DEPARTMENT of ISE
UNIVERSITY OF HOUSTON

FRIDAY SEMINAR SERIES
BROADEN HORIZONS | EXTEND MINDS

Dr. Yang Zhou
Department of Civil and Environmental Engineering
Texas A&M University

Date: Friday, April 4, 2025
Time: 1 p.m. to 1:50 pm
Location: D2 Lect2

Towards the Digital-Twin Enhanced Active Safety Analysis

Abstract: This presentation introduces a revolutionary approach that integrates artificial intelligence and digital twin technology with a novel three-dimensional vehicle dynamics framework for active safety analysis. Traditional passive safety methods are fundamentally challenged by the rarity and randomness of traffic accidents—a curse that limits their capacity for dynamic, anticipatory risk estimation and prevention. Moreover, conventional active safety techniques, typically reliant on piece-wise one-dimensional models, fail to capture the complex interplay between vehicle dynamics and driver behavior, resulting in imprecise risk predictions. In contrast, our comprehensive framework seamlessly incorporates advanced driving behavior models and control algorithms within a digital twin platform, effectively capturing the intricate interactions among vehicles and road infrastructures. Demonstrated through case studies on 3D vehicle collision modeling and the impacts of lane-changing on adaptive cruise control (ACC) traffic streams, this approach establishes a new benchmark for proactive road traffic risk analysis and prevention.

Biography: Dr. Yang Zhou is an assistant professor in the Zachry Department of Civil and Environmental Engineering at Texas A&M University, and career initiation fellow of Texas A&M Institute of data science. He received his Ph.D. degree and Master's degree from the University of Wisconsin-Madison and the University of Illinois at Urbana and Champaign, respectively. Before joining Texas A&M, Dr. Zhou worked as a postdoctoral research associate supported by the Department of Civil and Environmental Engineering, University of Wisconsin-Madison. Dr. Zhou has over ten years of experience in connected automated vehicle control and analysis, traffic flow analysis, AI applications on transportation, and high-fidelity simulation. Dr. Zhou has Ied multiple federal and local grants such as FHWA-EAR. Dr. Zhou is an expert in his field and has published more than 60 top-tier transportation journals, including Transportation Research Part B, Transportation Research Part C, and IEEE Transactions on Intelligent Transportation Systems.