Exponent®
Engineering & Scientific Consulting

Gitanjali Bhattacharjee, Ph.D.

Associate | Civil and Structural Engineering
New York
+1-212-895-8106 | gbhattacharjee@exponent.com

Professional Profile

Dr. Bhattacharjee specializes in developing probabilistic risk assessment methods and mitigation approaches for complex regional infrastructure networks subject to uncertain hazards. She has worked on seismic, wind, environmental contamination, lightning, avian, and multi-hazard analyses for roads, electric utilities, and underground pipelines.

Dr. Bhattacharjee's expertise includes disaster risk management, uncertainty quantification, statistical analysis, machine learning, and qualitative research methods. She has also worked on projects assessing the cause of damage or collapse of structures following flooding, corrosion and deterioration, and impact.

Prior to joining Exponent, Dr. Bhattacharjee was a research assistant at Stanford University, where she developed network performance-based methods for assessing and mitigating the seismic risk of regional road networks. Her work in that area included using global sensitivity analysis to prioritize bridge retrofits and developing surrogate models to reduce the computational burden of traffic simulation in the context of probabilistic risk assessment. She also contributed to refinements in the metrics with which post-earthquake road network disruptions are characterized. While at Stanford, Dr. Bhattacharjee also led a research project that aimed to inform the design of post-earthquake building damage information products by studying how earthquake responders make use of such information following a damaging earthquake.

Dr. Bhattacharjee’s ongoing research efforts include developing refinements to post-earthquake traffic demand modeling that incorporate the effects of business interruptions caused by building damage and developing models that quantify the risk posed by atmospheric pollution to components of electric power networks.

Academic Credentials & Professional Honors

Ph.D., Civil and Environmental Engineering, Stanford University, 2021

M.S., Structural Engineering, Stanford University, 2018

B.A., Architectural Engineering, University of Texas, Austin, 2016

B.A., Liberal Arts (Plan II), University of Texas, Austin, 2016

Shah Fellowship on Catastrophic Risk in Civil and Environmental Engineering, Shah Family Fund at Stanford University, 2020

Graduate Voice and Influence Fellowship, The Clayman Institute for Gender Research at Stanford

University, 2018

NSF Graduate Research Fellowship, 2016-2019

Happold Student Scholarship, Happold Foundation, 2016

Lillian C. Ho Endowed Presidential Scholarship, The University of Texas at Austin, 2015

Virginia & Ernest Cockrell, Jr. Scholarship in Engineering, The University of Texas at Austin, 2011-2014

Prior Experience

Copy Editor, Annals of Clinical & Laboratory Science, 2011-2016

Professional Affiliations

Member, Earthquake Engineering Research Institute (EERI)

Member, American Society of Civil Engineers (ASCE)

Member, Society for Risk Analysis (SRA)

Member, Structural Engineers Association of New York (SEAoNY)

Publications

Bhattacharjee, G., and Baker, J. W. (2023). "Using global variance-based sensitivity analysis to prioritise bridge retrofits in a regional road network subject to seismic hazard." Structure and Infrastructure Engineering, 19(2), 164–177.

Silva-Lopez R, Bhattacharjee G, Poulos A, Baker JW. 2022. Commuter welfare-based probabilistic seismic risk assessment of regional road networks. Reliability Engineering and System Safety (in press). DOI: 10.1016/j.ress.2022.108730.

Bhattacharjee G, Baker JW. More efficient bridge seismic retrofit prioritization using surrogate model-based sensitivity analysis. Proceedings of the 12th National Conference in Earthquake Engineering, Earthquake Engineering Research Institute, Salt Lake City, UT, 2022.

Bhattacharjee G, Baker JW. Using global variance-based sensitivity analysis to prioritize bridge retrofits in a regional road network subject to seismic hazard. Proceedings of the ASCE Lifelines 2021-2022 Conference, Los Angeles, CA. 2022.

Bhattacharjee G, Baker JW. 2021. Using global variance-based sensitivity analysis to prioritise bridge retrofits in a regional road network subject to seismic hazard. Structure and Infrastructure Engineering (in press). DOI: 10.1080/15732479.2021.1931892.

Bhattacharjee G, Soden R, Barns K, Loos S, Lallemant D. 2021. Factors affecting earthquake responders' building damage information needs and use. Earthquake Spectra, 38(1), 56-80. DOI: 10.1177/87552930211030297.

Bhattacharjee G, Barns K, Loos S, Lallemant D, Deierlein G, Kiremidjian A, Soden R. Developing a user-centric understanding of post-disaster building damage information needs. Proceedings of the 11th National Conference in Earthquake Engineering, Earthquake Engineering Research Institute, Los Angeles, CA, 2018.

Loos S, Barns K, Bhattacharjee G, Soden R, Herfort B, Eckle M, Giovando C, Girardot B, Deierlein G, Kiremidjian A, Baker JW, Lallemant D. 2018. The Development and Uses of Crowdsourced Building Damage Information based on Remote-Sensing (Blume Earthquake Engineering Center Technical Report 197).

Loos S, Barns K, Bhattacharjee G, Soden R, Herfort B, Eckle M, Giovando C, Girardot B, Saito K, Kiremidjian A, Baker JW, Lallemant D. Crowd-sourced remote assessments of regional-scale post-disaster damage. Proceedings of the 11th National Conference in Earthquake Engineering, Earthquake Engineering Research Institute, Los Angeles, CA, 2018.

Kim A, Jackson D, Lotto G, Ely G, Bhattacharjee G, O'Sullivan J, Stein R, Sevilgen S, Sevilgen V. Rapid and seamless earthquake information to inspire individuals to recognize risk. Proceedings of the 11th National Conference in Earthquake Engineering, Earthquake Engineering Research Institute, Los Angeles, CA, 2018.

Lallemant D, Soden R, Rubinyi S, Loos S, Barns K, Bhattacharjee G. 2017. Post-disaster damage assessments as catalysts for recovery: A look at assessments conducted in the wake of the 2015 earthquake in Nepal. Earthquake Spectra. 33(S1), S435-S451. DOI: 10.1193/120316eqs222m

Ghouri, YA, Mian, IM, Bhattacharjee, G, and Bhattacharjee, M. 2015. Hydropic Gallbladder in Three Patients with Poorly Controlled Diabetes Mellitus: What Constitutes Optimal Management? Journal of the Pancreas, 16(3), 290-94. Print.

Presentations

Bhattacharjee, G and Yan, S. Identifying overhead hardware wear with engineering principles and ML. T&D World Live. Sacramento, CA. September 13, 2023.

Bhattacharjee, G. Modeling threats to assets in infrastructure networks. NYU Center for Urban Science and Progress, Data Analytics of Urban Systems Failures. June 29, 2023.

Bhattacharjee, G. Probabilistic seismic risk assessment and mitigation in regional road networks. Columbia University Department of Civil Engineering and Engineering Mechanics, CIEN E4011 Big Data in Transportation. April 5, 2023.

Bhattacharjee, G. Performance and failure of electric utility structures and components. Columbia University Department of Civil Engineering and Engineering Mechanics, CIEN E4210 Forensic Structural Engineering. November 1, 2022.

Bhattacharjee, G. More efficient bridge seismic retrofit prioritization using surrogate model-based sensitivity analysis. 12th National Conference on Earthquake Engineering. Salt Lake City, UT. June 30, 2022.

Bhattacharjee, G. Making decisions under uncertainty. 2022 Women in Science Symposium, Colorado State University. April 21, 2022.

Bhattacharjee G. Shake, Rattle, and Roll: Deciding which Bay Area bridges to buck up against earthquakes. Hard Earth seminar series, CEE 126Z/EARTH 126Z. Stanford University, Stanford, CA, 2020.

Bhattacharjee G, Soden R, Barns K, Loos S, Lallemant D. Developing a task-centric understanding of responders' post-earthquake building damage information needs and use. United States Geological Survey Earthquake Science Center Seminar, Menlo Park, CA, 2019.

Bhattacharjee G, Silva-Lopez R, Baker JW. Modeling Bay Area Transport Network Resilience. Pacific Earthquake Engineering Research Center Researchers' Workshop, Richmond, CA, 2018.

Project Experience

Quantitative Risk Analysis

Avian electrocution: Developed a probabilistic method for assessing the risk of avian electrocution at overhead transmission lines and support structures, accounting for avian anatomy. Applied said method to quantify the effectiveness of mitigation measures, such as increases in phase spacing and the installation of bird guards, for reducing the risk of wildfire ignitions due to avian electrocution.

Arc faulting: Developed and implemented in Python a probabilistic, site-specific method for computing the rate of pipe coating and wall damage due to lightning- and fault-initiated subsoil arcs between transmission towers or poles and nearby buried pipelines.

Conductor clashing: Implemented in Python a method for quantifying the risk of arcing or contact between adjacent conductors in transition spans during high winds.

Conductor creep: Developed a method for predicting the creep experienced by overhead conductors during their service lives, using historical environmental and line-loading data to account for periods of high wind and elevated conductor temperature that would accelerate creep. Implemented said method – including sag-tension calculations – in Python to predict the current sag in overhead lines throughout the service territory of a large utility company.

Contamination-induced insulator flashover: Developed and implemented in Python a probabilistic, site-specific framework for assessing the seasonal risk of contamination-induced insulator flashover, based on historical environmental data. Applied model throughout the service territory of a large utility company. Adapted framework to enable real-time daily monitoring of flashover risk since last major rainfall.

Pipeline buoyancy: Led the development of a framework for assessing the site-specific risk of natural gas pipeline failures due to buoyancy at water crossings.

Wear at cold-end hardware connections: Helped to develop and implemented in Python a site-specific first-principles method for estimating the lifetime depth of wear at metal-on-metal cold-end hardware connections – such as hanger plates, C-hooks, and Y-clevises – due to buffeting in turbulent wind. Applied model throughout the service territory of a large utility company. Advised on the incorporation of first-principles model outputs into a machine learning model for predicting wear to prioritize inspections.

Wildfire impacts on buried pipelines: Implemented a method for estimating the temperature at the surface of a buried pipeline when exposed to a wildfire. Developed a framework for estimating the rate of buried pipeline damage due to wildfire.

Failure and Damage Investigations

Stuck truck: Investigated the cause of failure of a lintel at the entrance of a fully enclosed loading dock at an industrial facility, which collapsed onto a semi-trailer pulled by a tractor truck as the truck exited one loading bay.

Commercial parking garage condition assessment: Assisted in the evaluation of an eight-level parking garage’s structural safety and stability in light of observed reinforced concrete deterioration.

Asset Management

Obsolescence management: Developed metrics, visualizations, and a dashboard with real-time and projected future component obsolescence information to support obsolescence management efforts for programmable logic controllers in a large utility company’s gas transmission system.

Peer Reviews

International Journal of Disaster Risk Reduction

Earthquake Spectra