Background
The University Transportation Center for Railway Safety (UTCRS) was established in fall of 2013 through a grant from the U.S. Department of Transportation (USDOT) Office of the Assistant Secretary for Research and Technology (OST-R). In spring of 2023, the UTCRS was one of the centers selected for funding through the IIJA UTC competition. The UTCRS is a Tier I center and operates as a consortium of six institutions, namely, The University of Texas Rio Grande Valley (UTRGV) – Lead Institution, Texas A&M University (TAMU), The University of South Carolina (UofSC), The University of Nebraska-Lincoln (UNL), The University of California-Riverside (UCR), and South Texas College (STC). The lead institution is one of the fastest-growing universities in the UT System, and one of the nation’s premier Hispanic-Serving Institutions, with over 90% Hispanic enrollment. It is 2nd in the nation in the number of bachelor’s degrees and 3rd in the nation in the number of master’s degrees awarded to Hispanics.

Mission and Goals
As a Tier 1 University Transportation Center, the UTCRS and its team of educational institutions have a primary strategic goal of promoting the safety of railway transportation systems, with secondary goals of economic strength and global competitiveness, as well as climate and sustainability. The UTCRS consortium research thrust focuses on the development, testing, implementation, deployment, and technology transfer of smart technologies for safer railways in collaboration with rail industry partners.

Initiatives
The strategic goals of the UTCRS aim to fundamentally improve railway safety outcomes through Research, Education, Workforce Development, Technology Transfer, and Community Outreach as follows:

Research: The research conducted by the UTCRS can be subdivided into three focus areas, namely,

[1] Railway Mechanical Systems, which include mechanical components condition monitoring techniques, performance characterization and failure mitigation, and predictive maintenance protocols of rolling stock.

[2] Railway Operation Systems, which include at-grade railway crossing safety, railway operations safety, and smart technologies for highway-rail grade crossing monitoring and analysis.

[3] Railway Infrastructure Systems, which include durable materials and systems, innovative safety assessments, and advanced technologies for infrastructure monitoring.

All projects are approved by an industrial Advisory Board, and currently the UTCRS is working with nine different rail industry collaborators.

Education and Workforce Development: Since its inception in fall of 2013, the UTCRS has engaged over 850 undergraduate and graduate students in its research, education, professional development, technology transfer, and community outreach activities. These students are mentored by a team of highly qualified and dedicated faculty who are committed to providing a well-rounded education and research experience in the transportation engineering field. Students develop valuable skill sets through hands-on projects relevant to the railroad industry, research internships at partner institutions, co-authorship of journal and conference papers, presentations at local and national symposiums and conferences, and writing theses and dissertations.

Faculty, staff, students, teachers, and high school interns that participated in the various education and workforce development programs in Summer 2023.
Many UTCRS alumni are now in the transportation engineering workforce and the rail industry.

Technology Transfer and Community Outreach: As part of the strong commitment to technology transfer and community outreach, the UTCRS has partnered with many rail industries, Class I railroads, and community partners to disseminate the technologies developed at the center. The UTCRS team has helped the rail industry implement and deploy several advanced technologies that improve condition monitoring of rail components and infrastructure, and positively impact the efficacy and safety of rail operations. In terms of community outreach, the UTCRS faculty and staff offer year-round and summer STEM education programs in support of teachers and students alike. The UTCRS provides K-12 teachers the opportunity to participate in the Research Experience for Teachers (RET) program. Selected applicants for this research-intensive five-week program work closely with faculty, students, and staff on current educational research projects, prepare professional presentations, participate in workforce development workshops, and submit a final report on the results of their research. Teachers participating in this program are expected to bring the knowledge they gained to their classrooms in the form of class activities that are appropriate and beneficial for their students. In partnership with 26 local school districts, the UTCRS runs the largest transportation-related summer camps in the nation, hosting more than 1,100 students and 100 teachers annually. The camps promote science, technology, engineering, and mathematics (STEM) education, with a focus on railway safety. The UTCRS faculty and staff aided by teachers participating in the RET program develop innovative K-12 curricula with the goal of introducing students to STEM concepts through transportation engineering applications. The UTCRS outreach activities have greatly impacted and benefited the region and increased Hispanic student participation in transportation-related activities.

Products and Outcomes
UTCRS continues its timely delivery of comprehensive research, education, workforce development, technology transfer, and community outreach programs in support of the USDOT mission to train and develop the next generation of transportation professionals who are prepared to design, deploy, operate, and maintain the complex transportation systems of the future. The UTCRS is taking a leadership role in organizing the 2024 ASME Joint Rail Conference which will host major rail industries, Class I railroads, federal agencies, and academic partners working on research and development efforts of rail systems. The UTCRS is also engaged with several rail industries and Class I railroads to deploy and implement advanced onboard condition monitoring technologies to assess the health of railroad rolling stock. These technologies are expected to hasten the adoption of wireless onboard sensors with the ultimate goal of revolutionizing condition monitoring and predictive maintenance practices in the rail industry.

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CONSORTIUM MEMBERS:
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The University of Nebraska-Lincoln (UNL)
The University of South Carolina (UofSC)
The University of California-Riverside (UCR)
South Texas College (STC)