liu also won a North Carolina Department of Transportation grant, “Modeling the Effects of Rail Noise Propagation on Pedestrians in North Carolina Railroad Environments,” which began in August.



Education News and Student Honors and Activities

N.C. A&T Holds 30th Annual Summer High School Transportation Institute



(left to right) Front row: Shyla Hill, Jahaira Medina, Hayden Millner, Bailee Wright, Wesley Hull . Middle row: Jiya Heath, Donovan Calhoun, Jaylen Baker, Noelle Millner, Jacob Howell, Diuanta Peoples. Back row: Necorian Clark, Jabriel Abakah, Brendan Miller, Asher Towns .

N.C. A&T conducted the 30th annual Summer High School Transportation Institute (STI) July 11 through Aug. 5. STI, offered through the N. C. A&T [Transportation Institute](#) in the [Willie A. Deese College of Business and Economics](#), focuses on demonstrating how different transportation professions use STEM skills and familiarizes participants with the various industries and modes of transportation – from air to highway and from rail to water.

This year's STI was in-person for the first time in two years. The group included 15 North Carolina 11th and 12th graders: five from Greensboro, three from High Point, and one each from Elon, Gibsonville, Haw River, Kernersville, Mebane and Whitsett. Because of the COVID-19 pandemic, the 2020 and 2021 schedules were abbreviated and held virtually.

The 2022 four-week nonresidential program introduced students to career opportunities in the public and private sectors of transportation and supply chain management through classroom lectures, personal development workshops and field trips to the Port of Wilmington, Charlotte Motor Speedway; North Carolina Transportation Museum; the U.S. Department of Transportation's Turner-Fairbank Highway Research Center in McLean, Virginia; several locations in Washington, D.C.; and more. Students also participated in English and math SAT preparation classes, learned basic computer coding and practiced presentation and public speaking skills. *(continued on next page)*

2022 STI 30th Program *(continued from page five)*

“Each year, we aspire to offer a robust program that introduces students to existing and emerging technologies in the transportation industry. We are excited to have had the program in person this year and be able to give the students the full STI experience,” said Nicholas Allen, who became the STI project director and program manager for the Transportation Institute in August of 2021.

At the opening ceremony, Deese College Associate Dean Danielle Winchester, Ph.D., told STI participants they were on the fast track towards an in-demand career path and encouraged them to continue their education at A&T, noting the college boasts 100 percent job placement every year for graduates concentrating in supply chain management.

This was the first STI program under the direction of new Transportation Institute Director Rachel Liu, Ph.D. At the closing ceremony, Liu welcomed industry VIPs, alums and family members of current attendees. On the last day, she led the STI class through an exercise where students assembled a time capsule with personal notes and thoughts with the intent of returning to future STI ceremonies to revisit the capsule contents.

To qualify for the program, students have to have a minimum 2.5 GPA on a 4.0 scale, submit a typed 250-word essay conveying their interest in attending, how they believe it will help them advance their education and career goals and commit to attend every day of the program. Each student receives a weekly stipend and a certificate of completion.

The Federal Highway Administration, North Carolina Department of Transportation and CATM sponsor the STI in partnership with the university’s Transportation Institute to recruit talented young people to the industry and help increase minority and female representation in the workforce.



Bailee Wright receives instruction on flying a drone from D'Anthony Ravenell, NCDOT UAS Apprentice.



Jahaira Medina give the thumbs up before take off at the Smith-Reynolds Airport Discovery Flights .



Brendan Miller at the controls in virtual reality flight simulator at Beta Technologies in Washington, D.C.

STI 30th Program *(continued from page five)*



Top: Students tour The Turner-Fairbank Highway Research Center in McLean, Virginia.

Middle left: Asher Towns takes a virtual test drive at the Turner-Fairbank Highway Research Center.



Middle right: the first place bridge-building competition team: (from left) Hayden Millner, Necorian Clark, Donovan Calhoun, and Brendan Miller.

Bottom middle: The students at the N.C. Transportation Museum in Charlotte, North Carolina.

2022 STI Outstanding Student Awards

Three students received awards at the closing ceremony for their exemplary participation, conduct, and mastery of the information presented during the program.



Director's Award

Jaylen A. Baker
 17 years old
 East Forsyth High School
 Kernersville, N.C.

Since he was little, Baker has always admired bridges, skyscrapers and roller coasters. As he grew older, he learned about physics and the forces required for motion in cars, trains and roller coasters and was curious about the mechanics of building bridges and skyscrapers safely. Baker wanted to attend STI to learn about opportunities and careers in the transportation and engineering industry. At school, he plays lacrosse, runs track, is in the marching band and on several honor rolls.

“During my time in STI, I learned a lot and gained a ton of interest in new and different careers, like aerospace engineering. I enjoyed all the field trips and group projects as well.”

Leadership Award

Donovan T. Calhoun
 16 years old
 Wesleyan Christian Academy
 High Point, N.C.



While he was aware of the large impact that transportation has on daily life, Calhoun was not familiar with transportation-related college majors and was interested in learning more. By participating in STI, he wanted to expand his knowledge of the industry and potential education and career paths, narrow his focus and strengthen his understanding of supply chain management and STEM careers. Currently, after high school, Calhoun wants to study mechanical engineering at N.C. A&T and go on to pursue a master's degree. In school, he has participated in soccer, basketball, football and track and has been named to several academic honor rolls.

“Attending STI allowed me to obtain a panoramic view of the versatility that the field of transportation offers, ranging from railway to ferry systems. As an aspiring engineer, it was encouraging to learn how all types of engineers, including civil, mechanical, and aeronautical, are needed and impact the transportation industry.”

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2022 STI Outstanding Student Awards *(continued from page eight)*



Outstanding Scholarly Achievement Award

Necorian Clark
 17 years old
 Cedar Ridge High School
 Haw River, N.C.

At school, Clark serves as the vice president of the Minority Achievers Honor Society, treasurer of Student Council and Co-Captain of the varsity basketball team. He is also a member of the National Honor Society and the Red Cross Club and volunteers at basketball camp in the summer. After high school, Clark wants to continue playing basketball, attend a four-year university and study software engineering.

CATM Sponsors Summer Undergraduate Student Interns



Assistant professor in the Department of Civil, Architectural and Environmental Engineering at N.C. A&T, Venktesh Pandey, Ph.D., had two undergraduate interns assist with research over the summer.



Mary Bakre, a civil engineering student from Lagos, Nigeria has worked with Pandey for two years developing models that can assist in transportation safety and planning utilizing emerging technologies. Their research focuses on building computer models of intelligent transportation systems which can be used to benefit travelers in day-to-day traffic operations and long-term planning. This past summer, Bakre mapped the transportation network in Austin, Texas and built a script that evaluates the impacts of real-time information on route choices of travelers which could potentially reduce travel times.

She is also currently a project engineer intern with Go-Triangle. Bakre plans to pursue an MBA to prepare her for the career goal of being a project engineer with a consulting firm. *(continued on next page)*

Top: Venktesh Pandey
 Bottom Mary Bakre



CATM Summer Interns (continued from page nine)



Anusha Neupane also worked as an intern with Pandey over the summer and during the previous year. Neupane is an undergraduate civil engineering student from Nepal pursuing a minor in computer science. Her research has focused on developing a prototype trip planning algorithm that can easily be integrated into a cell phone application using datasets available for the state of North Carolina. The research involved mitigating traffic congestion by learning the spatio-temporal correlation of travel times and recommending alternate routes to travelers based on the revealed traffic information.

Neupane was lead author on a paper selected for presentation at the 2022 Undergraduate Consortium at the ACM Knowledge, Discovery, and Data Mining Conference, which is ranked as the top conference in data science in terms of acceptance rate and quality of presentations. You can access more information on her research [here](#).

After graduating with a bachelor's degree in civil engineering, Neupane plans to continue research in transportation while completing a master's degree.



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