Utkarsh Gangwal

Personal Information

Graduate Research Assistant
Department of Civil & Environmental Engineering
Disaster Research Center
University of Delaware

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Google Scholar
Personal website

Education

University of Delaware — *Newark, DE*
Ph.D. in Civil Infrastructure Systems, CGPA: 3.98/4 — *2021 – Present*
Advisor: Dr. Shangjia Dong

Indian Institute of Technology (IIT) Gandhinagar — *Gandhinagar, Gujarat*
Bachelor of Technology in Civil Engineering, CGPA: 8.57/10 — *2017 – 2021*
(With Honors in Civil Engineering)

Research Interests

- Interdependent human-infrastructure Network Analysis (Complex network analysis, System dynamic modeling, Geo-spatial AI)
- Societal impact of disaster (Econometrics modeling, Survey analysis)
- Disaster mitigation & infrastructure planning (Optimization, Community Resilience)

Preprints

J1. Qian, X., **Gangwal, U.**, Davidson, R., & Dong, S. (2024). A Deep Learning Framework for Joint Synthetic Household and Individual Generation. *Computers, Environment and Urban Systems*. (Under Review)

J2. **Gangwal, U.**, Dulam, R., Dong, S., Davidson, R., Ewing, B., Kendra, J., & Anderson, A. (2024) Multi-event cross-region analysis of household adaptation to infrastructure service disruption *Energy Research & Social Science*. (Under Review)

J3. Dulam, R., **Gangwal, U.**, Davidson, R., Dong, S., Ewing, B., Kendra, J., & Anderson, A. (2024) A generalized model to predict household adaptations to electric power outages An application of the Household Adaptations to Service Interruption (HASI) typology. *Journal of Infrastructure Intelligence and Resilience*. (Under Review)

Refereed Journal Articles

J1. **Gangwal, U.**, Dong, S., & Shi, F. (2025). Living with and without water: modeling human-infrastructure interactions in disaster preparedness. Urban Informatics, 4(1), 1-21. doi:10.1007/s44212-025-00072-0

J2. Horney, J. A., **Gangwal U**, and S. Dong. "Flood Inundation and Isolation Differentially Impact Access to Dialysis Care". American Journal of Disaster Medicine, vol. 19, no. 3, Sept. 2024, pp. 265-9, doi:10.5055/ajdm.0490

J3. **Gangwal, U.**, Siders, A. R., Horney, J., Michael, H. A., & Dong, S. (2023). Critical facility accessibility and road criticality assessment considering flood-induced partial failure. Sustainable and Resilient Infrastructure, 8(sup1), 337-355. doi: 10.1080/23789689.2022.2149184

J4. Dong, S., Gao, X., Mostafavi, A., Gao, J., & **Gangwal, U.** (2023). Characterizing resilience of flood-disrupted dynamic transportation network through the lens of link reliability and stability. Reliability Engineering & System Safety, 109071. doi: 10.1016/j.ress.2022.109071

J5. Horney, J. A., Scales, S. E., **Gangwal, U.**, & Dong, S. (2023). Ensuring Access to Opioid Treatment Program Services Among Delawareans Vulnerable to Flooding. Delaware Journal of Public Health, 9(2), 130. doi: 10.32481/djph.2023.06.024

J6. **Gangwal, U.**, & Dong, S. (2022). Critical facility accessibility rapid failure early-warning detection and redundancy mapping in urban flooding. Reliability Engineering & System Safety, 108555. doi: 10.1016/j.ress.2022.108555

J7. **Gangwal, U.**, Singh, M., Pandey, P. K., Kamboj, D., Chatterjee, S., & Bhatia, U. (2022). Identifying early-warning indicators of onset of sudden collapse in networked infrastructure systems against sequential disruptions. Physica A: Statistical Mechanics and its Applications, 591, 126796. doi: 10.1016/j.physa.2021.126796

Refereed Conference Proceedings

C1. Horney, J., Dong, S., & **Gangwal, U.** (2024, October). Are opioid treatment programs ready for disaster? the growing risk of flood-associated isolation. In APHA 2024 Annual Meeting and Expo. APHA.

C2. Ma, J., **Gangwal, U.**, & Dong, S. (2023). Fire Station Accessibility, Assessment, and Improvement Considering Probabilistic Road Failure in Facing Flooding. In ASCE Inspire 2023 (pp. 831-838). doi: 10.1061/9780784485163.096

Presentations

P1. Interdependent human-infrastructure system modeling for resource disparity assessment. *Natural Hazards Research Summit 2024*. College Park, MD, May 2024

P2. Assessing the impact of flood disruption on healthcare facility access equity, *Transportation Resilience 2023*. Washington D.C., Nov 2023 (Talk)

P3. Community Resilience Modeling Using Dynamic System Approach, *ASCE Inspire 2023*. Washington D.C., Nov 2023

P4. Road Criticality Assessment for Communities Access to Critical Facilities in Delaware, *Natural Hazards Workshop 2023*. Boulder, CO, Jul 2023

P5. Assessing the impact of flooding on healthcare facility accessibility in Delaware communities, *DENIN Research Symposium 2023*. Newark, DE, Apr 2023

P6. Road Criticality and Resource Redundancy Mapping in Delaware Coastal Community, *Natural Hazards Workshop 2022*. Online, Jul 2022

Honors & Awards

- Awarded the **Doctoral Fellowship for Excellence** for the AY 2025-26
- **Best poster award** Gangwal, U., et al. "Interdependent human-infrastructure system modeling for resource disparity assessment." Natural Hazards Research Summit, College Park, MD (2024)
- **UD Disaster Research Center Travel Awards 2023**
- **UD COE Graduate Student Travel Awards 2023 & 2024**

- **Honorable Mention** at the UD GIS day, 2022 for the map "Hospital Access Disparities after Hurricane Harvey in Harris County, TX, 2017"
- **Director's Gold Medal** at IIT Gandhinagar for overall outstanding performance among all B.Tech students
- **Institute Gold Medal** at IIT Gandhinagar for securing the highest cumulative performance index among all B.Tech Civil Engineering students
- **Best poster award** Chatterjee, Samrat, et al. "A Network-of-Network Approach for Cyber-Based Contingency Analysis of Interdependent Infrastructure Networks Under Uncertainty." Society of Risk Analysis, Washington DC (2019)
- **Scholarship for Academic Excellence** at IIT Gandhinagar for the academic year 2017-18, 2018-19, and 2019-20
- **Dean's List Honour**, at IIT Gandhinagar Semester- I of Academic Year- 2018-19 and Semester- I of Academic Year- 2019-20

PEER MENTORING

Research Mentor

- Mina Gorani, Undergrad Researcher (UVA) *Jun-Sept 2024*
  Research: Optimization for Equitable Routes to Critical Facilities After Flood Events
- Aiden Pape, Undergrad Researcher (Middlebury College) *Jun-Sept 2023*
  Research: Generating Geolocated Synthetic Population to Assess Travel Need to Access Opioid Treatment Centers
- Jack Kingham, Undergrad Researcher (UD) *Jun-Sept 2023*
  Research: Predicting Travel Patterns to Delaware Healthcare Facilities During Flooding
- Jiaji Ma, Undergrad Researcher (UVA) *Jun-Sept 2022*
  Research: Fire station access equity in facing flood disruption (Work published and presented at ASCE INSPIRE conference 2023)
- Annabelle Dorsett, Undergrad Researcher (UD) *Apr-Jun 2022*
  Research: Infrastructure service usage behavior analysis

SELECTIVE RESEARCH EXPERIENCE

Multi-event cross-region analysis of household adaptation to infrastructure service disruption (NSF #1735483) *Sept 2023 - Oct 2024*

Advisor(s): Dr. Shangjia Dong, Dr. Rachel Davidson, Dr. James Kendra, Dr. Bradley Ewing

- Used mixed logit models to understand the relation between various adaptations, outage duration, and individual characteristics
- Investigated how common different adaptations are across different states for past experiences and future disasters
- Evaluated the predictive power of the models to estimate the number of individuals likely to do an adaptation

System dynamic modeling of interdependent socio-physical systems for resource disparity assessment during flooding (NASEM #SCON-1000063) *Jan 2022 - Mar 2024 Advisor(s): Dr. Shangjia Dong*

- Developed a system dynamic model to capture the interdependency of social and physical systems during disaster preparedness through human consumption and competition for infrastructure services

- Analyzed the impact of physical and social vulnerability by estimating the resources available at micro- and macro-level
- Proposed a framework for analyzing interactions across multilayered systems

Critical facility accessibility and road criticality assessment during flooding (UDRF #21A00986, DelDOT #T202266002) *Jun-Sept 2022*

Advisor(s): Dr. Shangjia Dong, Dr. AR Siders, Dr. Jennifer Horney

- Identified accessibility disparities for Delaware state while taking into account partial failure by integrating the depth-disruption function to travel time calculations
- Used modified betweenness centrality to identify critical roads for access to critical facilities for the network and census block groups
- Proposed a weighted criticality metric to identify flooded roads critical to disconnected communities for restoring access to critical facilities

TEACHING

Teaching Assistant (University of Delaware)

Semester	Course	Students	Title
S 2024	CIEG351	53	(UG) Transportation Engineering
S 2024	CIEG451	53	(UG) Transportation Engineering Lab
S 2023	CIEG351	62	(UG) Transportation Engineering
S 2023	CIEG451	62	(UG) Transportation Engineering Lab

UG: Undergraduate-level

SERVICES

Reviewer

- Energy Research & Social Science, Elsevier
- Geo-spatial Information Science, Taylor & Francis
- Scientific Reports, Springer Nature
- Knowledge and Information Systems, Springer Nature
- Transportation, Springer Nature
- COTA International Conference of Transportation Professionals (CICTP) 2023 & 2024
- ASCE International Conference on Computing in Civil Engineering (i3CE)