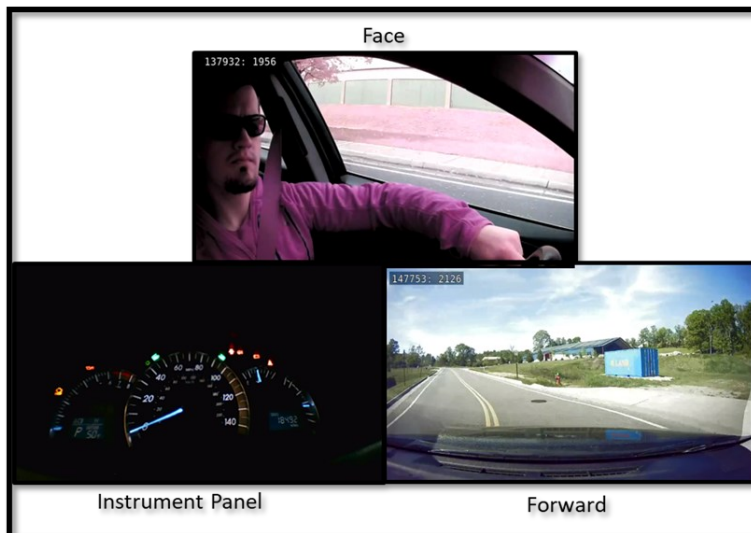




## CATM Sponsored Research

### Detecting Early-Stage Dementia Using Naturalistic Driving — Update

There are 56 million individuals aged 65 and older in the United States, some 17% of the population, and that percentage is expected to rise to 22% by 2050. Age-related cognitive decline may present a unique challenge for these individuals and their safe mobility. The goal of this effort was to explore the use of naturalistic driving data to identify those with pre-MCI (pre-mild cognitive impairment). Participants who expressed some degree of concern with their cognitive status, but who had not been formally diagnosed as having MCI, were defined as having pre-MCI.



Example experimental interfaces

To assess the utility of naturalistic driving data in identifying individuals with pre-MCI (the “cases”), the researchers relied on naturalistic driving data collected in the New River Valley area of Virginia; Northern Virginia; Washington, D.C.; and San Antonio, Texas. Participants in these studies were delineated into either case or control groups based on answers to memory impairment questions or metrics during screening. The Self-Administered Gerocognitive Exam (SAGE) was used as a cognitive assessment along with other memory-based and driving avoidance-based metrics collected during study intake.

*(continued on [page 2](#))*

## CATM Webinar

### Auditory Situational Awareness for Vehicle-Pedestrian Communication Systems: Tesseract Crosswalk Module

On November 14, 2023, Embry Riddle Aeronautical and N.C. A&T graduate, Dr. Rafael Patrick hosted a webinar detailing the innovative research he is conducting as an assistant professor in the industrial and systems engineering department at Virginia Tech. Dr. Patrick’s research focuses on auditory situational awareness for vehicle-pedestrian communication and essentially ensuring mobility for vulnerable populations. As technology advances and devices continue to interfere with pedestrian-vehicle interaction, Dr. Patrick and his team are conceptualizing ways to keep drivers and pedestrians safe and alert. Click [here](#) to view the webinar video.

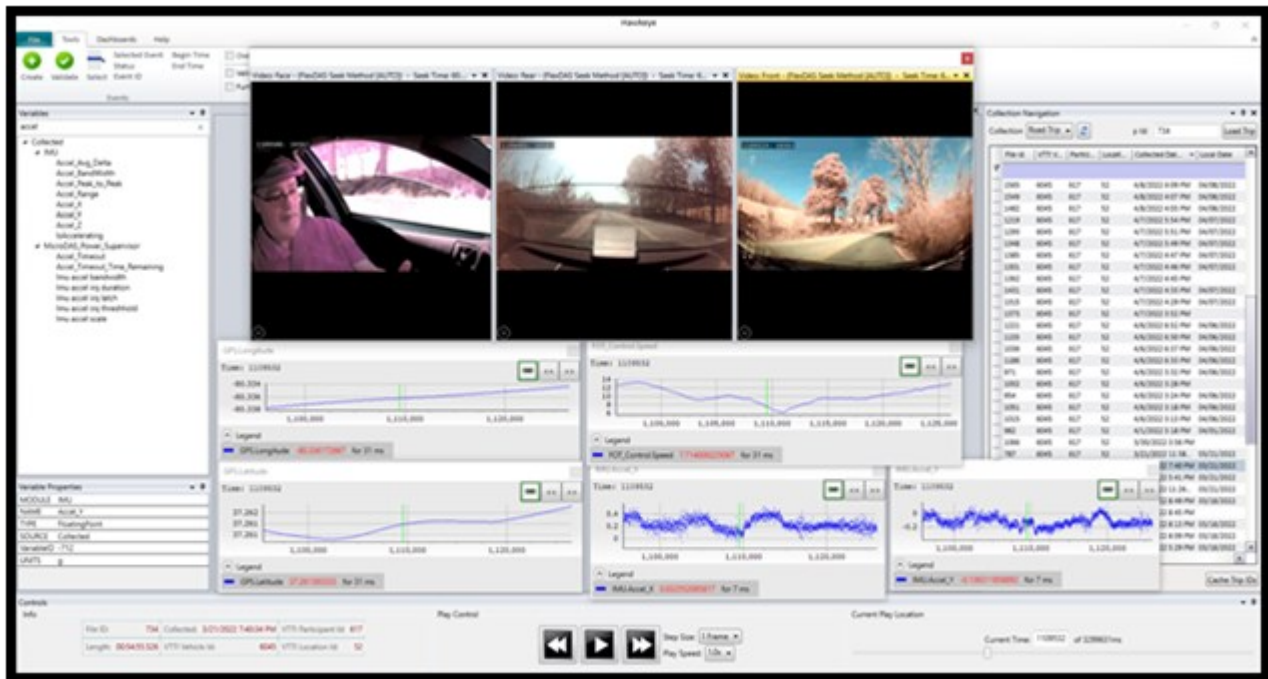
#### Winter 2023 Issue

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- 2023 Summer High School Transportation Institute
- 2023-2024 Dwight D. Eisenhower Transportation Fellowship recipients

## Detecting Early Stage Dementia Using Naturalistic Driving *(continued from page 1)*

Using these sources of data, metrics were calculated to evaluate the differences in driving patterns as well as usage of advanced driver assistance system (ADAS) between the case and control groups. The control groups were those with neither formal diagnosis of MCI nor expressed concerns over their cognitive status. ADAS included such features as adaptive cruise control and lane centering (LC). Additionally, analyses were conducted incorporating naturalistic driving study data from the Second Strategic Highway Research Program (SHRP 2) to facilitate comparisons between older adults driving vehicles equipped with ADAS and those without.

Results showed moderate LC usage rates, with almost half of the participants driving ADAS-equipped vehicles using those technologies at any point during the study period. Analyses were conducted to compare mobility and crash rate data between case and control groups driving ADAS vehicles with those driving vehicles which were not so equipped. Statistically significant results showed the lowest average number of trips per day for cases who drove ADAS vehicles (3.59 trips) compared to cases who drove non ADAS-equipped vehicles (4.66 trips). These results are inconsistent with other findings that have found no significant difference in driving exposure between MCI cases and controls, or that MCI cases may even engage in a greater number of trips. However, in such prior efforts, those researchers were evaluating drivers with diagnosed MCI, and none of the vehicles in those studies were equipped with ADAS. It is conceivable that those with pre-MCI may still have enough meta-awareness of their cognitive status to engage in driving self-restriction, while those who have progressed to a diagnosis of MCI have less awareness of their own cognitive status, and, so, may resume driving at prior levels. *(continued on page 3)*

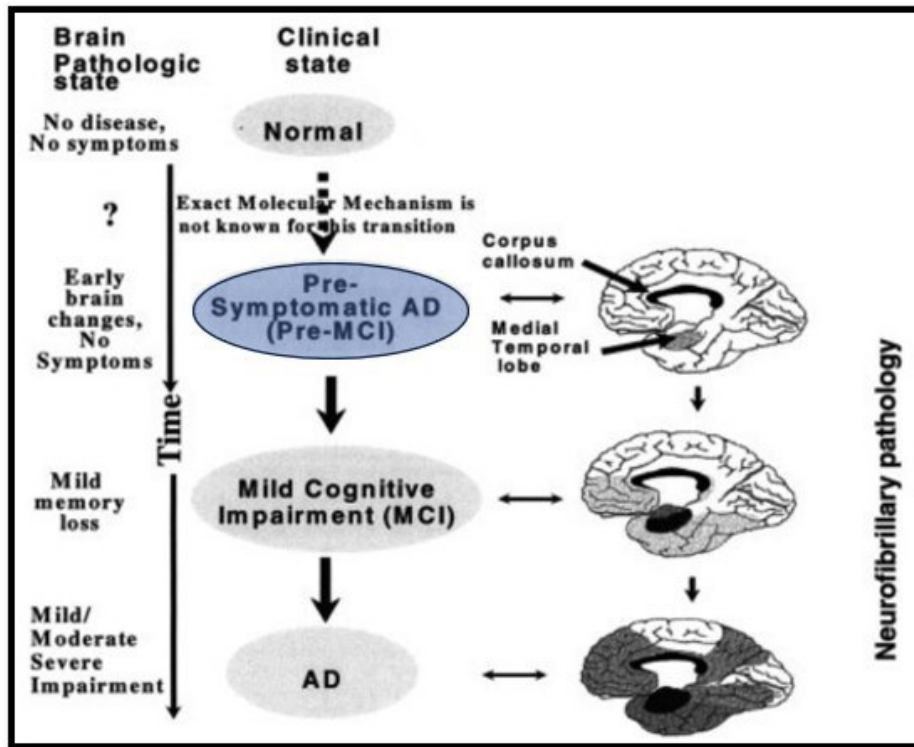


Screen samples from data collection instrument



## Detecting Early Stage Dementia Using Naturalistic Driving (continued from [page 2](#))

In summary, this study found that those with pre-MCI demonstrated modest differences compared to cognitively normal individuals in terms of mobility-related metrics, especially when driving vehicles equipped with ADAS, showing that drivers with the earliest stages of cognitive decline may use ADAS to enhance driving safety. Further, real-world driving safety metrics may one day be able to serve as an early way to detect individuals with pre-MCI.



Brain pathologic state diagram

From Mandal, P. K. (2007). Magnetic resonance spectroscopy (MRS) and its application in Alzheimer's disease. *Concepts in Magnetic Resonance Part A: An Educational Journal*, 30(1), 40-64.

## 2023 Summer High School Transportation Institute



### Summer High School Transportation Institute 2023 cohort

(from L to R, F to B) is Makayla Rice, Bailye Burris, Ariyana Hardaway-Dixon, Yaphet Abebe, Sky Adams, Ivy Hiner, Walter Christmas, Talan Brown, Sanaa Holston, Loriselle Acevedo, Jaydon Jones, Justin Preau, Ceigan Carter, Baylee Barkley, Ryan Brown, Trey Brown, Hazel Singletary, Amir Phillips, Cameron Brewster, Ajani Davis

The Summer High School Transportation Institute (STI), orchestrated by the Transportation Institute at Willie A. Deese College of Business and Economics, has been exposing high school students to careers and research opportunities in transportation since 1993. Since these students are introduced to the Aggie lifestyle during the program, nearly 40% of STI participants enroll at N.C. A&T upon graduation from high school.



This past summer, the program was residential for the first time in several years. From July 9 to July 23, 2023, participants of the program were able to live in campus dorms, dine at campus eateries, and attend college-style lectures.

The lectures were taught by N.C. A&T faculty and Greensboro professionals. A total of eight different lectures made up the STI curriculum. Each one taught students an aspect of transportation, whether it be the history, evolution or impact of transportation. To

further apply the knowledge they learned during lectures, students were required to complete group research projects to help introduce them to doing research at the university level.

Faculty members aided the students by teaching them proper research methods and how to articulate their findings. By the end of the program, students were equipped to present their research how *Aggies Do*, like confident scientists.

In addition to introducing participants to the Aggie lifestyle, the program prioritized making local connections this year. “We really focused on transportation but also on building connections with the people of Greensboro. It’s always been about community,” said program director, Nicholas Allen. One major local connection the program established is with Publix. Students got the opportunity to visit Publix’s McLeansville distribution center and gain firsthand knowledge about the role of transportation within a supply chain.

Along with conducting local field trips, the program conducted non-local field trips to places such as Wilmington, NC and Washington D.C. Students explored popular means of transportation and learned about the history of transportation in both cities.



Smith Reynolds Airport in Winston Salem, NC



Students visiting a battleship in Wilmington, NC

“Since the program’s mission is to increase the number of women and minority professionals in transportation, the program really focuses on giving students positive experiences that would make them want to return to transportation,” said Allen. Some of the positive, worthwhile experiences included flying drones, steering airplanes, and creating road maps.

Although each student that comes through the N.C. A&T STI program is intelligent, highly-skilled and unique, every year three students are given an outstanding student award for soaring above expectations.

Ariyana Hardway-Dixon, hailing from Union City, GA, was awarded the Outstanding Scholarly Achievement Award, which is given to students who demonstrate a high level of classroom engagement and lead the cohort in scholarly performance.

“All in all, the Summer Transportation Institute brought some of the best memories I will never forget,” said Hardway-Dixon.

Ceigan Carter, hailing from Hopkins, SC, was awarded the Leadership Award, which is given to students who exemplify strong leadership qualities in word and action both inside and out of the classroom.

Lastly, Baylee Barkley, hailing from Kannapolis, NC, was awarded the Directors Award, which is given to students who are team players displaying goodwill and enthusiasm.

All in all, the 2023 N.C. A&T Summer Transportation Institute was a major success and continued to constructively impact the careers and academic pursuits of minority students in transportation!

Applications for the 2024 program will open in February 2024. Please visit the Transportation Institute [website](#) for more information.

## 2023-2024 Dwight D. Eisenhower Transportation Fellowship Program Recipients

The Dwight D. Eisenhower Transportation Fellowship Program (DDETFP) is sponsored by the U.S. Federal Highway Administration to financially support students who are conducting research and obtaining associate, bachelor, masters or doctoral degrees in transportation-related fields.

The DDETFP has three different categories: graduate fellowship, local competition, and grants for research. N.C. A&T falls under the local competition category, whereby their program is specifically structured for minority-serving institutions and community colleges to administer.

N.C. A&T students Mikal Ali, Trevor Elliott, Byron Hall and Christian Bowens were all recipients of the DDETFP for the 2023-2024 academic school year.



Mikal Ali is a junior civil engineering student from Greensboro, NC. Ali was originally introduced to her research topic, mileage-based user fees, this past summer through her internship with N.C. A&T professor, Dr. Venkatesh Pandey. The main goal of her research is to find a practical way to implement a nation-wide system where drivers no longer pay for gas by the gallon, but instead, pay based on the mileage they have driven.

Ali really enjoys getting hands-on field experience through her research and plans to go straight into the industry post-grad. “It’s interesting how you run experiments and can potentially solve a problem just using math,” said Ali.

Ali thoroughly admires the inclusivity the program provides and hopes to further diversify the field of transportation through her work.

*“Success is to be measured not so much by the position that one has reached in life as by the obstacles which he has overcome while trying to succeed.”*



Byron Hall is a first-year masters student pursuing a degree in mechanical engineering. Hall is originally from Greensboro, NC and graduated from N.C. A&T with a bachelors in mechanical engineering in May, 2023.

Hall's research focuses on creating mounted control systems for autonomous vehicles. Even though his research does require some time in the lab, Hall is able to use his research findings in a tangible way as a member of [N.C. A&T's Autodrive Team](#).

Hall has always been interested in vehicles so he wanted to enter a field where he could combine his passion with his innovative ideas. “I knew that being able to dive more into that control theory is how I’d be able to create more of an impact in the field,” said Hall. After obtaining his masters and possibly a doctoral degree, Hall plans on continuing his research on autonomous vehicles.

*“You cannot have a positive life and a negative mind.”*



Trevor Elliott is a junior supply-chain management student from Fayetteville, NC. Elliott was originally introduced to the field of transportation through his family members who are in the trucking industry, leading him to have a strong interest in the inequity of ownership within the supply-chain transportation field.

Elliott's research focuses on figuring out ways to create a more inclusive supply-chain industry for minorities. He really dives deep into the history of the use of resources in the industry and how they can be evenly distributed.

"I want to use my resources and what it is that I'm learning to be able to help them further," said Elliott in regards to his family members in the trucking industry and Black business owners within the supply-chain transportation field. Elliott also researches specific methods Black business owners within the supply-chain industry can use in order to expand their businesses, and plans on being a supply-chain consultant after graduation.

*"When you have a dream, you've got to grab it and never let it go."*



Christian Bowens is a junior civil engineering student from Columbia, MD. Bowens' father is a civil engineer, so upon entering college, Bowens knew he wanted to follow in his father's footsteps. His father specifically focuses on structural engineering, so Bowens has always been informed on the importance of structures as it relates to transportation. That being said, his research combines the study of structure and transportation.

Bowens' research focuses on optimizing jamming harvest through an artificial intelligence software. Essentially, he is working on determining how to structure the flow of traffic to decrease traffic jams and generate the most possible revenue for highway manufacturers.

"Everyone believes that time is important so, if you mitigate traffic, you mitigate everyone's time," said Bowens.

Bowens was introduced to both DDETFP and his research topic by Dr. Pandey as well.

Overall, the 2023-2024 Dwight D. Eisenhower Fellowship scholars are doing groundbreaking research that will contribute to N.C. A&T's success as an engineering powerhouse!



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](http://bit.ly/ncatthetransportationinstitute)

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