Kyle D. Bathgate

Doctoral Candidate and Graduate Research Assistant
Maseeh Department of Civil, Architectural, and Environmental Engineering
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Education

Ph.D. Civil Engineering **Present**
University of Texas at Austin, 3.91 GPA
- Dissertation working title: Modeling the Resilience of Multi-Modal Freight Transportation Systems
- Committee: Dr. Stephen Boyles (advisor), Dr. Randy Machemehl, Dr. Tyler Dick, Dr. Kenneth Mitchell, Dr. Alison Conway

M.S.E. Civil Engineering **May 2021**
University of Texas at Austin, 3.93 GPA
- Thesis: "Resilience through Risk Assessment: A Conceptual Framework for Extreme Weather Risk Assessment of the Texas Port System"
- Advisor: Dr. Zhanmin Zhang

B.S.E. Civil and Environmental Engineering **May 2019**
University of Illinois Urbana-Champaign, 3.89 GPA
- Concentrations: Transportation and hydrology
- Graduated with High Honors

Research Experience

Graduate Research Assistant **2019-Present**
Center for Transportation Research (CTR) at the University of Texas at Austin
- Resilient Infrastructure and Smart Cities (RISC) Lab, PI: Dr. Zhanmin Zhang, 2019-2023
- Simulation, Pricing, Adaptive Routing, and Traffic Assignment (SPARTA) Lab, PI: Dr. Stephen Boyles, 2023-Present

Undergraduate Research Assistant **2017-2019**
University of Illinois Urbana-Champaign
- PI: Dr. Jeffery Roesler

Sponsored Research

"Data-Driven, Multimodal Freight Modeling for Waterways and Ports," sponsored by the Coastal and Hydraulic Laboratory of the of the US Army Corps of Engineers (USACE) Engineering Research and Development Center, Project BAA 23-0016, awarded for 1 year and $90,000 (Sept 2023 – Sept 2024)
- Led project proposal authorship team
- Processed and integrated data from multiple transport modes for simulation purposes
- Identified bottlenecks in multi-modal freight networks through discrete event simluation
- Simulated disruption scenarios to examine resilience and recovery bottlenecks

"Define a Statewide Plan for a Sustainable Real-Time Travel Time Network for Texas Hurricane Evacuations and Safe Citizen Return," sponsored by Texas Department of Transportation, PI: Dr. Zhanmin Zhang and Dr. Stephen Boyles, awarded for 2.5 years and $399,870 (Jan 2022 – Jan 2024)

- Led project proposal authorship team
- Surveyed past hurricane evacuation participants and decisionmakers in Texas
- Modeled evacuation network and identified corridors for traffic monitoring system expansion
- Prioritized traffic monitoring device upgrade and expansion using asset management methods

"Creating a Resilient Port System in Texas: Assessing and Mitigating Extreme Weather Events," sponsored by the Texas Department of Transportation, PI: Dr. Zhanmin Zhang, $317,000 (Jan 2020 – Dec 2021)

- Collected data from port stakeholders to understand existing resilience and shortcomings
- Created framework to assess port vulnerability, exposure, and risk to extreme weather events
- Estimated economic impacts of hurricanes of varying intensity on Texas ports
- Developed Excel-based tool (PortRESECO) for stakeholders to assess port resilience
- Recommended action items for port stakeholders to implement to improve resilience capabilities

Refereed Journal Publications

J7 **K. Bathgate**, K. Jiang, Z. Han, and Z. Zhang. Evacuation Volume and Safety Assessment: A Case Study in Rural Texas Highways during Hurricane Laura on US 90 and US 287. In progress, 2024

J6 J. Robbennolt, L. Xu, **K. Bathgate**, S. Pan, and S. Boyles. Identifying Critical Locations for Traffic Monitoring Devices during Hurricane Evacuations. In progress, 2024

J5 J. Sun, **K. Bathgate**, S. Pan, and Z. Zhang. Network-based Method for Assessing Interdependent Transportation Network Vulnerability to Cascading Failures. Under review, *Sustainability Analytics and Modeling*, 2024a

J4 J. Sun, **K. Bathgate**, and Z. Zhang. Bayesian Network-based Resilience Assessment of Interdependent Infrastructure Systems under Optimal Resource Allocation Strategies. Under review, *Resilient Cities and Structures*, 2024c

J3 S. Pan, J. Sun, **K. Bathgate**, and Z. Zhang. Modeling Interdependent Infrastructure System Vulnerability with Imprecise Information Using Two Fuzzy Inference Systems. Under review, *Transportation Research Record*, 2024b

J2 L. Xu, **K. Bathgate**, J. Robbennolt, J. Sun, S. Pan, Z. Han, and S. Boyles. Understanding the Utilization of Real-Time Traffic Information during Hurricane Evacuations in Texas. Under review, *Transportation Research Record*, 2024b

J1 **K. Bathgate**, A. Perez de la Cruz, and Z. Zhang. Quantitative Analysis of Hurricane Harvey Impacts on Texas Maritime Facilities. *Transportation Research Record*, 2676(7):411–422, July 2022a. ISSN 0361-1981. doi: 10.1177/03611981221078574. URL https://doi.org/10.1177/03611981221078574. Publisher: SAGE Publications Inc

Refereed Conference Presentations

C9 L. Xu, **K. Bathgate**, J. Robbennolt, J. Sun, S. Pan, Z. Han, and S. Boyles. Understanding the Utilization of Real-Time Traffic Information during Hurricane Evacuations in Texas. Transportation Research Board 103rd Annual Meeting, January 9, 2024a. Washington, DC. *Awarded Best Paper for 2023 by the TRB Standing Committee on Disaster Response, Emergency Evacuations, and Business Continuity (AMR20)*

C8 S. Pan, J. Sun, **K. Bathgate**, and Z. Zhang. Modeling Interdependent Infrastructure System Vulnerability with Imprecise Information Using Two Fuzzy Inference Systems. Transportation Research Board 103rd Annual Meeting, January 8, 2024a. Washington, DC

C7 J. Sun, **K. Bathgate**, and Z. Zhang. Bayesian Network-based Resilience Assessment of Interdependent Infrastructure Systems under Optimal Resource Allocation Strategies. Transportation Research Board 103rd Annual Meeting, January 8, 2024b. Washington, DC

C6 K. Jiang, **K. Bathgate**, S. Pan, J. Sun, Z. Han, M. Murphy, and S. Boyles. Perceptions and Usage of Traffic Monitoring Devices during Past Hurricane Evacuations in Texas. American Society of Civil Engineers Transportation and Development Institute, International Conference on Transportation and Development, June 14-17, 2023. Austin, TX

C5 **K. Bathgate**, K. Jiang, Z. Han, M. Murphy, and Z. Zhang. Evacuation Volume and Safety Assessment: A Case Study in Rural Texas Highways during Hurricane Laura on US 90 and US 287. Transportation Research Board 102nd Annual Meeting, January 8-12, 2023a. Washington, DC

C4 J. Sun, **K. Bathgate**, S. Pan, and Z. Zhang. Network-based Method for Vulnerability Analysis of Port Systems Considering Cascading Failures. Transportation Research Board 102nd Annual Meeting, January 8-12, 2023. Washington, DC

C3 **K. Bathgate**. Quantitative Analysis of Hurricane Harvey Impacts on Texas Maritime Facilities. Transportation Research Board 101st Annual Meeting, January 9-13, 2022c. Washington, DC

C2 **K. Bathgate**. An Extreme Weather Risk-Assessment Framework for Port Infrastructure Systems. 16th Annual Inter-university Symposium on Infrastructure Management (AISIM), July 17-18, 2021a. Virtual proceedings. *Awarded "Best Presentation" and selected for presentation at TRBAM 101 (2022)*

C1 **K. Bathgate**. A Study on the Effectiveness of Bus Rapid Transit in the South Congress/North Lamar Corridor in Austin, Texas. 62nd International Meeting of the Transportation Research Forum, April 6-8, 2021c. Virtual proceedings

Technical Presentations

P5 **K. Bathgate**. Data Integration for Multimodal Freight Resilience Assessment. Transportation Research Board 103rd Annual Meeting, 31st Annual Dwight David Eisenhower Transportation Fellowship Program Research Showcase, January 9, 2024. Washington, DC

P4 **K. Bathgate**, K. Jiang, S. Pan, J. Robbennolt, L. Xu, J. Sun, Z. Han, and S. Boyles. Evaluation of Real-Time Traffic Monitoring Devices for Texas Hurricane Evacuations. UT Center for Transportation Research Symposium, April 19, 2023b. Austin, TX

P3 **K. Bathgate**. An Extreme Weather Risk-Assessment Framework for Port Infrastructure Systems. UT Center for Transportation Research Symposium, April 12, 2022b. Austin, TX

P2 **K. Bathgate**. Hurricane Harvey Impacts on Texas Maritime Facilities: An AIS Big Data Statistical Analysis. UT CAEE Graduate Research Symposium, April 6, 2022a. Austin, TX

P1 **K. Bathgate**. Texas Seaport Resilience Assessment: Incorporating Stakeholder Input. Transportation Research Board 100th Annual Meeting, 28th Annual Dwight David Eisenhower Transportation Fellowship Program Research Showcase, January 25-29, 2021b. Virtual proceedings

Technical Reports

R1 **K. Bathgate**, J. Sun, S. Pan, S. Balakrishnan, Z. Zhang, M. Murphy, Z. Han, and L. Loftus-Otway. Creating a Resilient Port System in Texas: Assessing and Mitigating Extreme Weather Events – Final

Report. Technical Report FHWA/TX-22/0-7055-1, Center for Transportation Research at The University of Texas at Austin, Austin, TX, May 2022b. URL https://library.ctr.utexas.edu/ctr-publications/0-7055-1.pdf

Teaching Experience

Teaching Assistant **Spring 2024**
University of Texas at Austin, CE 321 Transportation Systems
- Assisted with curriculum developement and course structure design

Course Grader **Spring 2022**
University of Texas at Austin, CE 321 Transportation Systems
- Graded homework and project assignments for transportation introductory course
- Lectured on transportation infrastructure resilience and interdependencies

Guest Lecturer **2021-Present**
University of Texas at Austin, undergraduate and graduate-level civil engineering courses
- Courses: CE 311 S Probability and Statistics for Civil Engineers, CE 321 Transportation Systems, CE 392 N1 Infrastructure Systems Management
- Topics: Infrastructure Resilience and Interdependencies, Budget Planning and Budget Allocation, Statistics in civil engineering case study

Undergraduate Learning Assistant **Fall 2018**
University of Illinois Urbana-Champaign, CEE 398 Project-Based Learning
- Mentored underclassman in investigating a campus infrastructure problem
- Delivered organizational, planning, and grading support for instructors

Professional Experience

Applied Pavement Technology **May-Aug 2019**
Pavement Engineering Intern; Urbana, IL
- Inspected roadway and airfield pavement facilities in accordance with PCI methodology
- Managed pavement facility assets using PAVER software, GIS, and MS Access

Clark Dietz, Inc. **2017, 2018**
Transportation Engineering Intern; Champaign, IL
Provided construction engineering services on $14 million roadway and drainage project, May-Jul 2018
- Observed and inspected storm, sanitary, water main, and roadway construction
- Compiled and organized American Iron and Steel certifications for US EPA site visit

Documented construction and oversaw water main on $42 million MCORE project, Apr-Aug 2017
- Calculated quantities and revised road plans using Bentley MicroStation and GEOPAK
- Performed spatial analysis using GPS, surveying, and ESRI ArcGIS

Williamson County 911 **Jun-Aug 2016**
GIS Contractor; Marion, IL
- Created county atlas for emergency services personnel with ESRI ArcGIS software
- Coordinated with County 911 Director to ensure deliverables fulfilled requirements

Honors and Awards

- Jack E. Leisch Fellowship, ASCE Transportation and Development Institute (2023)

- Dwight David Eisenhower Transportation Fellow, FHWA (2020, 2023)
- Mary Kate (Kitty) Collins Memorial Endowed Presidential Scholarship in Civil Engineering, UT Austin (2023)
- Charles W. Merritt Endowed Graduate Fellowship in Engineering, UT Austin (2019-2023)
- Campus Honors Program (Chancellor's Scholar), University of Illinois (2015-2019)
- Tau Beta Pi Engineering Honors Society, University of Illinois Chapter (initiated Spring 2017)
- Chi Epsilon Civil Engineering Honors Society, University of Illinois Chapter (initiated Fall 2016)

Professional Societies

American Society of Civil Engineers (ASCE)

Student Presidential Group (SPG)

- Transportation and Developement Institute (T&DI) Representative (2024-Present)

Transportation and Developement Institute (T&DI)

- International Conference on Transportation & Development (ICTD), Student Volunteer Committee Chair (2022-2023)

University of Illinois Student Chapter

- Concrete Canoe Team Design Captain (2017-2019)
- Concrete Canoe Paddling Team Member (2017-2018)
- Secretary (2017-2018)
- Outreach Chair (2016-2017)

Transportation Research Board (TRB)

- Standing Committee on Critical Transportation Infrastructure Protection (AMR10), Friend
- Standing Committee on Disaster Response, Emergency Evacuations, and Business Continuity (AMR20), Friend
- Standing Committee on Extreme Weather and Climate Change Adaptation (AMR50), Friend
- Standing Committee on Geographic Information Science (AED40), Friend
- Standing Committee on Freight Transportation Data (AED70), Friend
- Sustainability and Resilience Group Young Member Council (AM000), Annual Meeting Working Group Member (2022)

Graduate Student Advisory Board (GSAB)

University of Texas at Austin, Department of Civil, Architectural, and Environmental Engineering

- Transportation Representative (2020-2022)

Intelligent Transportation Society of America (ITS)

University of Texas Student Chapter

- Member (2019-Present)
- President (2019-2021)
- UT CAEE GSAB Liason (2021-2022)

Institute of Transportation Engineers (ITE)

University of Texas Student Chapter

- Member (2019-Present)

University of Illinois Student Chapter

- President (2018-2019)
- Secretary (2017-2018)

Folk and Roots Club (The Pickin' Illini)

University of Illinois Registered Student Organization for bluegrass music performance

- President (2016-2017)

Referee Service

Conference Referee:

Transportation Research Board

- AMR10, Standing Committee on Critical Infrastructure Protection
- AMR20, Standing Committee on Emergency Response, Business Continuity, and Evacuations
- AMR50, Standing Committee on Extreme Weather and Climate Change Adaptation
- AM000, Sustainability and Resilience Group Young Member Council
- AED50, Standing Committee on Artificial Intelligence and Advanced Computing Applications

Journal Referee:

- Environmental Earth Sciences
- Journal of Computing in Civil Engineering
- Journal of Infrastructure Systems
- Journal of Management in Engineering
- Transportation Research Record

Skills

Enrolled Professional Engineer Intern, State of Illinois, License No. 061.040866

Programs: ESRI ArcGIS, Python, R, Microsoft Office, AnyLogic, Git, LaTeX
Methods: data processing, statistical analysis, survey design, data visualization, geospatial analysis, modeling and simulation