2026

The 16th IACIP Annual Workshop

Emerging Technologies in Intelligent Transportation Infrastructures and Materials

Date: Sunday Jan. 11, 2026
Time: 8:30 AM to 5:00 PM
Room: Pentagon (M4) / Marriott Marquis

The 16th IACIP Annual Workshop Program

Emerging Technologies in Intelligent Transportation Infrastructures and Materials

Time	**Sunday Jan. 11, 2026 from 8:00 AM to 5:30 PM**
Location	Pentagon (M4) / Marriott Marquis, near the Convention Center at 901 Massachusetts Avenue, Washington, D.C.
8:00– 5:00	**Registration and Membership**
8:30– 8:40	**Conference Opening and Welcome Remarks** (Dr. Zhe Han and Dr. Xiong Zhang)
8:40 – 9:25	**IACIP Keynote Speech I** (Moderator: Dr. Lei Wang) • **Dr. Zhanping You, Michigan Technological University**, "Performance and Sustainability of Rubber-Modified Asphalt for Pavement Construction in Cold Regions"
9:25 – 10:35	**Session I: Advanced Asphalt Materials and Characterization** (Session Chairs: Dr. Xijun Shi and Dr. Shenghua Wu) • **Dr. Kun Zhang, California State University,** "Prediction of the Field Aging of Asphalt Pavements via Integration of Hourly Pavement Temperature and Coupled Diffusion–Kinetics Aging Model (CDKAM)" • **Dr. Yuhong Wang, Hong Kong Polytechnic University**, "Connecting the Microscopic Properties of Asphalt Binder to Its Rheological Properties from the Lens of Colloidal Science" • **Dr. Xue Luo, Zhejiang University**, "A Pseudo J-Integral-Based DEM Approach for Modeling Viscoelastic Fatigue Crack Growth at Asphalt Mortar Interfaces" • **Dr. Zhen Fu, Chang'an University,** "Comparison and Selection of Different Bio-oils on Regenerated Asphalt and Their Restoration Capacity"
10:35 – 10:50	**Break – Student Poster Session I**
10:50 - 12:15	**Session II: Innovation and Smart Pavement Technologies** (Session Chairs: Dr. Yihao Ren and Dr. Hongyu Zhou) • **Dr. Jiong Hu, University of Nebraska–Lincoln,** "Carbonation-Treated RCA: Advancing Sustainability and Performance in Concrete" • **Dr. Kamal Hossain, Carleton University**, "Advancing Sustainable Civil Infrastructure through Life Cycle Assessment (LCA): Methodologies, Tools, and Canadian Case Studies" • **Dr. Shenghua Wu, University of South Alabama,** "A Novel Monotonic Cracking Index Test for Characterizing Microplastic-Modified Asphalt" • **Dr. Hongyu Zhou, University of Tennessee,** "Innovative Pathway to Beneficiate Traditionally Unmarketable Coal Combustion Residuals" • **Dr. Xijun Shi, Texas State University**, "Plient Fibers: Transforming Concrete Reinforcement with a Cost-Effective and Green Solution"
12:15 – 1:30	**Lunch Break**

1:30 – 2:15	**IACIP Keynote Speech II** (Moderator: Dr. Xiong Zhang) • **Dr. Anand J. Puppala, Texas A&M University**, "Innovation Research Areas in Geotechnical Engineering to Support Transportation Infrastructure"
2:15– 3:25	**Session III: Concrete, Bridge, and Rail Infrastructure Materials and Monitoring** (Session Chairs: Dr. Zhen Fu and Dr. Xinbao Yu) • **Dr. Yuliang Zhou, Morgan State University**, "Continuous Railroad Track Health Monitoring Using Distributed Fiber Optic Sensor" • **Dr. Shihao Huang, Tarleton State University**, "Effect of Load–Unload–Reload Cycles on the Shear Resistance of Railroad Ballast in Triaxial Monotonic Tests" • **Dr. Xinbao Yu, The University of Texas at Arlington**, "Winter Performance of the Texas Geothermal Bridge" • **Dr. Richard Ji, Federal Aviation Administration**, "Evaluation of Performance of Aircraft Tire on Trapezoidal-Shaped and Rectangular-Shaped Runway Grooving"
3:25 – 3:40	**Break – Student Poster Session II**
3:40 – 4:50	**Session IV: Intelligent and Resilient Infrastructure Systems** (Session Chairs: Dr. Lu Gao and Dr. Yuliang Zhou) • **Dr. Jiwang Jiang, Southeast University**, "Smart Microwave-Absorbing Asphalt Composites and Robotic Heating for Autonomous Pavement Microcrack Repair" • **Dr. Jingran Sun, University of South Florida**, "Bayesian Network-Based Resilience Assessment of Interdependent Infrastructure Systems under Optimal Resource Allocation Strategies" • **Dr. Xudong Fan, University at Buffalo,** "AI for Networked Infrastructure Systems: A Graph Learning-Based Decision-Making Algorithm" • **Dr. Di Yang, Morgan State University,** "Mitigating Temporal Data Aggregation Bias in Traffic Safety and Human Behavior: A Functional Data Analysis Approach"
4:50 – 5:00	**Announcements and Workshop Adjourn** (Dr. Lei Wang and Dr. Zhe Han)

BANQUET*

16th **IACIP Annual Workshop Banquet**

Sunday Jan. 11, 2026 from 6:30 PM to 10:00 PM

Tony Cheng's Seafood Restaurant (中国城海鲜大酒楼)

619 H Street NW, Washington, D.C.

More information at the end of this brochure

***Outstanding Graduate Student Award and Best Poster Award will be announced during banquet.**
***The banquet is complimentary to all student poster presenters and outstanding graduate student awardees.**

WORKSHOP REGISTRATION INFORMATION

We are excited to offer you a free workshop to attend! Please join us for this valuable learning opportunity.

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We offer various registration options to cater to different attendees:

1. **Professionals (Membership Only)**:
   - IACIP Membership Registration: $100
2. **Students (Membership Only)**:
   - IACIP Membership Registration: $25
3. **Professionals (Membership + Banquet)**:
   - IACIP Membership Registration: $100
   - Banquet Ticket: $45 (discounted)
   - Total: $145
4. **Students (Membership + Banquet)**:
   - IACIP Membership Registration: $25
   - Banquet Ticket: $45 (discounted)
   - Total: $70
5. **Banquet Ticket Only:**
   - Banquet Ticket: $55

Payment Options:
You can choose between two payment methods for your convenience:

- Cash
- PayPal

*** Membership is valid until December 31, 2026.**
****The banquet is complimentary to all student poster presenters and outstanding graduate student awardees.**

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IACIP KEYNOTE ABSTRACT

Performance and Sustainability of Rubber-Modified Asphalt for Pavement Construction in Cold Regions

Zhanping You, Ph.D., P.E.
Distinguished Professor, Transportation Engineering
Michigan Technological University, USA

ABSTRACT: The use of rubber-modified asphalt (RMA) in cold regions presents a promising approach to enhancing pavement durability while promoting sustainable infrastructure development. This study examines the design considerations, construction practices, and performance benefits of incorporating recycled tire rubber into asphalt mixtures for cold-climate applications. The modification of asphalt binders with crumb rubber improves elasticity, thermal cracking resistance, and fatigue performance, enabling pavements to better withstand temperature fluctuations and freeze–thaw cycles common in northern environments. Construction procedures emphasize proper temperature control, mixing uniformity, and compaction to ensure performance consistency in field conditions. Field trials and long-term monitoring in Michigan and other cold regions demonstrate that RMA pavements exhibit reduced surface cracking, improved flexibility, and longer service life compared with conventional hot-mix asphalt. Furthermore, the use of recycled tire rubber supports circular economy objectives by diverting waste from landfills and lowering the carbon footprint of road construction. The findings highlight the potential of rubber asphalt as a sustainable and resilient material solution for cold-region pavements and provide practical insights for agencies aiming to balance performance, cost, and environmental stewardship in future infrastructure design.

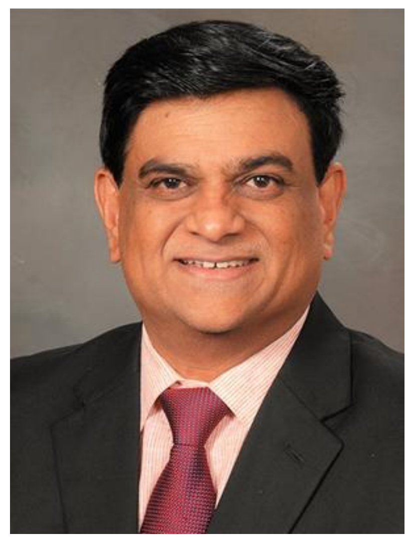
Bio: Dr. Zhanping You joined the faculty at Texas A&M University – Kingsville in January 2004 as a tenure track Assistant Professor. He accepted a position at the rank of Assistant Professor in December 2005 in the Department of Civil and Environmental Engineering at Michigan Technological University. He earned his PhD in Civil Engineering from the University of Illinois at Urbana - Champaign in 2003. Dr. You served as Director of the Center of Excellence for Transportation Materials for a few years, which is in partnership between Michigan Department of Transportation and Michigan Technological University for a few years. He was entitled Donald and Rose Ann Tomasini Assistant Professor of Transportation Engineering. He was promoted to Associate Professor in 2009, to Professor in 2014, and to Distinguished Professor in 2019.

In his capacity as a professor, he has completed research projects related to road materials. His contribution to pavement and materials research has been featured in newspapers, magazines, and other media. Dr. You has published over 300 papers in peer reviewed journals and conference proceedings. These publications include prestigious journals such as the Journal of the Transportation Research Board published by the National Academy of Sciences, the ASCE Journal of Materials in Civil Engineering, ASCE Journal of Engineering Mechanics, ASCE Journal of Computing in Civil Engineering, Road Materials and Pavement Design, and Construction and Building Materials. Dr. You has reviewed technical papers for over 35 journals and has edited four ASCE special publication books. In 2004 and 2005 he was a recipient of the U.S. Department of Transportation's Dwight David Eisenhower Transportation Faculty Fellowship.

Innovation Research Areas in Geotechnical Engineering to Support Transportation Infrastructure

Anand J. Puppala, Ph.D., P.E., D.GE, F. ICE, Dist M. ASCE.
A.P. Wiley and Florence Chair Professor, Zachry Civil and Environmental Engineering
Texas A&M University, College Station, Texas, USA

Abstract: Transportation infrastructure, particularly pavements and bridges, is increasingly susceptible to the effects of extreme weather events, including more frequent and severe rainfall and extreme cold weather events. These conditions pose significant challenges to the performance and durability of infrastructure systems. In this context, innovative technologies such as geothermal systems and geosynthetic reinforcements as well as tools to assess state of health of infrastructure monitoring are gaining major interest. Bridge decks, due to their elevated structures, are particularly vulnerable to icing compared to ground-level pavements. Shallow geothermal bridge deicing system offers a reliable and sustainable solution for bridge deicing during extreme cold weather. Similarly, pavements built over expansive soil often suffer from moisture-induced volume changes due to extreme precipitation. The use of wicking geotextiles, designed with hydrophilic and hygroscopic fibers, facilitates lateral moisture drainage and mitigating such distresses. This presentation covers two real case studies conducted in North Texas: (1) a full-scale geothermal bridge deicing system and (2) field test sections on low-volume roads reinforced with wicking geotextiles. The results show improved performance and resilience, with the geothermal system reducing reliance on conventional deicing methods and the geosynthetics enhancing subgrade drainage and pavement durability. Another topic that will cover is use of UAVs and SAR/INSAR works for asset health monitoring and their management. A few examples showing these technologies and how they can be effectively used for health monitoring will be presented.



Bio: Dr. Anand Puppala serves as A.P. Wiley and Florence Chair of Zachry Civil and Environmental Engineering at Texas A&M University and is a Director of Center for Infrastructure Renewal (CIR). He has over 30 years of experience in teaching, research, continuing education and administration in public universities in Texas. Dr Puppala has been conducting research on characterization and stabilization of expansive soils, sustainable utilization and stabilization of recycled materials for low to high volume roads, in situ intrusive methods for site characterization, remote sensing and UAV studies for health monitoring, infrastructure resilience and pavement material characterization studies. Dr. Puppala has been a recipient of several major research grants from federal, state and local government agencies. Dr. Puppala is the director of NSF's Industry University Co-operative Research Center (IUCRC) on Composites in Civil Infrastructure (CICI) at TAMU, College Station, Texas and was lead and co-lead PI of three major university transportation centers (UTCs) funded by US Department of Transportation.

Dr Puppala is a Board of Governor and Vice President of ASCE GeoInstitute (GI). Dr. Puppala was the past Chairman of Soil Mechanics section (AFS00) of the Transportation Research Board (TRB) and is a member of Design and Construction group of TRB. He is the chair of ISSMGE TC307 on Sustainability in Geotechnical Engineering. He has extensively published over 570 publications and participates with many esteemed organizations including ISSMGE, TRB, ICE, ASCE-GI and others to develop and deliver technical programs. He is on the editorial boards of many esteemed journals including ASCE Journal of Geotechnical and Geoenvironmental Engineering, ASCE Journal of Materials (Chief on Geomaterials), ASTM Geotechnical Testing Journal, Engineering Geology, International Journal of Pavement Engineering and many others. He received many major awards and distinctions including a prestigious 2020 Ralph Peck Award from ASCE-Geo Institute, and a Distinguished Member of ASCE in 2024, the highest honor given by ASCE. He is also a fellow of Institute of Civil Engineers (ICE) of UK.

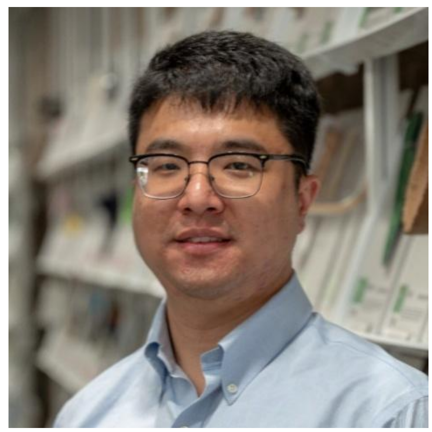
TECHNICAL PROGRAM (In alphabetical order by last name)

AI for Networked Infrastructure Systems: A Graph Learning-based Decision-making Algorithm

Xudong Fan, Ph.D.
Assistant Professor, University at Buffalo, Getzville, NY USA

Abstract: Emerging machine learning-based transportation system-level management tasks, such as traffic flow prediction, control, and road condition assessment, often rely on efficient and accurate representation of transportation systems. However, the intrinsic patterns of these complex systems and their interactions with embedded spatial environments make representation learning particularly challenging. In this study, a Regional Spatial Graph Convolutional Network (RSGCN) is developed for efficient representation of spatially embedded networks. The developed RSGCN model has the ability to learn the node connection pattern via multimodal node. To evaluate the network representation performance, the introduced RSGCN model is used to embed California Highway Networks into latent spaces and then reconstruct the networks. The performance of the developed model is compared with two other state-of-the-art geometric deep learning models, GraphSAGE and Spatial Graph Convolutional Network (SGCN). The results demonstrate the importance of considering regional information and the effectiveness of using novel graph convolutional neural networks for a more accurate representation of complex infrastructure systems.

Bio: Dr. Xudong Fan is an Assistant Professor in the Department of Civil, Structural, and Environmental Engineering from the University at Buffalo (UB). Prio to joining UB, he was a postdoctoral research associate in the Department of Civil and Environmental Engineering at Princeton University. Xudong received his Ph.D. in CEE department from Case Western Reserve University in 2023. He also received his B.S. and M.S. degrees in Civil Engineering at Central South University and Tianjin University, respectively. Xudong's research is motivated by mitigating public losses caused by infrastructure failures, with the goal of developing smart infrastructure systems using computational methods and advanced AI techniques. Xudong serves multiple organizations as a standing committee member, including the Committee on Artificial Intelligence and Advanced Computing (AED50) at TRB, Committee on Risk Assessment and Management (RAM) at ASCE, and Younger Member Engagement Committee (YMEC) at ASCE.



Comparison and Selection of Different Bio-oils on Regenerated Asphalt and Their Restoration Capacity

Zhen Fu, Ph.D., Pengkai Yang
Chang'an University, Xi'an, China

ABSTRACT: To determine the recovery ability of bio-oil on the performance of aged asphalt, three types of bio-oils, namely plant asphalt, kitchen waste oil, and industrial animal oil, were selected to regenerate aged SBS modified asphalt. The viscosity, thermal stability, low-temperature performance, and aging resistance of different regenerated asphalt were compared and studied. The results indicate that the three types of bio-oils have a certain ability to restore the basic performance and aging resistance of aged SBS modified asphalt. Among them, kitchen waste oil has a strong ability to regenerate aged asphalt and has high social and economic benefits, followed by plant asphalt and industrial animal oil. Kitchen waste oil was selected as the best regenerated bio oil, and a dosage of 4% is recommended. DINCH plasticizer was selected as a modified additive and compounded with kitchen waste oil to prepare a composite bio renewal agent. The recovery effect of composite bio rejuvenator on the performance of aged asphalt was studied through rheological tests and four component test. The results show that the composite regenerant effectively adjusted the proportion of aromatics and asphaltenes in the aged SBS modified asphalt, achieving prospective regeneration effects.

Bio: Dr. Zhen Fu is a professor in road engineering and materials at Chang'an University. She received her PhD degree from Chang'an University. Her research focuses on green economy and development pavement materials, high-performance asphalt-based materials and road maintenance materials. She is currently the reviewer of over 10 journals (Construction and Building Materials, Journal of Cleaner Production, and Journal of Traffic and Transportation Engineering (English Edition) et.al). Her work has been recognized by several awards including Science and Technology Progress Award in Henan and Shaanxi.

Advancing Sustainable Civil Infrastructure through Life Cycle Assessment (LCA): Methodologies, Tools, and Canadian Case Studies

Kamal Hossain, Associate Professor, Ph.D.
Carleton University, Ottawa, Canada

Abstract: This presentation introduces Life Cycle Assessment (LCA) as a systematic framework for evaluating the environmental impacts of products, materials, and civil infrastructure over their entire life cycle. Key life-cycle thinking concepts—functional units, reference flows, system boundaries, and allocation methods—are discussed within the context of ISO 14040 and ISO 14044 standards. The four LCA phases—goal and scope definition, inventory analysis, impact assessment, and interpretation—are explained with attention to data quality, assumptions, and uncertainty. Common LCA tools and methods, including TRACI, ReCiPe, Athena Pavement LCA, and Infrastructure Carbon Estimator, are reviewed through Canadian case studies, highlighting applications in transportation infrastructure, sustainability assessment, and evidence-based decision-making.

Bio: Dr. Kamal Hossain is an Associate Professor of Civil Engineering at Carleton University, Ottawa, Canada, with over 15 years of academic, research, and industry experience. He is internationally recognized for his work in highway pavement performance, sustainable and climate-resilient infrastructure, cold-regions engineering, and innovative de-icing technologies. He earned his Ph.D. in Transportation Engineering from the University of Waterloo and completed postdoctoral research at the University of Illinois at Urbana–Champaign. Dr. Hossain has led research projects funded by NSERC, the Ontario Ministry of Transportation, and the National Research Council Canada, among others. He has authored over 100 journal and conference publications, supervised more than 20 graduate theses, and received multiple awards from Carleton University, ASCE, and international conferences. He currently serves on the U.S. Transportation Research Board (TRB) Standing Committee on Pavement Maintenance (AKN18) and previously served for six years on the Binder for Flexible Pavements Committee (AKM20).

Carbonation-Treated RCA: Advancing Sustainability and Performance in Concrete

Jiong Hu, Ph.D.
Professor, Department of Civil and Environmental Engineering
University of Nebraska–Lincoln, USA

Abstract: The use of recycled concrete aggregate (RCA) in pavement concrete remains limited due to concerns about inferior mechanical and durability performance associated with residual cement paste. This study investigates accelerated CO_2 carbonation as a mass-scale treatment method to enhance RCA quality and reduce the environmental footprint of concrete. Coarse RCA derived from demolished pavements was treated under controlled CO_2 pressures ranging from 5 to 60 psi and evaluated through aggregate characterization and concrete performance testing. Results show that higher carbonation pressures (20–60 psi) significantly improve RCA crushing resistance and lead to recycled aggregate concrete with compressive and flexural strengths, resistivity, and durability comparable to natural aggregate concrete, without adverse effects on fresh properties. Life-cycle assessment indicates that CO_2-treated RCA mixtures achieve up to a 3.7% reduction in global warming potential. Field placement of pavement concrete incorporating CO_2-treated RCA confirmed satisfactory constructability and performance after 18 months in service. The findings demonstrate the technical feasibility and sustainability potential of CO_2-treated RCA for pavement applications.

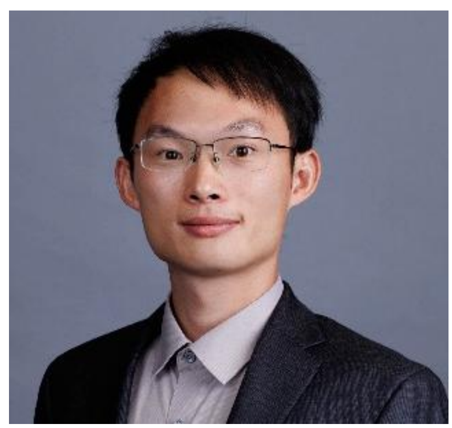
Bio: Jiong Hu is a Professor and Associate Chair for Graduate Programs of Civil and Environmental Engineering at the University of Nebraska–Lincoln. He is an American Concrete Institute Fellow, current Chair of the Transportation Research Board Committee AKN13 (Concrete Pavement Materials), former Chair of ACI Committee 238 (Workability of Fresh Concrete), and President of the ACI Nebraska Chapter. He has led over 50 research projects funded by state and federal agencies and industry partners. His research focuses on sustainable and resilient infrastructure materials, pavements, and implementation-oriented solutions that bridge research and practice.

Effect of Load–unload–reload Cycles on the Shear Resistance of Railroad Ballast in Triaxial Monotonic Tests

Shihao Huang, Ph.D.
Assistant Professor, Department of Mechanical, Environmental and Civil Engineering, Tarleton State University, Stephenville, TX, USA

Yu Qian, Ph.D.
Department of Civil and Environmental Engineering, University of South Carolina, Columbia, SC, USA

Abstract: Railroad ballast, composed of unbound coarse aggregates, is subjected to repeated vertical load–unload–reload (LUR) actions due to passing trains, which leads to significant particle rearrangement within the track bed. Shear resistance is a critical property governing the stability of ballast, yet conventional investigations predominantly rely on monotonic triaxial tests that do not adequately capture the effects of LUR-induced particle rearrangement. This study examines ballast shear behavior through novel large-scale triaxial tests incorporating axial LUR loading schemes, distinct from traditional cyclic loading, to replicate the mechanical effects of repeated train loads. Experimental results reveal that shear strength is strongly influenced by LUR loading paths: Increased LUR cycles enhance shear resistance due to the development of fabric anisotropy driven by particle rearrangement. Under identical confining pressures and initial densities, monotonic triaxial tests without LUR loading may underestimate ballast shear strength by up to 72.7%. This is attributed to the suppression of particle rearrangement under higher confinement. Furthermore, the shear failure envelope evolves with increasing LUR cycles, rendering failure criteria derived from monotonic tests inadequate for LUR conditions. These findings highlight the limitations of conventional triaxial approaches and underscore the necessity of accounting for particle rearrangement when evaluating the shear strength and failure behavior of railroad ballast and similar granular materials.



Bio: Dr. Shihao Huang joined Tarleton State University as a tenure-track Assistant Professor of Civil Engineering in February 2025. He earned his Ph.D. in Civil Engineering from the University of South Carolina (2024), M.S. from Tongji University (2020), and B.S. from Chang'an University (2017). Dr. Huang's research focuses on transportation geotechnics, including experimental geomechanics, particle-scale characterization, and sensing technologies for transportation infrastructure. He has published 15 peer-reviewed journal articles in the *Journal of Geotechnical and Geoenvironmental Engineering*, *Canadian Geotechnical Journal*, and *Acta Geotechnica*, and other international journals. He currently serves as an active committee member in the Transportation Research Board (TRB), the American Railway Engineering and Maintenance-of-Way Association (AREMA), and the American Society of Civil Engineers (ASCE).

Evaluation of Performance of Aircraft Tire on Trapezoidal-Shaped and Rectangular-Shaped Runway Grooving

Richard Ji, Ph.D.
Project Manager, Federal Aviation Administration Airport Pavement R&D Branch
New Jersey, USA

Abstract: Pavement grooving & surface texture are critical to achieving safe aircraft operations in wet weather. A laboratory testbed was designed and built to investigate the frictional interaction between aircraft tire and pavement surface. The testbed is built on a platform with a rotational arm to support an aircraft tire to travel and brake on a circular, reconfigurable track. Mechatronics design, data acquisition, and control system modeling of subsystems in the platform were presented and discussed. Experiments were conducted using the laboratory testbed to measure the friction coefficient of tire at various slip ratios across different grooved surfaces and water conditions. Finite element models are developed to simulate tire-water-pavement interaction to predict the friction coefficient between aircraft tires and wet grooved pavement. The aircraft tire model was validated by the contact footprint and load-deflection curve. The calculated friction coefficients were found to match well with field measurements. Through the developed approach, the evaluation of hydroplaning speed and braking distance of the landing aircraft can be performed.

Bio: Richard Y. Ji is a project manager at the FAA airport pavement R&D branch. Dr. Ji's responsibility is managing and overseeing the FAA funded projects at the FAA National Airport Pavement Test Facility (NAPTF). Dr. Ji received his doctoral degree in Civil Engineering from Michigan State University in 2005, with specialization in pavement design and analysis. Dr. Ji is an active member of professional and technical organizations including the Transportation Research Board (TRB), American Society of Civil Engineers (ASCE), and National Cooperative Highway Research Program (NCHRP). He is a registered professional Engineer since 2007.

Smart Microwave-absorbing Asphalt Composites and Robotic Heating for Autonomous Pavement Microcrack Repair

Jiwang Jiang, Ph.D.
Associate Professor, School of Transportation, Southeast University, Nanjing, China

Abstract: Asphalt pavements are susceptible to shallow microcracks induced by traffic loading and environmental actions, while conventional maintenance remains dominated by material replacement and structural reinforcement, resulting in inadequate utilization of the intrinsic healing capability of asphalt materials. To overcome this limitation, an autonomous repair approach based on microwave responsive principles was developed, forming an integrated system that combines smart microwave-absorbing asphalt composites (MA-AC) with a robotic heating device. MA-AC was employed as the healing medium and enabled to penetrate microcracks through surface application. A microwave heating robot, designed through coupled electromagnetic and thermal simulations, provided rapid and localized heating. The formulation and application dosage of MA-AC were optimized through laboratory experiments, and the entire repair system was further validated through field trials. The results indicated that the optimal MA-AC consisted of a 40% solid-content asphalt emulsion containing 10 wt.% microwave absorbers. Effective healing of microcracks in semi-circular bending specimens was achieved once the average temperature reached approximately 80 °C, and the preferred intervention window corresponded to a fatigue damage level of 60%–70%. The heating performance of the robotic system was enhanced through rational optimization of cavity geometry, slot distribution, and sealing conditions. A healing depth of about 70 mm was achieved, and a crack with a width of 2.4 mm and a depth of 55.8 mm exhibited complete apparent closure within 60 s, while the fatigue life recovered to more than 50% of that of the intact pavement. This study activates the inherent self-healing potential of asphalt materials and establishes an endogenous healing-oriented repair concept, offering an efficient and sustainable solution for autonomous microcrack rehabilitation in asphalt pavements.

Bio: Dr. Jiwang Jiang is an Associate Professor of Transportation Engineering in the Department of Highway Engineering at Southeast University. He earned his Ph.D. at School of Transportation, Southeast University in 2019. He was jointly trained at the University of Wisconsin–Madison from 2017 to 2018 and worked as a Postdoctoral Fellow at the Hong Kong Polytechnic University. Dr. Jiang's research focuses on the health condition evaluation of asphalt pavement, maintenance decision-making and development of low-carbon maintenance technology. He has published 122 SCI-indexed journal papers, authored one academic book, and held 16 authorized invention patents. He serves as Discipline Secretary (GL04) of the World Transport Convention, Deputy Secretary-General of the Jiangsu Engineering Society's Road and Track Committee, and a young committee member of IACIP and RILEM. He is also on the academic committee of APSE. He is an editorial board member of Scientific Reports, Transportation Engineering, and Fluid Dynamics & Materials Processing, and a young editorial board member for Journal of Traffic and Transportation Engineering, Journal of Road Engineering, Municipal Technology, Highway Engineering, and Journal of Highway and Transportation Research and Development. He is also a peer reviewer for over 30 SCI-indexed journals.

A Pseudo J-Integral-Based DEM Approach for Modeling Viscoelastic Fatigue Crack Growth at Asphalt Mortar Interfaces

Xue Luo, Ph.D.
Professor, College of Civil Engineering and Architecture, Zhejiang University, Hangzhou, China

Li'an Shen, Ph.D. Candidate
College of Civil Engineering and Architecture, Zhejiang University, Hangzhou, China

Abstract: The viscoelastic damage evolution at the microscale particle interfaces of asphalt materials fundamentally determines the material's fatigue crack growth and failure at the macroscale. However, existing microscale damage models are often based on empirical assumptions that depend on inter-particle stresses or forces, which are inaccurate for viscoelastic asphalt materials. To address the limitations of current models, a microscale viscoelastic fatigue damage model was developed using a pseudo J-integral-based Paris' law and implemented in a discrete element model of asphalt mortar using the PFC2D program. The viscoelastic constitutive behavior was represented by a generalized Maxwell model, and the relaxation moduli were determined through a uniaxial compressive dynamic modulus test. The Paris' law coefficients were calibrated by comparing model predictions with experimental results from indirect tensile fatigue tests of the material. The results show that the simulated fatigue life and crack area closely match laboratory test data, with an error margin within 15%. During the simulation of microscopic IDT fatigue damage, cracks hinder the horizontal transfer of forces within the cracked region, leading to stress concentrations in surrounding particles and a marked increase in their relative displacement. The variation in the number of contact breaks with fatigue load cycles is unaffected by the type of asphalt but is influenced by the applied stress level. These findings demonstrate that the pseudo J-integral-based Paris' law, when applied at particle interfaces, can effectively model crack growth at the microscale and accurately predict the fatigue damage performance of viscoelastic asphalt materials at the macroscale.

Bio: Dr. Xue Luo earned her Ph.D. from Texas A&M University in 2012 and is currently a professor in the College of Civil Engineering and Architecture at Zhejiang University, China. Her research focuses on multiphysics and multiscale analysis, integrating mechanics, materials science, artificial intelligence, and non-destructive evaluation to advance resilient and sustainable pavement infrastructure. Dr. Luo has served as the Principal Investigator for national and provincial projects in both China and the United States. She has published over 150 research articles and holds editorial positions as an associate editor or guest editor for several SCI-indexed academic journals. She also has served as a referee for more than 40 international journals.

Plient Fibers: Transforming Concrete Reinforcement with a Cost-Effective and Green Solution

Xijun Shi, Ph.D., P. E.
Assistant Professor, Ingram School of Engineering, Texas State University
Co-Founder and Chief Technology Officer, Circle Concrete Tech, Inc

Abstract: Steel reinforcement is a major driver of cost, construction time, and CO_2 emissions in concrete construction. With rapid urbanization and increasing global tire waste, recycled steel fibers (RSF) from scrap tires present a sustainable alternative to traditional rebar and wire mesh. Plient fibers—an RSF technology developed by the speaker and his team—offer a cost-effective, construction-friendly reinforcement solution for precast elements, pavements, and slab-on-grade applications. More than five years of research and prototype testing show that Plient fibers can fully or partially replace rebar without altering existing construction practices. Studies on precast junction boxes, drainage pipes, and slab prototypes confirm acceptable mechanical performance and successful integration in both wet-cast and dry-cast systems. Enhanced joint toughness observed in slab sections further supports their use in industrial flooring and pavement applications. Beyond constructability, Plient fibers deliver significant economic and sustainability benefits, including 20–50% cost savings, 14–37× lower CO_2 emissions, reduced labor requirements, and improved jobsite safety. These advantages position RSF as a compelling reinforcement strategy for modern concrete infrastructure. This presentation will highlight Plient fiber development, mechanical performance, constructability findings, and field applications, with a focus on sustainability, cost savings, and future implementation opportunities.

Bio: Dr. Xijun Shi, P.E., is an Assistant Professor of Civil Engineering at Texas State University (TXST). He earned both his Ph.D. and M.S. degrees in Civil Engineering from Texas A&M University (TAMU) and completed his undergraduate studies in the prestigious "Mao Yisheng" Honors Pavement Engineering Program at Southeast University in China. Since joining TXST in Fall 2020, Dr. Shi has secured more than 20 external research projects as PI or Co-PI—funded by NSF, NASA, NCHRP, USDOT, the ACI Foundation, NMDOT, TxDOT, and others—with total funding exceeding $14 million. He has authored over 50 peer-reviewed publications in leading scientific journals. Dr. Shi serves as Secretary of ACI Committee 555 Concrete with Recycled Materials. In 2022, he co-founded Circle Concrete Tech Inc. (https://buildwithcircle.com/), a startup focused on innovations that significantly reduce the environmental impact of the concrete industry. His honors include the 2021 USDA E. Kika De La Garza Fellowship and recognition as part of the ACI Class of 2022 Emerging Leaders Alliance. In the same year, he guided the TXST CaerusCrete team to first place in the NASA MINDS Undergraduate Student Design Competition with a lunar geopolymer project.

Bayesian Network-based Resilience Assessment of Interdependent Infrastructure Systems under Optimal Resource Allocation Strategies

Jingran Sun, Ph.D.
Assistant Professor, Department of Civil and Environmental Engineering, University of South Florida

Abstract: Critical infrastructure systems (CISs) play a key role in the socio-economic activity of a society, but are exposed to an array of disruptive events that can greatly impact their function and performance. Therefore, understanding the underlying behaviors of CISs and their response to perturbations is needed to better prepare for, and mitigate the impact of, future disruptions. Resilience is one characteristic of CISs that influences the extent and severity of the impact induced by extreme events. Resilience is often dissected into four dimensions: robustness, redundancy, resourcefulness, and rapidity, known as the "4Rs". This study proposes a framework to assess the resilience of an infrastructure network in terms of these four dimensions under optimal resource allocation strategies and incorporates interdependencies between different CISs, with resilience considered as a stochastic variable. The proposed framework combines an agent-based infrastructure interdependency model, advanced optimization algorithms, Bayesian network techniques, and Monte Carlo simulation to assess the resilience of an infrastructure network. The applicability and flexibility of the proposed framework is demonstrated with a case study using a network of CISs in Austin, Texas, where the resilience of the network is assessed and a "what-if" analysis is performed.

Bio: Jingran Sun, PhD, is an Assistant Professor in the Department of Civil and Environmental Engineering at the University of South Florida. His research focuses on infrastructure resilience and intelligent transportation systems, with an emphasis on modeling interdependent networks and optimizing system performance in the face of disruptions. His recent work addresses emerging challenges in enhancing the robustness and adaptability of critical infrastructure, with the following four specific areas: (1) Agent-based simulation and reinforcement learning for resilient infrastructure decision-making; (2) Bayesian network and fuzzy logic–based risk assessment of interdependent transportation systems; (3) Integration of AI and network science in planning and managing complex infrastructure systems. Dr. Sun holds three graduate degrees from The University of Texas at Austin: a PhD in Transportation Engineering, an MS in Statistics, and an MS in Construction Engineering and Project Management. He previously served as a postdoctoral fellow and Research Engineering Associate at UT Austin's Center for Transportation Research. His work has been widely published and recognized, earning awards from IEEE ITSC, TRB, and ASCE.

Connecting the Microscopic Properties of Asphalt Binder to Its Rheological Properties from the Lens of Colloidal Science

Yuhong Wang, Ph.D.
Professor, Department of Civil and Environmental Engineering, Hong Kong Polytechnic University, Hong Kong, China

Abstract: Dr. J. Claine Petersen, a prominent asphalt chemist, once stated: "The study of these (asphalt) molecular interactions at the nanoscale level, and their effect on physical and chemical properties measured at the macro level, is what is meant by physicochemical characterization. This is asphalt's 'black box' in which its most guarded secrets are kept". This presentation will summarize a series of studies we performed to connect the microscopic properties of asphalt binder at the nanoscale to its macro (rheological) properties from the lens of colloidal science. As shown in the presentation, major rheological properties commonly tested in pavement engineering can be well explained through fundamental theories in colloidal science. This presentation also summarizes the techniques we used to characterize asphalt binders at the nanoscale.

Bio: Dr. Yuhong Wang is a professor in the Department of Civil and Environmental Engineering at the Hong Kong Polytechnic University. He obtained his Ph.D. degree from the University of Kentucky in civil engineering. He successively worked at the Kentucky Transportation Research Center as a research engineer, Lawrence Tech. University as a tenure-track assistant professor, and East Carolina University as a tenure-track assistant professor. He started his employment at the Hong Kong Polytechnic University as an assistant professor in 2010. He is the founder and director of the Research Center for Nature-based Urban Infrastructure Solutions at the Hong Kong Polytechnic University. He has led and participated in more than 100 scientific research projects in the United States, Mainland China, and Hong Kong. He is a fellow of the Hong Kong Institution of Engineers (HKIE) and a registered professional engineer in the United States. Currently, Dr. Wang's main research projects and interests include nature-based infrastructure solutions, pavement engineering, and intelligent transport infrastructure, aiming to make our cities cleaner, smarter, more resilient, and more environmentally friendly.

A Novel Monotonic Cracking Index Test for Characterizing Microplastic-Modified Asphalt

Shenghua Wu, Ph.D.
Associate Professor, Department of Civil, Coastal, and Environmental Engineering, University of South Alabama, 150 Student Services Drive, Mobile, AL 36688, USA

Abeeb Oyelere, Ph.D.
Department of Civil, Coastal, and Environmental Engineering, University of South Alabama, 150 Student Services Drive, Mobile, AL 36688, USA

Abstract: Microplastics less than 5 mm are hazardous materials that negatively impact ecosystems and human health. Incorporating microplastics into asphalt binders offers a potential pathway for their reuse as performance-modifying additives. However, traditional performance indices used to evaluate the cracking behavior of neat asphalt binders are not well suited for plastic-modified binders. This presentation introduces a monotonic fracture testing approach and proposes a new performance metric, the Monotonic Cracking Index (MCI), which integrates both pre-peak and post-peak stress responses to characterize the cracking behavior of plastic-modified asphalt binders. Recycled high-density polyethylene (rHDPE) and recycled polypropylene (rPP) were incorporated into a PG 64-22 base binder at dosages of 2%, 4%, and 6% by binder weight to investigate the effects of plastic content on cracking resistance. The results demonstrate strong correlations between MCI and established performance indicators, including the Glover–Rowe (G–R) parameter, crossover temperature, and rheological index (R-value), as well as an inverse correlation with fatigue life. These findings highlight the potential of MCI as a reliable metric for assessing the cracking performance of plastic-modified asphalt binders.

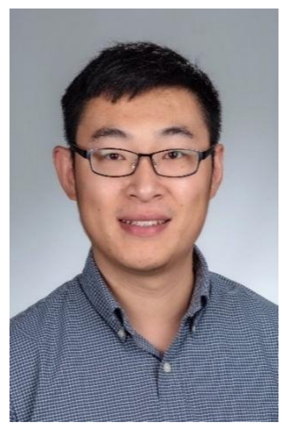
Bio: Dr. Shenghua Wu is an Associate Professor in the Department of Civil, Coastal, and Environmental Engineering at the University of South Alabama. His research interests include construction materials (asphalt and concrete), sustainable pavements, microplastics, plastic circularity, STEM education, and interdisciplinary approaches to addressing complex challenges. He has successfully secured over $11 million in research funding through competitive grants from organizations such as EPA, NOAA, NIST, NSF, and DOT. Dr. Wu holds several leadership roles, serving as the Director of the Interdisciplinary Center for Sustainable Engineering (ICSE), Executive Director of the Gulf Coast Environmental Engagement Center (GCEEC), Director of the Solid Waste Sustainability Hub, Director of the Gulf Coast Center for Addressing Microplastics Pollution (GC-CAMP), and Director of the Sustainable Materials Laboratory. He is also the founding faculty advisor for the Society of Sustainable Engineering (SSE). In addition, Dr. Wu has served as a panelist for multiple federal agencies, including NSF, DOE, NOAA, ACRP, and NCHRP, and editorial members for journals such as TRR, ASCE Journal of Materials in Civil Engineering, and ASTM Journal of Testing and Evaluation. He was the recipient for Recognizing Academic Research Excellence (RARE) award (2024) by the University of South Alabama, Mobile Area Engineering Educator of the Year (2025), Tau Beta Pi Professor of the Year (2023), Mortar Board Top Prof (2023), and Excellence in Teaching Award (2021).

Prediction of the Field Aging of Asphalt Pavements via Integration of Hourly Pavement Temperature and Coupled Diffusion-Kinetics Aging Model (CDKAM)

Kun Zhang, Ph.D.
Associate Professor, Department of Civil Engineering, California State University, Chico, CA, USA

Abstract: The asphalt aging model is one of the essential modules in the mechanistic-empirical pavement design for performance assessment. This work integrated the hourly pavement temperature into the Coupled Diffusion-Kinetics Aging Model (CDKAM) to quantify the long-term and non-uniform field aging of asphalt pavements. Seven pavement sections in the U.S. were used to illustrate the development and validation of this asphalt aging prediction model. Overall, the CDKAM with hourly pavement temperatures could reasonably quantify the field aging of asphalt with the consideration of both ultraviolet (UV) aging and thermal oxidation. The key factors that affect field aging of asphalt, including local weather conditions, binder aging susceptibility, air voids of asphalt mixtures, and binder diffusion, are all taken into account in the developed aging model. This study also separated the contributions of UV aging and thermal oxidation to asphalt aging based on the aging model. The results showed that UV aging could contribute from 50% to 90% of the total asphalt aging at the pavement surface. A higher percentage of contribution from UV aging occurred for pavements located in cold regions. As the depth increases, the percentage of contribution from UV aging decreases, while that of thermal oxidation increases. At a depth of 0.0765 m (3 inches) or lower, the asphalt aging is 100% due to thermal oxidation for all studied pavement sections.

Bio: Dr. Kun Zhang is an Associate Professor in the Department of Civil Engineering at California State University, Chico. He is the Lantis-Endowed University Professor and Dennis P. Murphy Distinguished Teacher-Scholar-Mentor Fellow in Civil Engineering. His research focuses on numerical modeling (CFD, DEM, FEM) for pavement design and production and strategic recycling of solid wastes as sustainable asphalt paving materials. He has served as PI/Co-PI for research projects funded by federal and state agencies and industrial companies. Dr. Zhang has published more than 40 peer-reviewed journal and conference papers and received the Best Paper Award in the Journal of Infrastructure Preservation and Resilience. He received the Gerald R. Seeley Early Career Faculty Award from the American Society for Engineering Education (ASEE) and the Outstanding Early Career Faculty Award from California State University, Chico.



Mitigating Temporal Data Aggregation Bias in Traffic Safety and Human Behavior: A Functional Data Analysis Approach

Di Yang, Ph.D.
Assistant Professor, Department of Transportation & Urban Infrastructure Studies, Morgan State University, Baltimore, MD USA

Abstract: Emerging transportation technologies, including connected and autonomous vehicles, smartphones, and smart sensors, have enabled the collection of high-granularity trajectory and human behavior data at unprecedented temporal resolutions. However, transportation safety and human behavior research continues to rely heavily on coarse temporal aggregation, which can obscure critical time-dependent patterns and introduce temporal data aggregation bias. This presentation introduces the Functional Data Analysis (FDA) in statistics to address this limitation in proactive traffic safety and driver behavior research. FDA treats safety risk measures and behavioral indicators as continuous functions over time, rather than as aggregated scalar values, allowing researchers to preserve and analyze temporal dynamics embedded in high-resolution data. Two application domains are examined. First, traffic surveillance video data are used to model conflict-based safety risk within signal cycles at signalized intersections. Functional smoothing and functional analysis of variance reveal distinct and statistically significant safety risk patterns across traffic movements that are not detectable using conventional aggregated approaches. Second, connected vehicle data from a large-scale field deployment are used to analyze driver responses to forward collision warnings. Non-parametric functional linear regression uncovers time-dependent driver reaction processes immediately following warnings and longer-term behavioral adaptation effects. Overall, the findings demonstrate that FDA provides a promising methodological framework for mitigating temporal data aggregation bias, enabling more behaviorally meaningful safety analysis in the era of high-granularity transportation data.

Bio: Dr. Di Yang is an Assistant Professor in the Department of Transportation & Urban Infrastructure Studies. His research focuses on applying and developing statistical and data-driven methods at the intersection of smart mobility and safety, connected and autonomous vehicles, human factors, policy analysis, and shared mobility. Dr. Yang's research contributions have resulted in over 50 publications in peer-reviewed journals, conference proceedings, and technical reports and is funded by the National Science Foundation, U.S. Department of Transportation (DOT), and Maryland DOT. He was also honored with the Institute of Transportation Engineers (ITE) Northeastern District Daniel B. Fambro Student Paper Award in 2021. Dr. Yang serves as an Associate Editor of ASCE Journal of Urban Planning and Development, a Handling Editor for the journal Transportation Research Record, and on the Editorial Advisory Board of the journal Accident Analysis and Prevention.

Winter Performance of the Texas Geothermal Bridge

Xinbao Yu, Ph.D., P.E.
Professor, Department of Civil Engineering
The University of Texas at Arlington

Abstract: Bridge deicing is critical to ensure roadway safety, mobility, and productivity. Chemical deicers are the most used and effective method, but they have adverse environmental impacts. As a green alternative, hydronically heated bridges powered by geothermal energy are a promising technology that relies on embedded hydronic loops for heating but are limited to new bridges. To expand their use to existing bridges, a new external geothermal heating design has been explored through concept and field tests. This novel shallow geothermal bridge deicing system was installed on an in-service bridge in North Texas and has been operated continuously for the past three winters. The system consists of four ground-source heat pumps (GSHPs) and sixteen vertical ground heat exchangers (GHEs), which circulate heated fluid through externally attached hydronic loops on a 20-inch-thick 8-span concrete bridge deck. A comprehensive monitoring system was installed to record ambient conditions, fluid temperatures, bridge deck and ground heat exchanger temperatures, soil moisture, and electricity energy consumption. This presentation highlights the winter performance of the bridge deicing operations conducted during the last few winter seasons.

Bio: Dr. Xinbao Yu is a Professor of Geotechnical Engineering in the Department of Civil Engineering at the University of Texas at Arlington (UTA). He received his Ph.D. in Civil Engineering in 2009 from Case Western Reserve University. Before joining UTA, Dr. Yu was a research associate at the Louisiana Transportation Research Center (LTRC). Dr. Yu is the lead PI for the TxDOT geothermal bridge project, a 10-year research program with total funding exceeding 3 million. Dr. Yu's research interests include geothermal energy applications, deep foundations, unsaturated soils, bridge scour, expansive soils, and Time-Domain Reflectometry (TDR) soil sensors. Dr. Yu's research sponsors include NSF, NCHRP, CALTRANS, TXDOT, ODOT, and private industries. Dr. Yu is a member of the Geo-Institute Technical Committee on Energy Geotechnics and Unsaturated Soils. Dr. Yu received the Excellence in Research Award from the College of Engineering at UTA in 2021.

Innovative Pathway to Beneficiate Traditionally Unmarketable Coal Combustion Residuals

Hongyu Zhou, Ph.D.
Associate Professor, Department of Civil and Environmental Engineering, University of Tennessee
Co-Founder, Terra Materials

Abstract: Ponded coal combustion residuals (CCRs) represent a large, stranded resource that is routinely excluded from supplementary cementitious material (SCM) supply chains due to heterogeneity, elevated moisture and unburned carbon, and stakeholder concerns about trace-metal leaching; we describe a scalable beneficiation pathway that uses biomolecule-enabled stabilization—centered on tannic acid, a naturally occurring polyphenolic ligand—to unlock ponded CCRs as specification-ready SCMs and as feedstocks for alkali-activated binders and geopolymer-based aggregates, creating a high-margin circular-materials opportunity aligned with low-carbon concrete procurement. In the proposed process, tannic acid functionalizes CCR particle surfaces and complexes multivalent metal species through strong coordination (chelation/surface complexation) while promoting adsorption to iron- and aluminosilicate-rich phases, lowering dissolved metal activity and forming sparingly soluble metal–tannate/adsorbed complexes that reduce leachability under relevant pH and ionic-strength conditions; critically, this surface modification can also improve dispersion and mitigate agglomeration, enabling tighter packing and more consistent reactivity of the amorphous aluminosilicate fraction in cementitious systems. The same stabilized CCR stream is well-suited for alkali activation, where reactive glassy phases form N-A-S-H and/or hybrid C-(N)-A-S-H gels that further immobilize trace metals through chemical incorporation and physical encapsulation; with controlled granulation and curing, these binders can be engineered into geopolymer-based manufactured aggregates for lightweight concrete and other construction applications.

Bio: Dr. Hongyu "Nick" Zhou is a David Goodpasture Faculty Fellow and Associate Professor at the University of Tennessee, Knoxville (UTK), with 15+ years of experience spanning concrete materials, advanced infrastructure engineering, autonomous construction, and additive manufacturing. He founded UTK's Future of Construction Initiative (FCi) and the Infrastructure Materials La boratory. Dr. Zhou has served as PI/Co-PI on $15M+ in sponsored R&D from DARPA, ONR, the U.S. Department of the Air Force, DOE, NASA, NSF, state DOTs, and industry— including multiple SBIR/STTR awards that progressed to prototypes and commercialization pathways. He is active in ACI and ASCE, currently chairs ASCE's Aerospace Division, and previously helped found and lead ASCE's Bio-Inspired Structures committee.

Continuous Railroad Track Health Monitoring Using Distributed Fiber Optic Sensor

Yuliang Zhou, Ph.D.
Assistant Professor, Department of Transportation & Urban Infrastructure Studies, Morgan State University, Baltimore, MD USA

Abstract: A continuous track health monitoring system is vital to the railroad since it can report and assess the track structural conditions at any location and time, which is an essential prerequisite for low-cost condition-based maintenance. Distributed Acoustic Sensing (DAS) technology provides high-speed and high-resolution sampling of ground vibrations along the entire length of fiber cable, making it an effective tool for detecting changes in trackside ground vibrations caused by changes in track structural properties. The objective of this study is to investigate the potential of using DAS-detected vibration caused by moving trains to estimate near-surface characteristics along the track. The field experiments, the work reported in this paper, were done at the Heavy Tonnage Loop (HTL) in Transportation Technology Center (TTC). A 2.7-mile fiber cable installed adjacent to the HTL track was utilized as an acoustic sensor to monitor acoustic vibrations transmitted through the track to the cable. "Rainfall plots" recorded by DAS provides the information of train length, velocity, and surface wave propagation. Moreover, dispersion property analysis yielded typical dispersion curves that were inverted to estimate 1D profiles of shear velocity and modulus at various sections of the HTL. The estimated modulus showed consistency with the DCP tested modulus, validating the feasibility of using DAS to evaluate subgrade properties.

Bio: Dr. Yuliang Zhou is an Assistant Professor in the Department of Transportation & Urban Infrastructure Studies. He earned his Ph.D. in Civil Engineering (Rail Transportation Engineering) from The Pennsylvania State University - University Park and previously completed a B.S. and another Ph.D. in Transportation Engineering at Tongji University, China. Dr. Zhou's research focuses on rail infrastructure condition assessment and health monitoring using advanced sensing technologies, including fiber optic sensing, MEMS sensors, UAV-based imaging, and multi-sensor networks. He has contributed to research projects supported by the Federal Railroad Administration (FRA), U.S. Department of Transportation (USDOT), and the Association of American Railroads (AAR), and also collaborates with industry partners such as Amtrak, Class I railroads, short lines, and MxV Rail. His work has produced more than 20 peer-reviewed journal articles, conference papers, and technical reports, with presentations delivered at major professional conferences including AREMA, TRB, the AAR Annual Review, and the Wheel/Rail Interaction Conference.

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