The Department of Civil and Environmental Engineering at the University of Houston presents...

CIVE 6111 Graduate Seminar

Parametric Studies of Structures via Model Reduction

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Department of Civil & Environmental Engineering at
University of Houston

Friday, March 10, 2023
2:45pm-3:45pm
Classroom Business Building (CBB) - Room 104
Zoom: https://uh-edu-cougarnet.zoom.us/j/94589160391

Abstract

Accelerated bridge construction (ABC) methods have been increasingly used for bridge rehabilitation and replacement projects in recent years. ABC methods use innovative planning, design, materials, and construction methods in a safe and cost-effective manner to reduce the onsite construction time. The main advantages of ABC method over conventional staged construction include reduced impact on traffic and mobility caused by onsite bridge construction, lane closures, and detours. Despite these advantages, ABC methods often require a higher initial cost and more planning, design coordination, and increased construction lead time. Decision makers need to accurately estimate total and life cycle costs of the two bridge construction methods to identify the most-cost effective method for different bridge construction projects. This presentation focuses on the development of a decision support tool (DST) for estimating the total and life cycle cost of conventional and accelerated bridge construction methods such as prefabricated elements, lateral slide, and self-propelled modular transporter. The DST is designed to provide DOT decision makers with much-needed support to generate accurate Rough Order of Magnitude cost estimate during the early project planning and engineering phases. The cost estimating DST was developed in six tasks that were designed to (1) collect historical cost data of various bridge projects constructed using both conventional staged construction and ABC methods; (2) create a database of all collected bridge cost data; (3) develop a construction cost module that enables DOT planners to develop rough order of magnitude estimates for each bridge construction method; (4) implement a road user cost module that estimates the cost to the travelling public resulting from detours and traffic delays during bridge construction; (5) develop a life cycle cost module that includes construction, road user, maintenance, and replacement costs; and (6) compare the construction, road user, and life cycle costs for each bridge construction method.

Bio

Dr. Ruda Zhang is an Assistant Professor in the Department of Civil and Environmental Engineering at the University of Houston (UH), where he leads the Uncertainty Quantification (UQ) Lab. He received his B.E. degree in Engineering Structure Analysis from Peking University, Beijing, China, and master's degree in Economics and Ph.D. degree in Civil Engineering from the University of Southern California, Los Angeles, CA. Before joining UH in Fall 2022, he was a Phillip Griffiths Assistant Research Professor in the Department of Mathematics at Duke University.
His research combines machine learning (ML) and uncertainty quantification (UQ) for structural engineering, and more broadly, for computational and data-enabled science and engineering (CDS&E). His current focus is on dimension reduction and emulation of computational models, using Gaussian processes, deep neural nets, and data-driven methods. His recent awards include the 2021 INFORMS Quality, Statistics & Reliability (QSR) best paper award, and the SIAM Early Career Travel Award.