Neetesh Sharma

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Current Position

Stanford University **Stanford, CA**
Adjunct Lecturer and Postdoctoral Scholar October 2022 - Present

Education

University of Illinois at Urbana-Champaign **Urbana, IL**
Ph.D. in Civil Engineering with minor in Statistics 2016–2020
Advisor: Professor Paolo Gardoni
Program: Societal Risk and Hazard Mitigation
Dissertation title: Regional Resilience Analysis: Modeling, Optimization, and Uncertainty Quantification

University of Illinois at Urbana-Champaign **Urbana, IL**
M.S. in Civil Engineering 2014–2016
Advisor: Professor Paolo Gardoni
Program: Construction Management
Dissertation title: Resilience Analysis: A mathematical formulation for modeling the resilience of engineering systems

National Institute of Technology, Tiruchirappalli **Tiruchirappalli, India**
B.Tech. in Civil Engineering 2006–2010

Research Interests

Optimal strategies for natural hazard mitigation and disaster recovery; infrastructure and socioeconomic resilience; sustainability; impacts of climate change; reliability, risk and life cycle analysis; decision making under uncertainty; performance assessment of deteriorating systems; modeling socioeconomic impacts of natural hazards; uncertainty quantification; statistical modeling and machine learning; project management and optimization.

Publications

Journal Papers

[J-7] Tabandeh, A., **Sharma, N.**, Iannacone, L., and Gardoni, P. (2022). "Numerical Solution of the Fokker-Planck Equation using Physics-based Mixture Models." *Computer Methods in Applied Mechanics and Engineering*, 399, 115424.

[J-6] Tabandeh, A., **Sharma, N.**, and Gardoni, P. (2021). "Uncertainty Propagation in Risk and Resilience Analysis of Hierarchical Systems." *Reliability Engineering and System Safety*, 219, 108208.

[J-5] **Sharma, N.**, and Gardoni, P. (2021). "Mathematical Modeling of Interdependent Infrastructure: An Object-Oriented Approach for Generalized Network-System Analysis." *Reliability Engineering and System Safety*, 217,

108042.

[J-4] Iannacone, L., **Sharma, N.**, Tabandeh, A., and Gardoni, P. (2021). "Modeling Time-Varying Reliability and Resilience of Deteriorating Infrastructure." *Reliability Engineering and System Safety*, 217, 108074.

[J-3] **Sharma, N.**, Nocera, F., and Gardoni, P. (2021). "Classification and Mathematical Modeling of Infrastructure Interdependencies." *Sustainable and Resilient Infrastructure*, 6(1-2), 4–25.

[J-2] **Sharma, N.**, Tabandeh, A., and Gardoni, P. (2020). "Regional Resilience Analysis: A Multi-Scale Approach to Optimize the Recovery of Interdependent Infrastructure." *Computer-Aided Civil and Infrastructure Engineering*, 35(12), 1315-1330.

[J-1] **Sharma, N.**, Tabandeh, A., and Gardoni, P. (2018). "Resilience Analysis: A Mathematical Formulation to Model Resilience of Engineering Systems." *Sustainable and Resilient Infrastructure*, 3(2), 49–67.

Book/Chapters

[B-3] Ayyub, B. M., Butry, D., Davis, C. A., Malushte, S. R., Medina, R.A., Reda Taha, M., Van de Lindt, J. W., Brett, C. R., Daghash, S., Field, C., Fung, J., Gardoni, P., McNeil, S., Moreu, F., Mostatavi, A., Saadat, Y., **Sharma, N.**, Soga, K., Soliman, E., Sutley, E. J., Tabandeh, A., Thomas, D., Vugrin, E., and Wright, R. N. (2021). *Hazard-Resilient Infrastructure: Analysis and Design*. Reston, VA: American Society of Civil Engineers.

[B-2] **Sharma, N.**, Tabandeh, A., and Gardoni, P. (2019). "Regional Resilience Analysis: A Multi-Scale Approach to Model the Recovery of Interdependent Infrastructure." In *Handbook of Sustainable and Resilient Infrastructure*, Edited by P. Gardoni, Routledge.

[B-1] **Sharma, N.**, and Gardoni, P. (2019). "Modeling the Time-Varying Performance of Electrical Infrastructure During Post Disaster Recovery Using Tensors." In *Handbook of Sustainable and Resilient Infrastructure*, Edited by P. Gardoni, Routledge.

Conference Proceedings and Presentations

[C-7] **Sharma, N.** and Gardoni, P. (2022). "High-fidelity performance of interdependent infrastructure." *In Proceedings of the 13th International Conference on Structural Safety & Reliability (ICOSSAR 2021-2022)*, Shanghai, China.

[C-6] **Sharma, N.**, Tabandeh, A., Gardoni, P., and Murphy, C. (2022). "Modeling and Evaluating the Impact of Natural Hazards on Communities and their Recovery." *In Proceedings of the European Conference on Safety and Reliability (ESREL 2022)*, Dublin, Ireland.

[C-5] **Sharma, N.**, Nocera, F., and Gardoni, P. (2022). "Quantifying the resilience of interdependent infrastructure." *In Proceedings of ASCE Lifelines Conference 2021-2022*, Los Angeles, USA.

[C-4] Tabandeh, A., Nocera, F., **Sharma, N.**, and Gardoni, P. (2021). "Digital Twins of Infrastructure." *In Proceedings of the 31st European Safety and Reliability Conference*, Angers, France, DOI: 10.3850/978-981-18-2016-8_222-cd.

[C-3] **Sharma, N.**, and Gardoni, P. (2021). "Quantitative modeling of regional resilience." *Engineering Mechanics Institute Conference*, New York, NY.

[C-2] **Sharma, N.**, Tabandeh, A., and Gardoni, P. (2019). "Recovery Optimization of Interdependent Infrastructure: A Multi-Scale Approach." In *Proceedings of the 13th International Conference on Applications of Statistics and Probability in Civil Engineering (ICASP13)*, Seoul, Korea. [**CERRA Student Recognition Award**]

[C-1] **Sharma, N.**, Gardoni, P., and Tabandeh, A. (2016). "A Stochastic Formulation to Model Resilience of Engineering Systems." *Engineering Mechanics Institute Conference*, Nashville, TN.

Poster Presentations

[P-2] **Sharma, N.**, Tabandeh, A., and Gardoni, P. (2019). Regional Resilience Analysis: Modeling, Optimization, and Uncertainty Quantification. *Colorado State University*, Fort Collins, CO.

[P-1] Ellingwood, B., Nozhati, S., Chong, E.K.P., Sarkale, Y., van de Lindt, J.W., Gardoni, P., Nocera, F., **Sharma, N.**, Peacock, W.G., Rosenheim, N., Goldberg D., and Kruse, J.B. (2018). Scalable Decision Model to Achieve Local and Regional Resilience of Interdependent Critical Infrastructure Systems and Communities. *Critical Resilient Interdependent Infrastructure Systems and Processes: A CRISP/RIPS Grantees Workshop*, Arlington, VA.

Awards and Honors

- **CERRA Student Recognition Award** 2019
  for the paper "Recovery Optimization of Interdependent Infrastructure: A Multi-Scale Approach,"
  13th International Conference on Applications of Statistics and Probability in Civil Engineering
- **Conference Travel Fellowship** 2016
  Department of Civil and Environmental Engineering
  University of Illinois at Urbana-Champaign
- **Gold Medal** 2010
  Department Rank 1 in Civil Engineering
  National Institute of Technology Tiruchirappalli, India
- **Outstanding Student of Civil Engineering** 2010
  RECAL, NIT Tiruchirappalli Alumni Association
  National Institute of Technology Tiruchirappalli, India
- **Dr. M Shanmugham Endowment Award** 2010
  National Institute of Technology Tiruchirappalli, India

Research Experience

Stanford University **Postdoctoral Scholar**

Socio-economic resilience 2022–Present

- Modeling the impact of damage to physical systems and infrastructure service disruption on the regional economy
- Modeling the interdependency mechanisms among the structural, functional, and socio-economic recoveries of disaster-affected communities

Unified system of equations for network dynamics 2022–Present

- Developing a differential equation model for interdependent infrastructure and socio-economic systems based on network dynamics theory for conducting functionality analyses,

system identification, and uncertainty quantification

University of Illinois at Urbana-Champaign **Postdoctoral Research Associate**

Disaster Preparedness Planning (Mississippi Emergency Management Agency) 2021–2022
- Developed estimates of expected structural damage, infrastructure functionality loss, and economic losses due to earthquake hazards originating from the New Madrid Seismic Zone in the central USA

Risk-Based Community Resilience Planning (NIST-funded Center of Excellence) 2020–2022
- Developed a general mathematical formulation for high-fidelity analysis of infrastructure and rigorous mathematical modeling of infrastructure interdependencies
- Developed a multi-fidelity approach to uncertainty quantification in high-dimensional problems such as regional resilience analysis
- Developed physics-based recovery models for deteriorating water infrastructure

Insured loss prediction for business interruption due to hurricanes (Office of Risk Management and Insurance Research at University of Illinois) 2020–2021
- Developed automated approaches to generate infrastructure inventory, functionality models, and financial valuation
- Developed a mathematical formulation for estimating value at risk and insured losses subject to natural hazards

University of Illinois at Urbana-Champaign **Graduate Research Assistant**

Risk-Based Community Resilience Planning (NIST-funded Center of Excellence) 2016–2020
- Developed the first orthogonal classification of infrastructure interdependencies
- Developed a multi-scale approach for the post-disaster recovery modeling and optimization of interdependent infrastructure
- Implemented the proposed approach for the regional resilience optimization of the Memphis Metro Statistical Area

Scalable Decision Model to Achieve Local and Regional Resilience of Interdependent Critical Infrastructure Systems and Communities (NSF-funded) 2016–2020
- Developed a new mathematical formulation for the recovery modeling and resilience analysis of deteriorating engineering systems
- Implemented the proposed approach for the interdependent recovery of power and transportation infrastructure of Clatsop County, Oregon

Teaching Experience

Stanford University **Adjunct Lecturer**

Disaster Resilience Seminar (CEE 209S) Fall 2022

University of Illinois at Urbana-Champaign **Graduate Teaching Assistant**

Undergraduate course on Systems Engineering and Economics (CEE 201) Fall 2020
Undergraduate course on Engineering risk and uncertainty (CEE 202) Spring 2020
Undergraduate course on Engineering risk and uncertainty (CEE 202) Fall 2019
Undergraduate course on Introduction to Computer Science (CS 101) Fall 2016

Undergraduate course on Introduction to Computer Science (CS 101) Spring 2016
Undergraduate course on Introduction to Computer Science (CS 101) Fall 2015
Undergraduate course on Discrete Mathematics (CS 172) Spring 2015

Professional Service/Experience

Journal Reviewer

Scientific Reports
Probabilistic Engineering Mechanics
Operations Research Forum
Reliability Engineering & System Safety
Structure and Infrastructure Engineering
Sustainable and Resilient Infrastructure
Journal of Infrastructure Systems

Conference Organization

ASCE UCLA Lifelines 2022 Conference February 2022
- Co-chair for two sessions on Risk and Resilience of Interdependent Infrastructure

AXIS Specialty U.S. Services, Inc. **Intern**

Catastrophe risk modeling Fall 2021
- Developed insurance claims datasets to validate models for direct damage and business interruption loss from floods, hurricanes, and wildfires

Farmer's Business Network, Inc. **Data Science Intern**

Credit risk modeling Summer 2019
- Developed a machine learning model to estimate the probability of default on farm loan repayments

Supply chain optimization Summer 2019
- Identified numbers and locations of warehouses for optimal delivery times of farm inputs across the US

Crop insurance Summer 2019
- Developed a novel mathematical formulation for crop insurance pricing

NTPC, Ltd. **Assistant Manager (Construction)**

Power plant construction 2011–2014
- Led the construction of turbine-generator support deck and chimney at Kudgi Super Thermal Power Project (5x800MW with a total project cost of $2.9 billion)

Familiarization to power sector economics 2010–2011
- Received training in finance, contracts, procurement, safety, total quality management, 5S and 6Sigma at Power Management Institute, Noida, India