



Semi-Annual Progress Report for University Transportation Centers #6

October 1, 2025 – March 31, 2026

Federal Agency: U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology

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Project Title: Maritime Transportation Research and Education Center (MarTREC)

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Recipient Organization: University of Arkansas
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End Date: May 31, 2029

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Report Term or Frequency: Semi-annual

Signature:

INTRODUCTION

The Maritime Transportation Research and Education Center (MarTREC) is a U.S. Department of Transportation (USDOT) Tier 1 University Transportation Center funded through the Office of the Assistant Secretary for Research and Technology. MarTREC was competitively awarded under MAP-21, the FAST Act, and now through funding of the Bipartisan Infrastructure Law. MarTREC's vision is to be recognized as the nation's premier source for expertise on maritime and multimodal transportation research and education.

The MarTREC consortium consists of renowned maritime transportation researchers dedicated to transferable research and innovative education and workforce development. Our consortium consists of the University of Arkansas (UA), Jackson State University (JSU), Louisiana State University (LSU), Texas A&M University (TAMU)/Texas Transportation Institute (TTI), University of New Orleans (UNO), and Vanderbilt University (VU).

This semi-annual progress report is submitted as per our UTC grant reporting requirements.

1. ACCOMPLISHMENTS

What are the major goals of the program?

MarTREC will contribute primarily to the strategic goals of building Economic Strength and Global Competitiveness by addressing resilient supply chains and system reliability and connectivity. The following performance metrics are used to evaluate the effectiveness of our research, leadership, education and workforce development, and technology transfer and collaboration and assess our progress towards meeting our semi-annual goals.

Research Performance Metric	Semi-Annual Goal	Semi-Annual Progress
# of peer-reviewed journal articles (published, accepted, submitted)	10 / 6 month	9
# of conference presentations given	10 / 6 month	27
# of students participating in transportation research projects funded by UTC	10 / 6 month	41
Leadership Performance Metric	Semi-Annual Goal	Semi-Annual Progress
# of national and regional leadership positions held	5 / 6 month	48
# of invited talks given	5 / 6 month	7
# of leadership and research awards received	1-2 / 6 month	7
Education and Workforce Development Performance Metric	Semi-Annual Goal	Semi-Annual Progress
# of transportation-related degrees conferred to supported students	7 / 6 month	9
# of technician certification programs offered	4 / 6 month	7
# K-12 outreach programs offered	2-3 / 6 month	3
Technology Transfer and Collaboration Performance Metric	Semi-Annual Goal	Semi-Annual Progress
# of existing collaborative partnerships	10 / 6 month	83
# of new collaborative partnerships formed	2-3 / 6 month	16
# of project deliverables submitted	2-3 / 6 month	5
# of collaborative research/tech transfer agreements	1-2 / 6 month	0

What was accomplished under these goals?

MarTREC's progress towards our semi-annual goals is presented in previous table. The following bullet points include both select project-specific updates and program-level highlights

- The *IoT (Internet of Things) Sensor Fusing for Low-Cost Cloud Based Monitoring for Resilient Levees and Embankments* project successfully developed and demonstrated a low-cost, scalable monitoring system that integrates IoT-based sensor fusion with IMU sensors for real-time slope performance tracking. It established a cloud-based framework for remote data handling and analytics, reduced reliance on expensive traditional instrumentation, and incorporated periodic unmanned aerial vehicle UAV-based LiDAR (Light detection and ranging) data collection. Overall, the system provides an automated and practical solution validated through real-world deployments.
- Key accomplishments for project, *AI-Drive Preventive Maintenance for Coastal Bridges in Marine Environments*, include the completion of two manuscripts drafts, validation of a five-dimensional physics-informed input representation that improves predictive performance, and the development of integrated systems for literature acquisition (UWSS and OpenClaw) and data processing (SciMine-TS).
- Dr. Herbert of JSU published a paper with UC Berkely colleagues with her work with *Pathways for a Future-Ready Maritime Transportation Workforce*, along with four students developing articles on maritime transportation workforce development challenge and future outlook.
- Machine learning-based surrogate flood models have been developed for street-scale inundation in the city of Jackson, MS.
- TTI has created a summary database of all bridges on the subject rivers. A vulnerability rating system has been defined that considers structural vulnerability and allision potential, *A Simulation and Decision-Support Tool for Vulnerability Reduction in Hazardous Material Transportation via the U.S. Inland Waterway Transportation System* project shows how unstructured incident narratives can be systematically converted into probabilistic inland waterway systems.
- Two new research projects were started during this reporting cycle as presented below

New Project Title	Lead Institution
A Reinforcement Learning Framework for Dynamic Inland Waterway Maintenance Under Stochastic Shoaling and Annual Budget Allocation	Texas A&M University
Operationalizing Smartwatch Technology to Measure and Mitigate Heat Stress Among Maritime Transportation Workers	Vanderbilt University

- Twelve ongoing research projects continued during this reporting cycle as presented below. These projects have made steady, measurable progress during this reporting period, with key milestones across research, development, and collaboration efforts, positioning the work for timely completion and next-stage outcomes.

Ongoing Project Title	Lead Institution
Pathways for a Future-Ready Maritime Transportation Workforce - <i>Project 7010</i>	Jackson State University
AI-Driven Preventive Maintenance for Coastal Bridges in Marine Environments – <i>Project 7011</i>	Jackson State University
A Simulation and Decision-Support Tool for Vulnerability Reduction in Hazardous Material Transportation via the U.S. Inland Waterway Transportation System - <i>7012</i>	University of Arkansas
Bracing for Impact: Developing Steel-Concrete Sandwich Panel Retrofits for Increased Bridge Pier Protection – <i>Project 7013</i>	University of Arkansas
Developing Optimization Methods for Maritime Escort Strategies for Littoral and Chokepoint Shipping Lanes – <i>Project 7016</i>	University of Arkansas

Resilient Multimodal Transport Systems via Container-on-Barge – <i>Project 7018</i>	University of Arkansas
Automatic Boundary Detection and Change Analysis Using Static and Dynamic Imagery – <i>Project 7017</i>	University of Arkansas
IoT Sensor Fusion for Low-Cost Cloud Based Monitoring for Resilient Levees and Embankments – <i>Project 7020</i>	Jackson State University
Community Resilience in Emergency Advanced Transport Education -The Next Frontier – <i>Project 7021</i>	Jackson State University
Improved Road Flood Predictability and Disruption Response Through the Synergistic Integration of Geospatial Databases, Process-Based Modeling, and Machine Learning – <i>Project 7022</i>	Jackson State University
Mississippi Summer Transportation Institute 2025 – <i>Project 7023</i>	Jackson State University
Vulnerability Assessment of Bridges Crossing Major US Rivers in Support of a Safe and Resilient Transportation System – <i>Project 7025</i>	Texas A&M Transportation Institute

- Five research projects were completed during this reporting cycle as presented below. These projects are in the dissemination phase.

Completed Project Title	Lead Institution
An Automated Training Model for Selecting Maritime Traffic Monitoring and Tracking Model Types using AIS Data with Missing Information – <i>Project 7009</i>	Jackson State University
Deploying Smart Watch Technology to Measure and Mitigate Heat Stress Among Maritime Transportation Workers – <i>Project 7008</i>	Vanderbilt University
Continuous Decision Plan for Optimizing Budget Allocation for Dredging Projects Considering Shoaling Effect within a Multi-year Horizon – <i>Project 7007</i>	Texas A&M University
Synthesis and Analysis of Maritime Supply Chain and Freight Indicators – <i>Project 7015</i>	University of Arkansas
An Elementary School STEMusical: Exciting the Future of STEM – <i>Project 7014</i>	University of Arkansas

The MarTREC consortium leadership team is as follows:

Center Personnel	Title	Organization
Heather Nachtmann	Center Director	University of Arkansas
Michelle Barry	Center Associate Director	University of Arkansas
Stacy Williams	Center Associate Director	University of Arkansas
Sandy Sehon	Center Manager	University of Arkansas
Peggy Anderson	Research Advancement Specialist	University of Arkansas
Hiba Baroud	Site Director	Vanderbilt University
Vince Mantero	Site Director	Texas A&M Transportation Institute
Bethany Stich	Site Director	University of New Orleans
Bruce Wang	Site Director	Texas A&M University
Robert Whalin	Site Director	Jackson State University
Brian Wolshon	Site Director	Louisiana State University

How have the results been disseminated (submitted, accepted, published)?

- Nine journal articles
- Twenty-seven presentations

- Five conference papers
- Two books/book chapters

What do you plan to do during the next reporting period to accomplish the goals?

- The remaining goals for *Project 2020* focus on advancing the system into a more predictive and intelligent framework. This includes developing a digital twin of geotechnical infrastructure by integrating IoT sensor and UAV-based LiDAR data, enhancing Geotechnical Asset Management for early detection of instability and deformation, and building a machine learning–driven predictive analytics framework to identify potential failure mechanisms under extreme conditions.
- Immediate priorities for *Project 7011* include finalizing experiments, figures, and revisions for the two draft manuscripts and advancing them to submission, while continuing development of the third publication using structured, literature-derived datasets for model training and evaluation
- The remaining goals focus on completing key research deliverables and translating findings into actionable workforce strategies with *Project 7010*
- During the next reporting period, *Project 7012* will be using machine learning applications for predictive risk analysis in inland waterway hazmat transportation
- Work will continue across ongoing projects with a focus on analysis, completing key tasks, and meeting milestones
- Continuing work on disseminating research outcomes via publications, presentations and invited talks
- Continue building collaborations to ensure MarTREC contributes use-inspired research serving USDOT and its associated constituents
- Continue planning and participating in the National Mobility Summit on June 22, 2026
- Continue planning for our annual advisory board meeting in Fall 2026

2. PARTICIPANTS & COLLABORATING ORGANIZATIONS

What organizations have been involved as partners?

Advisory Board Member	Title	Organization
Harold Beaver	District Engineer, (Retired)	Arkansas Department of Transportation
Reese Brewer	Director	Frontier Metropolitan Planning Organization
Jack Buffington	Director, (Retired)	Mack Blackwell Transportation Center
Cassandra Caldwell	Executive Director	Arkansas Waterways Commission
Bryan Day	Executive Director	Port of Little Rock
Dan Flowers	Director, (Retired)	Arkansas Department of Transportation
Ann Gilbert	Executive Director	Arkansas Transit Association
Gary Hunt	Vice President, (Retired)	ABF Freight System, Inc.
Mike Johnson	Assoc. Vice Chancellor, Facilities (Retired)	University of Arkansas
Caren Kraska	President/Chairman	Arkansas & Missouri Railroad
Glenn Moore	Advisor, Cyber Security and Infrastructure Security Agency	U.S. Dept. of Homeland Security
Ned Mitchell	Research Civil Engineer	U.S. Army Corps of Engineers
Shannon Newton	President	Arkansas Trucking Association
Craig Philip	Professor, Civil Engineering	Vanderbilt University

Matthew Smith	Technical Director, Water Resources Infrastructure	U.S. Army Corps of Engineers
Melissa Tooley	Director, External Initiatives	Texas A&M Transportation Institute
Lorie Tudor	Retired	Arkansas Department of Transportation
Eric Wolfe	President	Watco Logistics

Have other collaborators or contacts been involved?

Existing Collaborators

1. Aaron Brantly, Virginia Tech, Blacksburg, VA, research collaboration
2. Austin Downey, Assistant Professor, University of South Carolina, research collaboration
3. Berniece Herbert, Jackson State University, research collaboration
4. Bertiel Harris, FEMA, board service
5. Candis Pizzetta, Jackson State University, research collaboration
6. Cathy Vienne, Propeller Club of New Orleans, outreach
7. Charles Colen, University of Arkansas at Pine Bluff, Pine Bluff, AR, research collaboration
8. Charles Doktycz, Argonne National Laboratory, research
9. Cheryl Keymer, North Arkansas College, Harrison, AR, research collaboration
10. Christine Titus, Greater New Orleans Port Safety Council, outreach
11. Colmore Christian, Alabama A&M University, co-author and project collaborator
12. Connie Porter Betts, Louisiana Department of Transportation, board service
13. Craig Woolsey, Virginia Tech, Blacksburg, VA, research collaboration
14. Daniel Capparella, Vanderbilt University, outreach
15. David Scoggin, Global Logistics Expert, board service
16. Dawn Lopez, Associated Terminals, outreach
17. Donghoon Kim, Arkansas State University, Jonesboro, AR, research collaboration
18. Doug Hutchings, Arkansas Research Alliance, Little Rock, AR, research collaboration
19. Doug Mettenburg, J.B. Hunt Transport, industry contact for J.B. Hunt Innovation Center
20. Douglas Grubbs, Crescent Port Pilots Association (retired), board service and outreach
21. Fan Bu, Texas Tech University, research collaboration (IMSE)
22. Dwight Norton, Chief of Planning and Infrastructure, New Orleans Regional Transit Authority, board service
23. Feng Wang, Professor, Ingram School of Engineering, Texas State University, San Marcos, research collaboration
24. Greg Harris, New Orleans Public Belt Railroad, board service and outreach
25. Harrison Crabtree, Director, World Trade Center Greater New Orleans, board service
26. Huidong Li, Vanderbilt University, research collaboration
27. J.B. Ruhl, Vanderbilt University, research collaboration
28. Jack Mays, Virginia Tech, Blacksburg, VA, research collaboration
29. James Davis, U.S. Army Corps of Engineers, Vicksburg, MS, research collaboration
30. Jasim Imran, Professor, University of South Carolina, research collaboration
31. Jeff Roesel, New Orleans Regional Planning Commission, board service, adjunct instructor
32. Jesse Spencer-Smith, Vanderbilt University, research collaboration
33. Joannis Koutromanos, Virginia Tech, Blacksburg, VA, research collaboration
34. John Walker, Caltrans Division of Planning and Modal Program Management, research collaboration
35. Jurgen Hackl, Princeton University, proposal development

36. Justin Rawls, Mississippi Department of Transportation, project support consultation
37. Kelly Owens, INROADS, Chief Impact Officer; sustainability series and HBCU fellowship program coordination
38. Kenichi Soga, UC Berkeley, proposal development (international consortium on socio-technical methods)
39. Kimberly Hilliard, Center for Social Entrepreneurship (carried from previous report)
40. Kristi App, International Freight Forwarders & Customs Brokers Association of New Orleans (IFFCBANO), research and education
41. Kylee Mills, Port of New Orleans, outreach
42. Laura Berry, North Arkansas College, Harrison, AR, research collaboration
43. Laura Bryan, Principal Planner, City of New Orleans, board service and education
44. Laura Myers, University of Alabama, research collaboration
45. LCDR Casey Rayburg, U.S. Navy, research collaboration
46. LCDR Chase Allvord, U.S. Navy, research collaboration
47. LCDR Dan Wright, U.S. Navy, research collaboration
48. LCDR Ian Johnston, U.S. Navy (retired), research collaboration
49. Lin Meng, Vanderbilt University, research collaboration
50. Loretta Moore, Jackson State University, research collaboration Louisiana Disaster Resilience Initiative, board service
51. Louisiana Ports and Waterways Investment Commission, board service
52. Magdalena Asborn, U.S. Army Corps of Engineers, research collaboration
53. Maria Caballero, Wellesley College, research collaboration
54. Matt Gondolf, UC Berkeley, student exchange program development
55. Max Baker, City of Franklin, research collaboration
56. Michael Roth, U.S. Army Corps of Engineers, Vicksburg, MS, research collaboration
57. Mike Sewell, Gresham Smith, research collaboration
58. MS Department of Transportation (MDOT), research collaboration
59. MS Emergency Management Agency (MEMA), research collaboration
60. NASEM Gulf Research Program, Co-Chair, Committee of Experts for Building Health and Climate Research Capacity
61. National Waterways Foundation, board membership
62. Ned Kenneth, U.S. Army Corps of Engineers, research collaboration
63. Northwestern University Transportation Center, research collaboration on multi-modal freight systems resilience
64. Oak Ridge National Laboratory (Rebecca Efroymsen), paper development on environmental justice indicators
65. Patricia Hu, Bureau of Transportation Statistics (retired), co-chairing JSM transportation statistics session
66. Paul Matthews, Port of South Louisiana, research, outreach, and board service
67. Randy Guillot, President, Triple G Express, Inc., research, education, and board service
68. Rebecca Efroymsen, Oak Ridge National Laboratory, research collaboration
69. Red Cross, research and education collaboration
70. Renee Amar, Executive Director, Louisiana Motor Transport Association, board service and research
71. Sanjib Sharma, Howard University, research collaboration
72. Sarah Burnett Smith, Arkansas Research Alliance, Little Rock, AR, research collaboration
73. Saurav Kumar, Arizona State University, research collaboration

74. Scott Parr, Embry-Riddle Aeronautical University, Daytona Beach, FL, publications and book collaboration
75. Seth Martin, U.S. Army Corps of Engineers, Little Rock District, research collaboration
76. Shahadat Hossain, Professor, Department of Civil Engineering, UT Arlington, research collaboration
77. Steve Olmsted, Arizona Department of Transportation, research collaboration
78. Tim Tsang, Texas Tech University (IMSE), research collaboration
79. University of Louisiana Maritime Academy Advisory Committee, board service
80. WeiKe Lu, Professor, University of Alabama at Tuscaloosa/Alabama Transportation Institute, research collaboration
81. William App, President, J.W. Allen & Co., Inc., board service
82. Xiaobing Li, Jackson State University, research collaboration
83. Yili Tang, University of Western Ontario, Canada, proposal development

New Collaborations

1. Abby Cisco, USACE ERDC, research collaboration
2. Brent Crocker, Mississippi State Emergency Management Office, partnership initiative
3. California Department of Transportation (Siavash Shojaat), research collaboration
4. Greg Dejarnett, Alabama Emergency Management, research collaboration
5. Hao Liu, Assistant Professor, University of Maine, research collaboration
6. Jann J. Norwood, Director of Academies, Jackson Public School District, MSTI program collaboration
7. Jing-Ru Cheng, PhD Engineer, Research and Development Center, U.S. Army Corps of Engineers, Vicksburg, MS, research collaboration
8. Karim El-Basyouny, University of Alberta, Edmonton, Canada, publications collaboration
9. Kevin Jin, Electrical Engineering and Computer Science, University of Arkansas, joint proposal
10. Natasha Cunday, Mississippi State Emergency Management Office, partnership initiative
11. Nur Mohammad Shuman, North South University, Bangladesh, research collaboration
12. Rocky Talchabadel, Assistant Professor, Jackson State University, project on AI and Nature-Based Solutions for flooding
13. Rodrigo Affonso de Albuquerque Nobrega, Ph.D., Transportation Research & Environmental Modeling, Federal University of Minas Gerais, Belo Horizonte, Brazil, research collaboration
14. Sadik Khan, climate resilience and sustainable infrastructure collaboration
15. Stephen Wong, University of Alberta, Edmonton, Canada, publications collaboration
16. Suman Mitra, Civil Engineering, University of Arkansas, collaborative proposal Waggoner Engineering, student training on URBAN and ESRI application

3. OUTPUTS

Journal publications, presentations, conference papers, and books

Journal Publications

1. Bista, S., Bhattarai, S., Sharma, S. & Talchabadel, R. "Local-scale flood hazard projections in historically vulnerable communities." *Model. Earth Syst. Environ.* 12, 5 (2026)
2. E Shifat, S., Zohuruzzaman, A. Q. M., Darothy S.B., Li, Y., Khan, S., Cour, I.L., Shafi, N. (2025). "Sensor-Based Performance Ranking of Yazoo Clay Slopes via ML-SHAP." Under Review for publication at *Transportation Research Record*.

3. Fuller, J.D., Metz, N., Wolshon, B., Hassan, H., "Cross-National Analysis of Drivers' Route Diversion Behavior: Insights from a 13-Country Study", ASCE's Journal of Transportation Engineering, Part A: Systems, Status: Undergoing review
4. Gupta, V.K., Burris, M., Wang, X., and Turnbull, K.F., 2025. "The Impact of the I-35 HOT Lane Toll Cap on Congestion and Revenue." Research in Transportation Economics. Elsevier Publisher. 113, 101628
5. Kang, L., Z. Zhang, S. Parr, and B. Wolshon, "Investigating Traffic Resilience and Clearance Time in Hurricane Evacuations: The Role of Population, Geographic Factors, and Evacuation Corridors," Transportation Research Record: Journal of the Transportation Research Board, in press for 2026 publication
6. Kumar, N., Pour, Z., Liao, H., Zhang, S., and Nachtmann, H., "Risk-Informed Decision Support for Safe Inland Waterway Transportation Using Natural Language Processing and Bayesian Networks", *Risk Analysis*, under review, 2026
7. Meng, Y., X. Wang, H. Tan, H. Liu, and W. Xu. 2025. Bayesian Procedures for Modeling Truck Route Choices. IEEE Transactions on Intelligent Transportation Systems. 26(8), 11647-11657
8. Murphy, J., and Scott, M. (Grad Student) Virtual Reality Training for Students and Responders in an Emergency Management Technology Program. Science Innovation (SI) Journal). Spring/Summer 2026.
9. Sultana, T., H. Hassan, and B. Wolshon, "Toward the Integration of Vehicle-to-Infrastructure (V2I) Communication in Transportation System: An Investigation of Drivers' Perceptions and Preferences for V2I Messages," Journal of Intelligent Transportation Systems, in press for 2026 publication

Presentations

1. Abkowitz, M. Speaker, "Operationalizing Smartwatch Technology to Measure and Mitigate Heat Stress Among At-Risk Populations," Adaptation Futures, October 2025
2. Atoofi, P. and X. Wang. "Improved Modeling of Dredging Project Selection Considering Channel Draft and Stochastic Shoaling Effect on the Network." TRB 105th Annual Conference in DC. January 2026.
3. Baroud, H. "Linking Infrastructure Resilience and Economic Benefits Through Complex Systems Modeling." Oxford Program for Sustainable Infrastructure Systems, University of Oxford, November 2025.
4. Baroud, H. "Urban Resilience from the Perspective of System Interdependencies. Oak Ridge National Laboratory." October 2025
5. Bhandari, A., Bhattarai, Y., Sharma, S., Talchabhadel, R. "Machine Learning Surrogate Modeling to Improve Urban Flood Predictions," AGU25, New Orleans, LA, December 2025
6. Bhattarai, Y., Ghimire, G. R., Talchabhadel, R., Sharma, S. "Enhancing Riverine Flood Inundation Predictions with Artificial Intelligence," AGU25, New Orleans, LA, December 2025
7. Bhandari, A., Bhattarai, Y., Sharma, S. & Talchabhadel, R. "Enhancing Transportation Resilience to Floods Using Machine Learning based Surrogate Model," TRBAM-26 (Washington, D.C., 2026)
8. Bista, S., Poudel, S., Talchabhadel, R. "Rapid flood mapping using low complexity terrain-based techniques," AGU25, New Orleans, LA, December 2025
9. Bryan, L.B., "The City Planning Commission". March 2026 Invited
10. Coleman, J. "How Our Transportation Solutions Fit into the Broader Freight Ecosystem". October 2025 Invited

11. Darothy, S.B, Zohuruzzaman, A.Q.M., E Shifat, S., Khan, S., Cour, I.L., "Comparing the Accuracy of LiDAR and UAV Photogrammetry for Multi-Temporal Slope Change Detection" Presented in TRB 2026
12. Eriksen, K., "Connecting Global Markets through the Waterfront, and What's Up with the Mississippi River Ship Channel". October 2025 Invited.
13. Kuai, C., Z. Li, Y. Zhang, X. Wang, D. Lord, Y. Zhou. "U.S. Port Disruptions Under Tropical Cyclones: Resilience Analysis by Harnessing a Multiple-Source Dataset." TRB 105th Annual Conference in DC. January 2026.
14. Lawson, A., Parr, S., Wolshon, B., "California and Arizona Wildfire Evacuation Safety Analysis," TRB 2026 Evaluating Speed and Weather Interactions for Traffic Safety Outcomes, and January 2026
15. Lawson, A., Parr, S., El-Basyouny, K., Wolshon, B., Wong, S., Blain, M., "Traffic Safety Assessment of Crashes for Hurricane Evacuations," TRB 2026 Urban Traffic Efficiency and Safety Through Operational Lane Design, January 2026
16. Metz, N., Fuller, J.D., Wolshon, B., "Characterizing Driver Route Flexibility: An International Analysis," Session 4029, 105th Annual Meeting of the Transportation Research Board, Washington, DC, January 2026.
17. Mailer, M., "Across the Atlantic in the Land of Mountains: Insights into Mobility and Tourist Travel Research in Austria". March 2026 Invited.
18. Mallum, F., "Geopolitics, Protectionism, and the Changing Global Trade System". October 2025 Invited.
19. Mitra, S., Curry, R., Sullivan, K., "Developing Optimization Methods for Maritime Escort Strategies for Littoral and Chokepoint Shipping Lanes," INFORMS Annual Meeting, October 2025. Invited talk
20. Murphy, J. Interdisciplinary Collaborations with Tech...; ATMAE Con.; October 2025
21. Murphy, J. Tech Sim. For Disaster Prep Training; ETC User Con.; October 2025
22. Murphy, J. Tech Sim for Disasters; 1909 Technology Ed. Con. November 2025
23. Murphy, J. HBCU Emergency Management Workforce Consortium: February 2026
24. Philip, C. Moderator, "SmartRivers Plenary Panel on Maritime Disruption," Sept 2025, Memphis
25. Pu, F., X. Wang, X. Li and Y. Zhou. "Truck-as-Hub Vehicle Routing Problem with Drones in Rural Areas." TRB 105th Annual Conference in DC. January 2026.
26. Roesel, J., "Leading Our Growth and Development: An Inside Look at the Regional Planning Commission". January 2026 Invited.
27. Shifat, E., Zohuruzzaman, S. A. Q. M., Darothy S.B., Li, Y., Khan, S., Cour, I.L., Shafi, N. "Sensor-Based Performance Ranking of Yazoo Clay Slopes via ML-SHAP." Presented in TRB 2026

Conference Papers

1. Lawson, A., S. Parr, K. El-Basyouny, B. Wolshon, M. Blain, S. Wong, "Traffic Safety Assessment of Crashes for Hurricane Evacuations", Transportation Research Record, Status: Pending, undergoing review, Submitted 2025.
2. Zohuruzzaman, A.Q.M., Zulfikar, M., Alzghoul, A., Khan, S. (2025). IoT-AI System for Real-Time Landslide Monitoring and Risk Assessment in Slopes and Levees. Conference of American Geophysical Union 2025. Poster Presentation.
3. Zohuruzzaman, A.Q.M., Zulfikar, M., Khan, S. (2026). Proactive Slope Monitoring for Climate-Resilient Geotechnical Infrastructure. DFI 51st Annual Conference on Deep Foundations Conference. Abstract accepted.
4. Zohuruzzaman, A.Q.M., E Shifat, S., Zulfikar, M., Khan, S., Shafi N. (2026). ALARM - Automatic Landslide Assessment and Risk Monitoring: A Special Analysis Framework for Real-time Geo-

structure Health Monitoring. 2026 International Mechanical Engineering Congress and Exposition(IMECE) Conference. Abstract accepted.

5. Zohuruzzaman, A.Q.M., E Shifat, S., Zulfikar, M., Khan, S. (2027). AI Drive Zonal Deformation Risk Identification in Expansive Clay Highway Embankments Using a Real-Time Multi-Modal Monitoring System. Geo-Congress 2027 Conference. Abstract submitted.

Books/Book Chapters

1. Wolshon, B. and S. Parr, Emergency and Major Event Transportation Systems Planning, Design, Management, and Operations, Elsevier Press, in development for March 2026 publication
2. Wolshon, B. and V.V Dixit. "Planning and Management of Transportation Systems for Evacuation," Chapter 7, Handbook of Emergency Response: A Human Factors and Systems Engineering Approach, Second Edition, ISBN: 9781041073482, Taylor & Francis Publishing Inc., New York, 2026

Website(s) or other Internet site(s)

<https://martrec.uark.edu/>

<https://www.uno.edu/academics/colaehd/la/centers-institutes-affiliates/transportation>

<https://tti.tamu.edu/>

<https://www.vanderbilt.edu/vector/>

Technologies or techniques

- MarTREC research supports public and industry impact by enabling knowledge sharing and stakeholder engagement through webinars and digital outreach, promoting the adoption of innovative monitoring technologies
- Presented the research findings to MS Department of Transportation and Pearl River Water Supply District
- Fireside Chat with the Emergency Manager from the MS Department of Transportation
- Organizations including National Weather Service, the MS Emergency Management Agency and Public Safety official are working with students' professional development, research engagement, and job shadowing and intern opportunities
- JSU's team has developed a weather notification App with resource information before, during and after an emergency. They have incorporated a simulations lab in preparation for disaster response.
- All codes and data generated from Vanderbilt's research are publicly available
- Projects are training undergraduate, graduate, and research scientists to become independent researchers and future decision makers.
- Work was presented to the US Committee on Maritime Transportation System Supply Chain Resilience
- A deep learning method is being developed for multi-year waterway maintenance project planning through the ongoing research project
- Use of AI in this project to monitor infrastructure will provide new pathways and opportunities for technology use
- Disseminated work at conferences and various meetings with military officers
- Expanding knowledge involving the use of smartwatch and computer vision technology to solve practical transport safety and mobility problems
- Use of computer vision for traffic safety analysis and use of smartwatches to identify stressful locations

- Established the explainable, physics-informed machine learning architecture using the Temporal Fusion Transformer (TFT) Model

Inventions, patent applications, and/or licenses

- Nothing to report

Other products

- Utilizing the National Bridge Inventory (NBI) database to conduct this project
- Developing an imagery database that can be shared with agencies and public
- Agent-based simulation code developed in Netlogo
- Python connection to simulation software using PyNetlogo. The code has been updated and saved in a shared folder

4. OUTCOMES

MarTREC faculty have increased the body of knowledge through courses they teach at their universities:

Undergraduate Courses

1. Active Transportation Planning, Policy and Design
2. Car Culture & Suburbs
3. Case Studies in Risk and Reliability
4. Decision Support Tools in Supply Chain and Logistics
5. Disaster Management
6. Engineering Economic Analysis
7. Enterprise Risk Management
8. Geometric Design of Highways and Airports
9. Globalization & Mobility
10. Introduction to Transportation Engineering
11. Principles of Highway and Traffic Engineering
12. Risk, Reliability, Resilience Engineering
13. Senior Design Project
14. Soil Mechanics

Graduate Courses

1. Advanced Highway Design and Traffic Safety
2. Applications in Civil and Environmental Engineering
3. Applied Techniques for Transportation Professionals
4. Case Studies in Risk and Reliability
5. Direct Study, Transportation Management
6. Enterprise Risk Management
7. Environment & Energy
8. Finite Element Methods
9. Intermodal Freight Transportation
10. Level Linear Programming
11. Quantitative Exploration of Data-Uses AIS and NHTSA data
12. Seminar on Computation Data Enabled Science and Engineering Methods
13. Special Topics in CDS&E- Data Clustering Analysis Methods with AID Data and HNTSA Data

14. Topics in Mathematics and Statistics with applications to CDS&E
15. Traffic Operations and Control
16. Transportation Policy and Administration
17. Unsaturated Soil Mechanics
18. Urban Transportation System Planning

Short Courses

1. Webinar on Pathway toward Resilience for Geo-Infrastructure, January 2026
2. Webinar on Geotechnical Asset Management with Remote Sensing and Geophysical Methods for Climate Adaptive, February 2026
3. Webinar on Sustainable Pavement Solutions on Expansive Soils using Geocells and Recycled Asphalt Pavement, March 2026
4. Virtual Faculty Workshop on GeoClimate Intelligence Platform, March 2026

Education Materials Developed

1. Interviewed and quoted as expert on traffic safety in “Meta’s largest data center brings 600% crash spike, chaos to rural Louisiana,” WGNO, New Orleans, Louisiana, November 19, 2025. Available online at: <https://www.wgno.org/local-regional-news/2025-11-19/construction-on-metas-largest-data-center-brings-600-crash-spike-chaos-to-rural-louisiana>
2. Interviewed and quoted as an expert on roads and traffic for “Louisiana tops nation in road rage incidents for second year.” WBRZ, Baton Rouge, LA, broadcast date January 16, 2026. Available online at: <https://wgno.com/news/louisiana/louisiana-tops-nation-in-road-rage-incidents-for-second-year/?nxsparm=7>
3. Interviewed and quoted as an expert on roads and traffic for “Louisiana ranks first in road rage incidents. LSU experts share reasons why and how to avoid it.” The Reveille, Baton Rouge, LA, January 19, 2026. Available online at: <https://lsureveille.com/272911/news/louisiana-ranks-first-in-road-rage-incidents-lsu-experts-share-reasons-why-and-how-to-avoid-it/>
4. Development of executive management training materials focused on risk management, assessment and communication

5. IMPACTS

What is the impact on the effectiveness of the transportation system?

MarTREC faculty have impacted on the transportation system by holding **leadership positions** that engage with external transportation organizations and individuals:

1. Advisor, Alpha Pi Mu
2. Advisor, INFORMS Arkansas Student Chapter
3. Associate Director, MarTREC and MackBlackwell
4. Associate Editor, IEEE Transactions on Reliability
5. Board of Directors, American Concrete Institute (ACI)
6. Board Member, Blue Sky Maritime Coalition and Chair of Sustainable Funding Committee
7. Board Member and Past Chairman, Cumberland River Compact
8. Board Member, NASEM Governing
9. Board Member, National Waterways Foundation
10. Board Member, Southeastern Conference of Public Administration
11. Chair, TRB Standing Committee on Extreme Weather and Climate Adaptation

12. Co-Chair, Committee, U.S. Gulf Coast, National Academies of Science, Engineering & Medicine (NASEM) Gulf Research Program
13. Co-chair, Risk and Resilience Measurement Committee Member in ASCE Infrastructure Resilience Division
14. Committee Chair, Transportation Research Board, Executive Committee and NRC Division
15. Committee Member, Green Shipping Corridor Stakeholders
16. Committee Member, IISE Scholarship
17. Committee Member, INFORMS Scholarship
18. Committee Member, Inland Waterway Transportation
19. Committee Member, NASEM Report Review
20. Committee Member, SmartRivers 2025 Conference
21. Committee Member, Transportation Research Board: Critical Infrastructure Protection
22. Committee Member, TRB Resilience Section
23. Community Liaison, State-of-the-Science and the Future of Cumulative Impact Assessment Board on Environmental Studies and Toxicology, NASEM
24. Committee Planning Member, 2026 NaTMEC conference
25. Executive Committee Member, ASA Transportation Statistics Interest Group
26. Executive Committee Member, Global Young Academy
27. Faculty Liaison/Coordinator, HBCU_SCI Fellowship Program, funded by INROADS, UNCF and the Thurgood Marshall Fund
28. Lead Track Chair, IISE Annual Meeting Operations Research
29. Member, Advisory Council for Transportation Research, Arkansas Department of Transportation
30. Member, American Society for Public Administration Transportation Policy & Administration
31. Member, AREMA Technical Committee 1 on Roadway and Ballast.
32. Member, Deep Foundations for Landslides & Slope Stabilization Committee, Deep Foundation Institute
33. Member, ERVA Standing Council, NSF Engineering Research Visioning Alliance
34. Member, Federal Demonstration Partnership/NAS, Truitt-Felbinger Award Committee American Society for Public Administration
35. Member, Foundation Committee, US Society of Dams
36. Member, Levee Committee, US Society of Dams
37. Member, Louisiana Ports and Waterways Investment Commission
38. Member, Strategic Planning Committee ACSP
39. Member, Technical Committee on Unsaturated Soils, Geo-Institute, ASCE
40. Member, Transportation Research Committee on Ports and Channels
41. Member and Workgroup lead of Data and AI, AKH 17 Standing Committee on Structural Foundations, TRB, NASEM.
42. Member of AKH 00 AI Working Group, TRB, NASEM.
43. Member-At-Large, Council of University Transportation Centers Executive Committee
44. Research Director of FERSC, Tier-1 UTC
45. Senior INFORMS Member
46. Epsilon Pi Tau International Tech Honorary Trustee-Jackson State Chapter (2006-Present)
47. US representative, World Association for Waterborne Transport Infrastructure (PIANC) Task 193
48. Vice Chair, Technical Committee on Shallow Foundations, Geo-Institute, ASCE

Awards bestowed upon MarTREC faculty as a result of their contributions to the understanding and awareness of transportation issues:

1. Chimka, Justin; John L. Imhoff Chair (2024-2025)

2. Khan, Sadik; 2025 AASHTO High Value Research- Honorable Mention, on Research Project, "State Study 316: Advanced Landslide Investigation Protocol Using Geophysical Methods for Mississippi."
3. Khan, Sadik 2020 NSF CAREER AWARD Awarded by the National Science Foundation.
4. Murphy, Jessica; Waves of Change STEM Professional Achievement Award (10/24/2025)
5. Murphy, Jessica, Epsilon Pi Tau International Honorary-Warner Award, Distinguished Lecturer Award March 2026
6. Nathan Gartner Award (Best Paper on Traffic Flow Theory) from the TRB by co-advised Ph.D. student Fan Pu, Dr. Yang Zhou and other collaborators.
7. Talchabhadel, Rocky; Mini-Grant Data Science Project Showcase First Prize Best in Show, December 2025, Atlanta, GA

Awards bestowed upon MarTREC students as a result of their contributions to the understanding and awareness of transportation issues:

1. Lawson, Amelia, UTC Student of the Year Award, January 2026
2. 1st Place, Zaidur Rahman, Best Poster Competition at Mack-Blackwell Annual Advisory Board meeting, October 2025
3. 2nd Place, Shantonu Mitra, Best Poster Competition at Mack-Blackwell Annual Advisory Board meeting, October 2025
4. 3rd Place, Josiah Entner, Best Poster Competition at Mack-Blackwell Annual Advisory Board meeting, October 2025

What is the impact on the body of scientific knowledge?

Editorial journal positions currently held by MarTREC researchers:

1. Advisory Board Member on Transportation Research Part E: Logistics Review
2. Associate Editor, INFORMS Journal on Computing
3. Associate Editor, IISE Transactions on Healthcare Systems Engineering
4. Associate Editor, Maritime Economics and Logistics
5. Associate Editor, Natural Hazards Review
6. Associate Editor, Stochastics and Quality Control
7. Editorial Board, Quality Engineering
8. Editorial Board, ACI Structural Journal
9. Editorial Board, Journal of Critical Infrastructure
10. Editorial Member, ASCE Journal of Risk and Uncertainty
11. Editorial Member, Environment Systems and Decisions
12. Area Editor, The Engineering Economist
13. Review Editor, Frontiers in Water, Water and Built Environment

What is the impact on transportation workforce development?

- MarTREC graduated 10 students into the transportation workforce during this reporting period; three master's students and six doctoral students, and 1 undergraduate student
- The Center for Training Transportation Professionals at the University of Arkansas executed workforce development training programs through 30 classes, certifying 657 participants in seven areas: asphalt, aggregates, concrete, pavement, soils, stormwater management, and unpaved roads.
- Projects are training undergraduate students, graduate students, and research scientists to become independent researchers and future decision makers
- Driving Simulator/Autonomous Vehicles/Modern technologies for senior high students

- Developed a website with monthly webinar series and animated videos to facilitate effective knowledge dissemination and stakeholder engagement
- Provided scholarships to students for articles on maritime labor workforce development, providing exposure to transportation to young people
- Assisted in drafting brochure to distribute during MS Partners in Preparedness Conference (March 2026)

6. CHANGES/PROBLEMS

Changes in approach and reasons for change

- Currently, USDOT does not have an approved strategic plan, as the previous one that UTCs used in the 2023 competition has been withdrawn. MarTREC continues to focus on its strategic goals of Economic Strength and Global Competitiveness. Our team invested significant time ensuring that all ongoing projects, programs, website, and marketing materials fall within the guidance of the current federal administration. All related guidance received from OST-R was shared with the MarTREC consortium.

Actual or anticipated problems or delays and actions or plans to resolve them

- Nothing to Report

Changes that have a significant impact on expenditures

- Nothing to Report

Significant changes in use or care of animals, human subjects, and/or biohazards

- Nothing to Report

7. SPECIAL REPORTING REQUIREMENTS

- Nothing to Report