ADVANCING EQUITABLE CLIMATE RESILIENCE OF INTERDEPENDENT CRITICAL INFRASTRUCTURE SYSTEMS UNDER DEEP UNCERTAINTIES

"Equitable Climate resilience" is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate equitably. The projected climate change impacts that likely would increase the frequency of weather and climate extremes, the paucity of data and information on the interdependent critical infrastructure systems (CIS) network topologies, and the lack of community engagement in the CIS resilience-building decision-making process induce a variety of uncertainties and challenges in advancing the equitable climate resilience of CIS (e.g., energy systems, transportation, food stores, temporary shelters). Specifically, the lack of adequate data and information on the CIS network topologies poses significant challenges to accurately assess the vulnerability of interdependent CIS, which is a crucial component for designing efficient climate-resilient infrastructure systems.

Although the challenges of obtaining reliable data on CIS networks and the various dimensions of their interdependencies (i.e., physical, logical, geographical, or cyber interdependencies) are well acknowledged, modeling CIS vulnerability under a scarce and incomplete data/information environment is neglected. On the other hand, although it is well-known that CIS service disruptions have severe implications for the well-being of rural and disadvantaged populations during disasters since they lack the resources to prepare for and recover from disaster-induced damages, their voices are often not heard in the CIS resilience-building decisions. In some instances, despite many efforts of the government to reach socially vulnerable communities, challenges still exist as many of these communities lack the vital capacity (e.g., workforce, finances, expertise) to access competitive federal grants. Thus, besides understanding the risk of failures of CIS to various disaster threats, it is imperative to engage communities and understand/integrate their preferences and needs in the resilience-building decision-making process.

In this talk, I will present the novel approaches and key findings from my research using different case studies that address some of the above-mentioned challenges and issues. The talk will also provide an overview of how social science-informed, data-driven, mathematical modeling approaches can be used in developing human-centric, equity-informed decision frameworks that can be used by the federal and state governments, disaster emergency managers, local governments, and other policymakers to design effective strategies for advancing the equitable climate resilience of the CIS and our communities while accounting for the deep uncertainties of the future.

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Dr. Mukherjee is an assistant professor in the Department of Industrial and Systems Engineering at the University of Buffalo, The State University of New York. Her research interests are in the avenues of developing social-science-informed, data-centric mathematical models to examine systemic/stochastic impacts of climatic change and natural hazard events on interdependent socio-technical systems, develop risk-informed decision models, and investigate cost-effective adaptation measures to advance the resilience and sustainability of our communities and critical infrastructure systems. Her research is funded by the National Science Foundation, UB's Center for Geohazards Studies, and The State University of New York (SUNY) Seed Grants. Dr. Mukherjee holds a Ph.D. in Civil Engineering and a Master of Science in Economics from Purdue University. She also holds a Master of Science degree in Civil Engineering from Iowa State University.

Dr. Mukherjee has authored and co-authored more than 45 publications in peer-reviewed journals and conferences and presented her work at various national and international conferences. Her work has been cited in multiple news articles, including the CBS News Live Streaming, United Nations Office for Disaster Risk Reduction (UNDRR), The Los Angeles Times, Popular Science, and The Hill. Dr. Mukherjee has received the Outstanding Young Investigator Award from the Energy System Division of the Industrial Institute of Systems Engineers (IISE)-2021, Best Track Paper (runner up) from the Institute of Industrial and Systems Engineers (IISE) Work Systems Division-2023, Best Paper Award from the Society for Risk Analysis-2019, and Jury Award for Best Paper from the PMI Project Management Research & Academic Conference-2017, and several Student Paper Awards. She is on the Reviewer Editorial Board of several journals. She is also a part of the Institute of Industrial and Systems Engineers (IISE), the American Society of Civil Engineering (ASCE), the Institute for Operations Research and the Management Sciences (INFORMS), the Institute of Electrical and Electronics Engineers (IEEE), and Society of Women Engineers (SWE).

MARCH 8, 2024

ZOOM MEETING

11:30 AM – 12:20 PM

ZOOM LINK
HTTPS://BIT.LY/480XY74

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