Yanlin Guo

Personal Data:

Gender:	Female
Address:	Department of Civil and Environmental Engineering Colorado State University 1372 Campus Delivery Fort Collins, Colorado 80523-1372
Phone:	970-491-3518
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Research Interests:

Wind engineering, data-driven wind simulation, hurricane effects on community resilience, structural health monitoring (SHM) based resilient infrastructure system, system identification, structural dynamics, and signal processing

Education Background:

08/10-08/15 Ph.D. in Structural Engineering
University of Notre Dame, Notre Dame, Indiana, USA
Advisor: Dr. Ahsan Kareem

11/07-07/10 M.Phil. in Civil Engineering
Hong Kong Polytechnic University, Hong Kong
Advisor: Dr. Yi-Qing Ni

08/03-06/07 B.Eng. in Transportation Engineering
Southeast University, Nanjing, China

Research Experience:

08/18-now Assistant Professor
Colorado State University, Fort Collins, CO, USA
- Develop advanced tools for modeling/simulation of extreme winds and wind effects on structures
- Develop data analysis tools for structural health monitoring and unmanned aerial vehicles (UAVs)-based remote sensing
- Analyze community resilience under natural hazards

08/16-08/18 Research Scientist
Colorado State University, Fort Collins, CO, USA
- Research on resilience of buildings subjected to natural hazards
- Develop stochastic wind simulation techniques
- Develop physical models for tall building envelope damage under hurricanes
- Develop an efficient and cost-effective bridge inspection system using unmanned aerial vehicles (UAVs)

08/15-08/16 Postdoctoral Research Associate

University of Notre Dame, Notre Dame, Indiana, USA
- Studied the feasibility and benefits of ultra-tall concrete wind turbine towers
- Developed a proposal for an external funding agency

08/10-07/15 Research Assistant
University of Notre Dame, Notre Dame, Indiana, USA
- Developed a non-stationary system identification (SI) technique using time-frequency blind source separation to handle colored excitation
- Developed a non-stationary SI technique using wavelet transform, transformed singular value decomposition, and Laplace wavelet to handle transient data
- Developed a non-stationary SI framework using time-varying spectra of wavelet transform or short time Fourier transform to track time-varying system properties
- Developed a real-time hybrid framework for performance assessment of tall buildings under both normal and transient loading conditions
- Applied the developed real-time hybrid framework to the world's tallest building-Burj Khalifa through a web-enabled approach

11/07-07/10 Research Assistant
Hong Kong Polytechnic University, Hong Kong
- Developed sensor placement optimization methods for bridge damage detection
- Developed Hilbert-Huang transform based procedures for ship-bridge collision accident alarming and condition/damage assessment of the collided bridges

01/08-02/08 Research Assistant
PolyU Technology and Consultancy Co. Ltd., Hong Kong
- Cooperated in an independent structural appraisal of a cable-stayed bridge in Vietnam

09/05-09/06 Undergraduate Researcher
Southeast University, Nanjing, China
- Team leader, wrote a successful proposal to get funding from Student Research Training Project
- Studied how to effectively use time-space resources at crossings of urban roads

Honors, Awards and Fellowships:

- 2019, Best Journal Paper Award in the Structural Hazards category in Journal of Structural Engineering, ASCE, Reston, Virginia, for the peer-reviewed paper titled "Generalized wind loading chain: time-frequency modeling framework for nonstationary wind effect on structures".
- 2017, One of the Three Annual Best Journal Papers (honorably mentioned), American Association for Wind Engineering (AAWE), Gainesville, Florida, for the peer-reviewed paper titled "Non-stationary frequency domain system identification using time–frequency representations" published in Mechanical Systems and Signal Processing.
- 2015, ND Energy Postdoctoral Fellowship, University of Notre Dame, South Bend, Indiana.
- 2014, Finalist of Dynamics Committee Student Paper Competition, ASCE EMI, Hamilton, Ontario, Canada.
- 2014, GSU Conference Presentation Grant, University of Notre Dame, South Bend, Indiana.

- 2013, GSU Conference Presentation Grant, University of Notre Dame, South Bend, Indiana.
- 2013, Finalist of Structural Health Monitoring & Control Committee Student Paper Competition, ASCE EMI, Evanston, Illinois.
- 2013, Professional Development Award, University of Notre Dame, South Bend, Indiana.
- 2011, Professional Development Award, University of Notre Dame, South Bend, Indiana.
- 2007, Honor of "Excellent College Graduate", Southeast University, Nanjing, China.
- 2006, Prize for Outstanding Student Research Project, Southeast University, Nanjing, China.
- 2005, Honor of "Advanced Student", Southeast University, Nanjing, China.
- 2004, Honor of "Three Good Student", Southeast University, Nanjing, China.

Journal Publications:

* Graduate student author with Guo as primary advisor
[+] Visiting graduate student author advised by Guo
[#] Corresponding author

1. Perry, B.*, Guo, Y. [#], and Atadero, R. (2024), "Non-contact dynamic three-component (3C) displacement measurement with a dual-stereo vision enabled uncrewed aerial system (UAS)", *Journal of Engineering Mechanics (ASCE)*, Accepted. Impact factor: 3.125.
2. Perry, B.*, Heyliger, P.R., Guo, Y. [#], and Alkharisi, M.K. (2023), "Unmanned aerial system (UAS)-based portable sensing for blast-loaded cables", *Journal of Structural Engineering (ASCE)*, In-press. Impact factor: 3.858.
3. Dong, Y.*, Guo, Y. [#], and van de Lindt, J.W. (2023), "Fragility modeling of urban building envelopes subjected to windborne debris hazard", *Journal of Structural Engineering (ASCE)*, 149, 04023041. Impact factor: 3.858.
4. Dong, Y.* [#], Guo, Y., Ellingwood, B.R., Mahmoud, H.N. (2022), "De-aggregation of wind speeds for hurricane scenarios used in risk-informed resilience assessment of coastal communities", *Journal of Structural Engineering (ASCE)*, 148, 04022175. Impact factor: 3.858.
5. Perry, B.J.*, Guo, Y. [#], and Mahmoud, H.N. (2022), "Automated site-specific assessment of steel structures through integrating machine learning and fracture mechanics", *Automation in Construction*, 133, 104022. Impact factor: 10.3.
6. Perry, B.J.*, and Guo, Y. [#] (2021), "A portable three-component displacement measurement technique using an unmanned aerial vehicle (UAV) and computer vision: a proof of concept", *Measurement*, 176, 109222. Impact factor: 5.6.
7. Adhikari, P., Abdelhafez, M, Dong, Y.*, Guo, Y., Mahmoud, H.N., and Ellingwood, B.R. [#] (2021), "Achieving residential coastal communities resilient to tropical cyclones and climate change", *Frontiers in Built Environment*, 6, 1-18. Impact factor: 3.0.
8. Wang, C.[+], Zhang, H.[#], Ellingwood, B.R., Guo, Y., Mahmoud, H., and Li. Q. (2020), "Assessing post-hazard damage costs to a community's residential buildings exposed to tropical cyclones", *Structure and Infrastructure Engineering*, 1845215, 1-11. Impact factor: 3.7.
9. Perry, B.*, Guo, Y. [#], Atadero, R., and van de Lindt, J.W. (2020), "Streamlined bridge inspection system using unmanned aerial vehicles (UAVs) and machine learning techniques", *Measurement*, 164, 108048. Impact factor: 5.6.

10. Guo, Y.[#], Wang, L., and Kareem, A. (2020), "Interpolation of discrete time histories", *Journal of Engineering Mechanics (ASCE)*, 146, 06020002. Impact factor: 3.125.
11. Sabharwal, C. L., and Guo, Y.[#] (2019), "Tracking the 6-DOF flight trajectory of windborne debris using stereophotogrammetry", *Infrastructures*, 4, 66. Impact factor: 2.6.
12. Guo, Y.[#], and van de Lindt, J.W. (2019), "Simulation of hurricane wind fields for community resilience applications: a data-driven approach using integrated asymmetric Holland models for inner and outer core regions", *Journal of Structural Engineering (ASCE)*, 145, 04019089. Impact factor: 3.858.
13. Kareem, A., Hu, L.[#], Guo, Y., and Kwon, D.K. (2019), "Generalized wind loading chain: time-frequency modeling framework for nonstationary wind effects on structures", *Journal of Structural Engineering (ASCE)*, 145, 04019092. Impact factor: 3.858.
14. Guo, Y.L.[#], Ni, Y.Q., and Chen, S.K. (2017), "Optimal sensor placement for damage detection of bridges subject to ship collision"*, Structural Control and Health Monitoring*, 24, 1-16. Impact factor: 6.058.
15. Guo, Y.[#], and Kareem, A. (2016a), "Non-stationary frequency domain system identification using time–frequency representations", *Mechanical Systems and Signal Processing*, 72-73, 712-726. Impact factor: 8.4.
16. Guo, Y.[#], and Kareem, A. (2016b), "System identification through nonstationary data using time–frequency blind source separation", *Journal of Sound and Vibration*, 371, 110-131. Impact factor: 4.7.
17. Guo, Y.[#], Kwon, D.K., and Kareem, A. (2016), "Near-real-time hybrid system identification framework for civil structures with application to Burj Khalifa", *Journal of Structural Engineering (ASCE)*, 142, 04015132. Impact factor: 3.858.
18. Guo, Y.[#], and Kareem, A. (2015), "System identification through nonstationary response: a wavelet and transformed singular value decomposition based approach", *Journal of Engineering Mechanics (ASCE)*, 141, 04015013. Impact factor: 3.125.
19. Spence, S.M.J.[#], Bernardini, E., Guo, Y., Kareem, A., and Gioffrè, M. (2014), "Natural frequency coalescing and amplitude dependent damping in the wind-excited response of tall buildings", *Probabilistic Engineering Mechanics*, 35, 108-117. Impact factor: 2.6.
20. Kijewski-Correa, T., Kareem, A.[#], Guo, Y., Bashor, R., and Weigand, T. (2013a), "Performance of tall buildings in urban zones: lessons learned from a decade of full-scale monitoring", *International Journal of High-Rise Buildings*, 2, 179-192. Impact factor: 0.6.
21. Kijewski-Correa, T.[#], Kwon, D.K., Kareem, A., Bentz, A., Guo, Y., Bobby, S., and Abdelrazaq, A. (2013b), "Smartsync: an integrated real-time structural health monitoring and structural identification system for tall buildings", *Journal of Structural Engineering (ASCE)*, 139, 1675-1687. Impact factor: 3.858.
22. Guo, Y.[#], Kareem, A., Ni, Y.Q., and Liao, W.Y. (2012), "Performance evaluation of Canton Tower under winds based on full-scale data", *Journal of Wind Engineering and Industrial Aerodynamics*, 104-106, 116-128. Impact factor: 4.8.

In Review or In Re-review*:*

1. Rakoczy, A. M.[#], Ribeiro, D., Hoskere, V., Narazaki, Y., Olaszek, P., Karwowski, W., Cabral, R., Guo, Y., Futai, M. M., Milillo, P., Santos, R., Trias, A., Gonzalez, L., Matos, J. C., and Schmidt, F. (2023), "Technologies and platforms for remote and autonomous bridge inspection - review", *Structural Engineering International (International Association for*

Bridge and Structural Engineering (IABSE)), In Review.

2. Perry, B.*, and Guo, Y. # (2024), "Generating finite element (FE) model of bridges from uncrewed aerial system (UAS)-collected images using artificial intelligence", *Automation in Construction*, In Review.

***Under Advanced Preparation for Submittal**:*

1. Dong, Y.*, and Guo, Y. # "Data-driven modeling of urban wind field using deep learning approach", *Journal of Industrial Aerodynamics and Wind Engineering*, (To be submitted in March 2024).
2. Guo, Y. # Fatehi, S.P.*, and Ni, Yi-Qing, "Ship-bridge collision accident alarming and ship-collided bridge condition assessment using HHT based approaches", *Sensors*, (To be submitted in September 2024).

Conference Papers and Presentations:

* Graduate student author with Guo as primary advisor

1. Dong, Y.*, Li, S., Anarak, K.Y.*, Catarelli, R.A., Guo, Y., Gurley, K.R. and van de Lindt, J.W. (2023). "Modeling windborne debris flight trajectory in urban communities", *The 16th International Conference on Wind Engineering,* August 27-31, 2023, Florence, Italy (oral presentation).
2. Dong, Y.*, and Guo, Y. (2023). "Data-driven modeling of urban wind field using conditional generative adversarial networks", *Engineering Mechanics Institute Conference 2023,* June 6-9, 2023, Atlanta, Georgia, USA (oral presentation).
3. Li, S., Dong, Y.*, Anarak, K.Y.*, Catarelli, R.A., Guo, Y., Gurley, K.R. and van de Lindt, J.W. (2023). "Impact of tall building cluster layout on urban wind field and debris flight trajectory", *Engineering Mechanics Institute Conference 2023,* June 6-9, 2023, Atlanta, Georgia, USA (oral presentation).
4. Guo, Y., Wu, T., Elsworth, J., Fatehi, S.P.*, and Dana, S. (2023). "Enhancing hardening and resilience of solar trackers under strong winds", *2023 Photovoltaic Reliability Workshop,* February 28-March 2, 2023, Lakewood, Colorado, USA (poster presentation).
5. Dong, Y.*, Guo, Y., and van de Lindt, J.W. (2022). "Modeling of fragility of urban building envelopes subjected to windborne debris impact", *2022 SimCenter Symposium*, November 3-4, 2022, Austin, TX (oral presentation).
6. Dong, Y.*, Guo, Y., Ellingwood, B.R., and Mahmoud, H.N. (2022). "Selection of hurricane scenarios for assessing resilience of coastal communities", *14th Americas Conference on Wind Engineering*, May 17-19, 2022, Lubbock, TX (oral presentation).
7. Guo, Y. (2022). "From full-scale monitoring to digital twins and beyond: Scholarship development inspired by Dr. Kareem's vision", *Engineering Mechanics Institute Conference 2022*, May 31-June 3, 2022, Baltimore, Maryland, USA (oral presentation).
8. Perry, B.*, Guo, Y., Atadero, R. (2022). "Measurements of the 3-Component (3C) Dynamic Displacements of Full-Scale Structures Using an Unmanned Aerial System (UAS)", *Engineering Mechanics Institute Conference 2022,* May 31-June 3, 2022, Baltimore, Maryland, USA. (conference paper and oral presentation)
9. Perry, B.*, Guo, Y., Atadero, R. (2022). "Measurement of 3 component displacement of full-scale structures using an unmanned aerial system (UAS)", *11th International Conference on Bridge Maintenance, Safety and Management,* July 11-15, 2022, Barcelona,

SP (presentation). (conference paper and oral presentation)

10. Guo, Y., and van de Lindt, J. W. (2021). "Data-driven simulation of asymmetric hurricane wind fields for community resilience planning", *The 6th American Association for Wind Engineering Workshop*, May 12-14, 2021, Clemson, SC, USA, Virtual Event (oral presentation).
11. Perry, B.*, Guo, Y., Atadero, R., and van de Lindt, J.W. (2021). "Tracking bridge condition over time using recurrent unmanned aerial vehicle (UAV)-based inspection", *Bridge Maintenance, Safety, Management, Life-Cycle Sustainability and Innovations (Proceedings of the 10th International Conference on Bridge Maintenance, Safety and Management)*, April 11-April 18, 2021, Virtual Event. (conference paper and oral presentation)
12. Perry, B.*, and Guo, Y. (2021). "Measuring traffic-induced loads and 3D bridge displacements with UAVs", *Bridge Maintenance, Safety, Management, Life-Cycle Sustainability and Innovations (Proceedings of the 10th International Conference on Bridge Maintenance, Safety and Management)*, April 11-April 18, 2021, Virtual Event. (conference paper and oral presentation)
13. Perry, B.*, Guo, Y., Atadero, R., and van de Lindt, J.W. (2021). "Unmanned aerial vehicle (UAV)-enabled bridge inspection framework", *Bridge Maintenance, Safety, Management, Life-Cycle Sustainability and Innovations (Proceedings of the 10th International Conference on Bridge Maintenance, Safety and Management)*, April 11-April 18, 2021, Virtual Event. (conference paper and oral presentation)
14. Adhikari, P., Abdelhafez, M., Dong, Y.*, Guo, Y., Mahmoud, H.N., and Ellingwood, B.R. (2021). "Achieving residential coastal communities resilient to tropical storm", *Engineering Mechanics Institute Conference 2021 and Probabilistic Mechanics & Reliability Conference 2021*, May 25-28, 2021, New York, NY, USA, Virtual Event (oral presentation).
15. Dong, Y.*, Guo, Y., and van de Lindt, J.W. (2021). "Fragility model of tall buildings due to windborne debris under hurricanes", *Engineering Mechanics Institute Conference 2021 and Probabilistic Mechanics & Reliability Conference 2021*, May 25-28, 2021, New York, NY, USA, Virtual Event (oral presentation).
16. Guo, Y., and van de Lindt, J.W. (2019). "Data-driven simulation of hurricane wind field", *The 15th International Conference on Wind Engineering*, September 1-6, 2019, Beijing, China. (conference paper)
17. Perry, B.*, and Guo, Y. (2019). "Unmanned aerial vehicle (UAV) enabled building information modeling for bridge inspection", *The 9th international conference on structural health monitoring of intelligent infrastructure*, August 4-7, 2019, St. Louis, Missouri, USA. (conference paper and oral presentation)
18. Dong, Y.*, and Guo, Y. (2019). "System identification for time-varying systems under non-white excitations", *The 13th International Conference on Applications of Statistics and Probability in Civil Engineering*, ICASP13, May 26-30, 2019, Seoul, South Korea. (conference paper)
19. Dong, Y.*, and Guo, Y. (2019). "A time-frequency domain approach for identification of non-stationary systems under non-white wind excitations", *Engineering Mechanics Institute Conference 2019*, June 18-21, 2019, Pasadena, CA, USA. (conference paper and oral presentation)
20. Perry, B.*, and Guo, Y. (2019). "A streamlined bridge inspection system utilizing

unmanned aerial vehicles (UAVs)", *The Transportation Research Board* (*TRB*) 98th *Annual Meeting*, January 13-17, 2019, Washington, D.C., USA. (conference paper and oral presentation)

21. Guo, Y., and van de Lindt, J.W. (2017). "Data-driven simulation of hurricane wind field based on an asymmetric Holland model", *The National Institute of Standards and Technology Center of Excellence Semi-Annual Meeting*, November 2-3, 2017, Gaithersburg, MD, USA (oral presentation).
22. Guo, Y., and van de Lindt, J.W. (2017). "Fragility model for hurricane-induced damage to tall building clusters with application to urban resilience analysis", *The 13th Americas Conference on Wind Engineering*, May 21 - 24, 2017, Gainesville, Florida, USA (oral presentation).
23. Kareem, A., Guo, Y., and Hu, L. (2017). "Generalized wind loading chain: a time-frequency perspective", *The 13th Americas Conference on Wind Engineering*, May 21 - 24, 2017, Gainesville, Florida, USA (oral presentation).
24. Kareem, A., Guo, Y., Hu, L., and Kwon, D. K. (2016). "A transition from time or frequency domain to time-frequency domain for estimating non-synoptic wind load effects", *Proceedings of the 14th International Symposium on Structural Engineering*, Oct. 12-15, 2016, Beijing, China. (conference paper and oral presentation)
25. Guo, Y., Fang, Y., Ding, F., Kurama, Y., and Kareem, A. (2016). "Aerodynamic shape tailoring of ultra-tall wind turbine towers", *Proceedings of the 8th International Colloquium on Bluff Body Aerodynamics and Applications*, June 7-11, 2016, Boston, USA. (conference paper and oral presentation)
26. Kareem, A., Guo, Y., and Hu, L. (2016). "Time-frequency domain modeling framework for non-stationary aerodynamic load effects", *Proceedings of the 8th International Colloquium on Bluff Body Aerodynamics and Applications*, June 7-11, 2016, Boston, USA. (conference paper and oral presentation)
27. Guo, Y., Kwon, D. K., and Kareem, A. (2015). "Real-time structural health monitoring under stationary and transient winds", *Proceedings of the 14th International Conference on Wind Engineering*, June 21-26, 2015, Porto Alegre, Brazil. (conference paper and oral presentation)
28. Gibbs, M., Guo, Y., and Kareem, A. (2015). "Performance evaluation of wind-sensitive footbridges", *Proceedings of the 14th International Conference on Wind Engineering*, June 21-26, 2015, Porto Alegre, Brazil. (conference paper and oral presentation)
29. Guo, Y., and Kareem, A. (2014), "Non-stationary system identification based on instantaneous or marginal spectra of time-frequency transforms", *Conference of the ASCE Engineering Mechanics Institute*, Hamilton, ON, Canada, August 5-8, 2014 (oral presentation).
30. Guo, Y., and Kareem, A. (2013a), "System identification from non-stationary data: blind source separation and time-frequency approaches", *Proceedings of the 11th International Conference on Structural Safety & Reliability*, New York, NY, USA, June 16-20, 2013. (conference paper and oral presentation)
31. Guo, Y. , and Kareem, A. (2013b), "System identification of nonstationary data: a wavelet and transformed singular value decomposition based approach", *Conference of the ASCE Engineering Mechanics Institute*, Evanston, IL, USA, August 4-7, 2013 (oral presentation).

32. Guo, Y., and Kareem, A. (2012), "System identification using nonstationary data", *Joint Conference of the Engineering Mechanics Institute and the 11th ASCE Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability*, Notre Dame, IN, USA, June 18-20, 2012 (oral presentation).
33. Guo, Y., Ni, Y.Q., and Kareem, A. (2011), "Performance evaluation of the Guangzhou New TV Tower under winds based on full-scale monitoring data", *Proceedings of the 13th International Conference on Wind Engineering*, July 10-15, 2011, Amsterdam, The Netherlands. (conference paper and oral presentation)
34. Zhou, H.F., Ni, Y.Q., Guo, Y., and Ko, J.M. (2010), "Performance assessment of Jiangyin Bridge using long-term structural health monitoring data", *Bridge Maintenance, Safety, Management and Life-Cycle Optimization,* D.M. Frangopol, R. Sause, and C.S. Kusko (eds.), Taylor & Francis, London, UK, 2962-2971 (CD-ROM) (*Proceedings of the 5th International Conference on Bridge Maintenance, Safety and Management*, July 11-15, 2010, Philadelphia, Pennsylvanian, USA). (conference paper and oral presentation)
35. Guo, Y., Ni, Y.Q., and Chen, S.K. (2009), "Sensor placement optimization for damage evaluation of bridges subject to ship collision", *Proceedings of the International Postgraduate Conference on Infrastructure and Environment*, June 5-6, 2009, Hong Kong. (conference paper and oral presentation)
36. Guo, Y., Ni, Y.Q., Zhou, H.F., and Chen, S.K. (2009), "Condition assessment of post-ship-collision bridges using HHT analysis", *Proceedings of the 5th International Workshop on Advanced Smart Materials and Smart Structures Technology*, M.L. Wang, B.F. Spencer, Jr., and Y. Cao (eds.), Techno-Press, Daejeon, Korea, 57-64 (July 29-31, 2009, Boston, *Massachusetts*, USA). (conference paper and oral presentation)
37. Guo, Y., Ni, Y.Q., and Ko, J.M. (2009), "Optimal sensor placement on cables of cable-stayed bridges for structural damage detection", *Structural Health Monitoring 2009: From System Integration to Autonomous Systems,* F.-K. Chang (ed.), DEStech Publications, Lancaster, Pennsylvania, USA, 2131-2138 (*Proceedings of the 7th International Workshop on Structural Health Monitoring*, September 9-11, 2009, Stanford, California, USA). (conference paper and oral presentation)
38. Guo, Y., Ni, Y.Q., Chen, S.K., and Zhou, H.F. (2009), "Optimal sensor layout for bridges subject to ship collision", *Proceedings of the 33rd IABSE Symposium on Sustainable Infrastructure: Environment Friendly, Safe and Resource Efficient*, September 9-11, 2009, Bangkok, Thailand. (conference paper and oral presentation)

Technical Reports:

1. Perry, B., Guo, Y., Atadero, R., and van de Lindt, J.W. (2022), "A Streamlined Bridge Inspection Framework Utilizing Unmanned Aerial Vehicles (UAVs)", Mountain-Plains Consortium, MPC 21-443, pp. 1-49.
2. Roueche, D., Cleary, J., Barnes, R., Davis, B., Marshall, J., Rittelmeyer, B., Smallegan, S., Guo, Y., Hodges, C., Kijewski-Correa, T., Salman, A., Turner, K., Merschman, E., Mulchandani, H., Prevatt, D., Robertson, I., Mosalam, K. (2019), "3 March 2019 Tornadoes In The Southeastern US: Field Assessment Team Early Access Reconnaissance Report (EARR)", DesignSafe-CI, pp. 1-52.

Invited Lectures and Panel Discussions:

1. May 11, 2022 "A streamlined bridge inspection system using unmanned aerial system (UAS) and artificial intelligence (AI)." Alaska Unmanned Aircraft Systems (UAS) Workshop, Alaska, USA. Webinar
2. July 28, 2021 "Tapping the potential of aerial robots and artificial intelligence (AI) to advance infrastructure inspection," Pennsylvania Unmanned Aerial Systems (UAS) Workshop, Pennsylvania, USA. Webinar.
3. July 1, 2021 "RT4: SHM enhanced by machine learning and artificial intelligence," The 10th International Conference on Structural Health Monitoring of Intelligent Infrastructure, Porto, Portugal. Panel discussion. Co-Panelists: Ye, X.W., Li, J., Wu, T., Li, S.L., Huang, Y. and Wu. S.
4. May 13, 2021 "Unlock the power of the unmanned aerial system (UAS)-based infrastructure inspection by artificial intelligence and computer vision," Puerto Rico & US Virgin Islands UAS Workshop: Innovative Applications in Transportation Infrastructure using Unmanned Aerial Systems, Puerto Rico, USA. Webinar
5. November 5, 2020 "Unlock the power of the unmanned aerial system (UAS)-based infrastructure inspection by artificial intelligence (AI)," FHWA EDC-5 UAS Webinar #5: Advancing UAS for Structural Inspections, virtual event. Webinar https://www.fhwa.dot.gov/uas/webinars.cfm

Conference Sessions/Mini-Symposia Organized:

1. 2022 Co-Organizer for "Mini-symposium: AI Applications for Wind Engineering" in ASCE Engineering Mechanics Institute Conference 2022, Johns Hopkins University, Baltimore, Maryland. Co-Organizers: T. Wu, G. Hu and X. Deng.
2. 2021 Co-Organizer and Co-Chair for "Mini-symposium: Emerging advances in wind hazard assessment and mitigation" in ASCE Engineering Mechanics Institute Conference 2021, Columbia University, New York. Co-Chair: T. Wu.

Professional Meetings:

1. June 7, 2023 ASCE EMI Dynamics Committee meeting, Atlanta, Georgia, United States.
2. May 18-19, 2023 NIST Computational Wind Engineering Workshop, Reston, Virginia, United States.
3. May 3, 2023 ASCE SEI Methods of Monitoring and Evaluating Structural Performance Committee meeting, New Orleans, Louisiana, United States. Virtual.

4. October 3, 2022 IABSE Task Group 5.9 meeting. Virtual.
5. June 2, 2022 ASCE EMI Dynamics Committee meeting, Baltimore, Maryland, United States. Virtual.
6. May 31, 2022 ASCE EMI Structural Health Monitoring & Control Committee meeting, Baltimore, Maryland, United States. Virtual.
7. April 20, 2022 ASCE SEI Methods of Monitoring and Evaluating Structural Performance Committee meeting, Atlanta, Georgia, United States. Virtual.
8. May 25, 2021 ASCE EMI Structural Health Monitoring & Control Committee meeting. Virtual.
9. May 24, 2021 ASCE EMI Dynamics Committee meeting. Virtual.
10. May 23-24, 2019 Joint University of Florida and University of Washington NSF NHERI Workshop. Gainesville, Florida, United States.

Grants:

Externally-funded projects as PI:

- (2024-2029) "CAREER: Enhancing Hurricane Resistance of Building Exteriors (Envelopes) under Urban Development in a Changing Climate", Guo, Y. (PI), NSF, $542,947.00.
- (2022-2025) "Participant Support: Collaborative Research: Modeling Hurricane-Induced Windborne Debris to Reduce Damage in Urban Communities", Guo, Y. (PI), van de Lindt, J. W. (CoPI), NSF, $16,000.00.
- (2022-2025) "RACER: Enhancing Hardening and Resilience of Solar Trackers under Strong Winds", Guo, Y. (PI), Wu, T. (Co-PI), Elsworth, J. (Co-PI), U.S. Department of Energy, $2,332,541.00.
- (2022-2025) "Collaborative Research: Modeling Hurricane-Induced Windborne Debris to Reduce Damage in Urban Communities", Guo, Y. (PI), van de Lindt, J. W. (CoPI), NSF, $422,122.00.
- (2022-2025) "Participant Support: Collaborative Research: Modeling Hurricane-Induced Windborne Debris to Reduce Damage in Urban Communities", Guo, Y. (PI), van de Lindt, J. W. (CoPI), NSF, $16,000.00.
- (2022-2024) "Non-Contact 3-Component (3C) Displacement Measurements with a Dual-Stereo Vision Enabled Uncrewed Aerial System (UAS)", Guo, Y. (PI), Atadero, R. A. (CoPI), Mountain-Plains Consortium FASTACT, University Transportation Center of the U.S. Department of Transportation, North Dakota State University, $55,000.00.
- (2021-2023) "Development of a New Airborne Portable Sensing System to Investigate Bridge Response", Guo, Y. (PI), Atadero, R. A. (CoPI), Mountain-Plains Consortium FASTACT, University Transportation Center of the U.S. Department of Transportation, North Dakota State University, $60,000.00.
- (2018-2022) "Development of an Autonomous Transportation Infrastructure Inspection System Based on Unmanned Aerial Vehicles (UAV)", Guo, Y. (PI), van de Lindt, J. W.

(CoPI), Atadero, R. A. (CoPI), Mountain-Plains Consortium FASTACT, University Transportation Center of the U.S. Department of Transportation, North Dakota State University, $58,000.00.

- (2017-2022) "Development of Unmanned Aerial Vehicle (UAV) Bridge Inspection Procedures", Guo, Y. (PI), van de Lindt, J. W. (CoPI), Atadero, R. A. (CoPI), Mountain-Plains Consortium FASTACT, University Transportation Center of the U.S. Department of Transportation, North Dakota State University, $57,000.00.

Externally-funded projects as CoPI:

- (2024-2028) "INTACT: Intelligent Tropical-Storm-Resilient System for Coastal Cities", Ni, Y. Q. (PC), Guo, Y. (CoPI), et. al, Hong Kong Research Grants Council (RGC), $4,356,659.34.
- (2020-2025) "Center of Excellence for Risk-Based Community Resilience Planning", van de Lindt, J. W. (Co-Director), Guo, Y. (CoPI), et. al, National Institute of Standards and Technology, $20,000,000.00.
- (2020-2022) "Investigating the Applicability of Multi-Fidelity Modeling to Condition Evaluation of Transportation Infrastructure", Atadero, R. A. (PI), Guo, Y. (CoPI), Mountain-Plains Consortium FASTACT, University Transportation Center of the U.S. Department of Transportation, North Dakota State University, $60,000.00.

Collaborative Research Projects:

1. Enhancing hardening and resilience of solar trackers under strong winds (2023-2026, in collaboration with Dr. T. Wu at University at Buffalo and Mr. J. Elsworth at National Renewable Energy Laboratory (NREL))
   - Developed a successful U.S. Department of Energy proposal
2. Developing intelligent tropical-storm-resilient system for coastal cities (2024-2028, in Collaboration with Dr. Y. Q. Ni at The Hong Kong Polytechnic University and 18 other investigators from three countries)
   - Developed a successful Theme-based Research Scheme (most prestigious research program in Hong Kong) proposal sponsored by The Research Grants Council (RGC) of Hong Kong
3. Using virtual reality (VR) and augmented reality (AR) to improve conceptual learning of invisible physics (2021-2023, in collaboration with Drs. R. Atadero, F. Ortega, M. Rhodes, and H. Hausman)
   - Developed a prototype VR teaching module to be implemented for pilot study of investigating how VR help improve conceptual learning related to bluff body aerodynamics
4. Physics-based modeling of windborne debris damage to urban building envelopes through integrated experimental and computational approaches (2022-2025, in collaboration with Dr. J. W. van de Lindt at The Colorado State University, and Dr. K. Gurley at The University of Florida)
   - Developed a successful NSF proposal
5. Development of unmanned aerial vehicle (UAV) bridge inspection procedures (2017-2019, in collaboration with Dr. R. Atadero and Dr. J. W. van de Lindt at The Colorado State University)
   - Developed a successfully funded MPC proposal

- Developing UAV-based data collection and computer-vision based data processing techniques

6. Study of natural frequency coalescing and amplitude dependent damping (2012-2013, in collaboration with Dr. S.M.J. Spence and Dr. E. Bernardini at The University of Notre Dame)
   - Conducted wavelet analysis to analyze natural frequency coalescing phenomena
   - Co-authored a paper published in *Probabilistic Engineering Mechanics*
7. Chicago full-scale monitoring project (CFSMP) (2012-2013, in collaboration with Dr. T. Kijewski-Correa at The University of Notre Dame)
   - Conducted a comparison study of the measured structural response and wind tunnel prediction
   - Identified structural properties from transient data measured under wind storms
   - Co-authored (*leading student author*) a paper published in *International Journal of High-Rise Buildings*
8. Development of a real-time structural health monitoring and identification system-"Smartsync" for Burj Khalifa (2010-2013, in collaboration with Dr. T. Kijewski-Correa and Dr. D.-K. Kwon at The University of Notre Dame)
   - Developed a clustering scheme to automate the spectra based system identification process
   - Co-authored a paper published in *Journal of Structural Engineering*
9. Evaluation of structural performance of the Guangzhou New TV Tower under winds using structural health monitoring data (2010-2012, in collaboration with Dr. Y.Q. Ni from The Hong Kong Polytechnic University)
   - Analyzed wind properties, and conducted a comparison study of the measured structural response and wind tunnel prediction
   - Identified structural properties using various classical methods and conducted serviceability assessment
   - Co-authored (*1st author*) a paper published in *Journal of Wind Engineering and Industrial Aerodynamics*

Projects of Recent Research:

Fragility model for hurricane-induced damage to tall building clusters with application to urban resilience analysis (2016-2023)

The primary damage to tall buildings after hurricanes is mainly comprised of the non-structural damage to the cladding systems and façade, as well as the water intrusion through the building envelope resulting from that damage. The existing damage assessment models for mid/high-rise buildings often neglect the geometry of building clusters or simply assume a homogeneous configuration for simplification purposes. These simplified approaches likely introduce significant uncertainties for urban tall buildings whose geometries and distributions often vary. In this context, my student, co-worker and I have proposed a new physics-based fragility modeling approach for urban buildings envelopes, which explicitly considers geometric configurations of urban buildings, to improve the accuracy of risk assessment for urban buildings (Dong et al. 2023).

Three-component dynamic displacement measurements with a UAS (2021-2023)

Much of the current research of measuring displacement with a UAS mainly focuses on either the one-component displacement measurement (i.e., depth) or the two-component displacement measurements (i.e., planar to the camera). My student, co-worker and I have proposed new techniques to measure all three components (x-, y- and z-direction) simultaneously while effectively

compensating the translational and rotational motion of UAS (e.g., Perry and Guo 2021, Perry et al. 2022). This work was recognized by ***the Third-place in ASCE EMI Structural Health Monitoring & Control Committee Student Paper Competition*** in 2022.

Stress intensity factor estimation of steel cracks in a computationally efficient manner using images of steel cracks (2021-2022)

My student, co-worker and I have developed a novel technique based on artificial intelligence (AI) and surrogate modeling to establish prediction models of stress intensity factors of steel structures (Perry et al. 2022). The proposed models only take steel crack images and normal stress of a structure as input. This work eliminates the need of a high-fidelity FE model, while providing critical information of crack formation mode and facilitating repair decision-making. This work was recognized by ***the 6th Thornton Tomasetti Student Innovation Fellowship*** in 2021.

Investigation of hurricane impact to buildings and communities considering climate change (2012-2021)

My students, co-workers and I have studied the impact of various hurricane and climate change scenarios on the performance of coastal residential communities (Adhikari et al. 2021, Wang et al. 2020), as well as hurricane wind effects on tall buildings (Guo et al. 2012, Kijewski-Correa et al. 2013a,b).

Streamlined bridge inspection system using UAS (2017-2022)

Recently, the rapid development of commercial unmanned aerial vehicles (UAVs) has made collecting images of bridge conditions trivial. Measuring the damage extent, growth, and location from the collected big image set, however, can be cumbersome. My student, co-workers and I have proposed a streamlined bridge inspection system that offers advanced data analytics tools to automatically: (1) identify type, extent, growth, and 3D location of defects using computer vision and AI techniques; (2) generate a 3D point-cloud model and segment structural elements using machine learning; and (3) establish a georeferenced element-wise as-built bridge information model (Perry et al. 2020). This work was recognized by ***the 28th Annual Outstanding Student of the Year Award by U.S. Department of Transportation (USDOT)*** in 2019.

Generalized wind loading chain (2017-2019)

My co-workers and I have developed a new generalized wind loading chain, which is a paradigm-shifting framework for modeling nonstationary wind effects on structures using evolutionary spectral- and wavelet transform-based approaches and leads to a gust front factor for possible codification (Kareem et al. 2019). This work was recognized by ***Best Journal Paper Award in the Structural Hazards category in Journal of Structural Engineering*** in 2019.

Data-driven simulation of hurricane wind field (2017-2019)

For accurate modeling of the cumulated damage of hurricane events to physical structures in community resilience analysis, the temporally and spatially varying wind field of a hurricane event needs to be estimated. However, wind field measurements from past events may not include the wind field data for every hour/minute, which are needed for carrying out time-dependent analysis. Also, for certain analyses (e.g., synthetic scenario analysis in resilience planning) the hurricane wind field needs to be simulated to model the damage to an arbitrary community of interest. In response to this need, this project proposes a novel data-driven simulation technique to simulate the temporally and spatially varying hurricane wind fields for hindcast and synthetic scenario analysis purpose. Due to its data-driven nature, the proposed technique can simulate realistic hurricane wind fields based on the observations of historical hurricane events. This technique is based on an asymmetric Holland model and has addressed two shortcomings of the existing

Holland-type modes, i.e. the poor representation of wind field for inner core region and inability to model surface wind speed change due to roughness change from water to land. The developed models will be integrated into IN-CORE (a research web portal being developed by NIST center of excellence in resilience planning) as the hurricane wind simulation module.

Projects of Postdoctoral Research:

Feasibility and benefits of ultra-tall wind turbine towers (2015-2016)
Bigger turbines with blades over 60 meters and availability of more wind energy at higher elevations are leading efforts to develop taller turbine supporting towers. Current state of the art is around 80 meters and moving to higher heights will face serious structural issues surrounding excessive vibration and fatigue effects which may lead to operational constraints and ultimate failure of turbine towers. This project proposed to explore new technologies for towers up to 150 meter tall. The feasibility and benefits of ultra-tall wind turbine towers was investigated.

Conditional simulation of non-stationary wind fields (2015-2016)
The direct measurement of wind fields is often restrained by the number of available sensors, difficulty of sensor deployment at inaccessible locations, or partial failure of sensing network. The missing information at unmeasured locations can be recovered through the conditional simulation based on the measured data. This study proposed to use the Kriging method to conditionally simulate the non-stationary wind speeds of a gust-front wind field at arbitrary locations using the limited measurements.

Major Research Accomplishments during Ph.D.:

Identification of time-varying systems using spectra of time-frequency analysis (2014-2015)
Full-scale monitoring has witnessed that structural dynamic properties may change over time due to temperature, aging or extreme loadings. Spectra of wavelet or short time Fourier transform are very popular in tracking time-varying frequencies; however, they have seldom been used to identify the time-varying damping ratio, because a short window required to capture time-varying information amplifies the bandwidth significantly, which may lead to considerably overestimated damping ratios. To solve this problem, this study innovatively adapted theoretical frequency response functions (FRF) of systems for instantaneous or marginal spectra of the wavelet or short time Fourier transform by adding short window effects explicitly. In this way, the response spectra estimated within the short time windows and the adapted FRFs are influenced by the same window, thus the adapted FRFs can be fitted to instantaneous or time-localized marginal spectra of response to identify frequency and damping ratio at each time instant. This method is a breakthrough that allows spectra based system identification (SI) methods to reliably identify damping of time-varying systems under non-stationary excitations.

Real-time performance assessment of tall buildings (2013-2014)
This study proposed a near real-time framework for SI of structures using streaming data from SHM systems. To account for both stationary/weakly non-stationary response under normal conditions (e.g., extra-tropical winds and/or ambient excitations) and transient/highly non-stationary response under transient events (e.g. earthquakes, windstorms or time-varying traffic loadings), a hybrid framework was developed by integrating a new non-stationary SI scheme based on wavelets in tandem with transformed singular value decomposition, and a robust stationary SI scheme called covariance-driven stochastic subspace identification. To enable expeditious and

convenient utilization of this framework in the world's tallest building, Burj Khalifa, a web-enabled approach was proposed to facilitate automated hybrid SI in near real-time as an "Internet of Things" (IoT). It is anticipated that the proposed framework in the context of the IoT has the potential of being well-suited for SHM systems to meet the demand of quick near real-time structural performance assessment involving minimal human intervention.

Non-stationary SI based on wavelets and transformed singular value decomposition (2012-2014)

Traditional SI methods may not be reliable (especially for damping estimation) from transient response measured under earthquakes, windstorms, or time-varying traffic loadings, due to a lack of long segments of stationary data. In this project, a new nonstationary SI scheme based on continuous Morlet wavelet transform, transformed singular value decomposition and Laplace wavelet filtering (WT-TSVD-Laplace) was proposed. Thanks to the automatic identification of the analysis regions by the TSVD, this scheme can be readily used to conduct the online nonstationary SI from a set of streaming signals, which can be extremely advantageous for a quick structural condition assessment under extreme events. In addition, Laplace wavelet filtering in this scheme extracts impulse type signals from the WT coefficients in the identified analysis regions, therefore enabling a reliable damping estimation from transient nonstationary data. This scheme proves to have significant leverage for highly non-stationary response induced by transient excitations.

Non-stationary SI based on time-frequency blind source separation (2012-2013)

The spectra of strong winds and earthquakes could not be sufficiently white near the structural natural frequencies, rendering most of the existing modal identification methods with the assumption of stationary white noise excitation problematic. To handle the challenge, a new SI technique based on time-frequency blind source separation was proposed. By selectively utilizing the information in local regions of time-frequency domain, where only one mode has energy contribution, the proposed technique can successfully identify mode shapes and separate modal responses from non-stationary response under colored excitations. This technique can also handle response with closely spaced modes. In addition to the exclusive advantage in dealing with non-stationary data, the proposed technique also benefits from low sensitivity to noise and the absence of end effects in modal separation, which might be an advantage over conventional wavelet and empirical mode decomposition based SI methods when data length is extremely limited.

Performance evaluation of Canton Tower under winds based on full-scale data (2011-2012)

Canton Tower is a 610 m tall tower, located at the edge of the most active typhoon prone area in the world. Therefore, the wind effects are critical to the satisfactory performance of the tower. A sophisticated long-term SHM system consisting of about 700 sensors has been implemented by The Hong Kong Polytechnic University. In this study, wind characteristics (wind speed, direction, and turbulence intensity) and structural responses (strain, acceleration, and displacement responses) during several typhoon events were analyzed. Full-scale response and wind tunnel predictions were compared. Different techniques were employed to identify the modal properties and sources of identification errors were analyzed. In addition, the amplitude-dependence in modal properties was investigated. Finally, the tower serviceability during different typhoon events was evaluated and the performance was found to be satisfactory from human comfort consideration.

Teaching Experiences:

Courses taught at Colorado State University:

Year	Semester	Course No.: Title	Mode	Cr. Hrs.	Enrollment
2017	Spring	CIVE 367: Structural Analysis	Face-to-face	3	30
2018	Spring	CIVE 367: Structural Analysis	Face-to-face	3	32
2019	Spring	CIVE 367: Structural Analysis	Face-to-face	3	24
2019	Fall	CIVE 504: Wind Engineering	Face-to-face	3	13
2020	Spring	CIVE 367: Structural Analysis	Remote	3	25
2020	Fall	CIVE 504: Wind Engineering	Remote	3	9
2021	Spring	CIVE 303: Infrastructure and Transportation Systems	Remote	3	55
2021	Spring	CIVE 695F: Independent Study-Structures	Remote	3	1
2021	Fall	CIVE 504: Wind Engineering	Hybrid	3	9
2021	Fall	CIVE 367: Structural Analysis	Hybrid	3	18
2022	Spring	One course release due to childbirth	N/A	N/A	N/A
2022	Fall	CIVE 504: Wind Engineering	Face-to-face	3	10
2023	Spring	CIVE 303: Infrastructure and Transportation Systems	Face-to-face	3	23
2023	Spring	CIVE 367: Structural Analysis	Face-to-face	3	17
2023	Spring	CIVE 303: Infrastructure and Transportation Systems	Face-to-face	3	63
2023	Spring	CIVE 367: Structural Analysis	Face-to-face	3	14

Other teaching experiences:

08/10-12/12 Teaching Assistant
University of Notre Dame, Notre Dame, Indiana, USA

- **Courses:**
  - CE 40250, Analysis of Wobbly Structures
  - CE 40620, Transportation Engineering
  - CE 40290/60290, Design of Structures to Resist Natural Hazards
  - CE 40240/60240, Structural Systems
- **Duties**
  - Homework/exam grading, office hours, website updating
  - Designed homework problems
  - Mentored students on course projects

11/07-12/09 Teaching Assistant
Hong Kong Polytechnic University, Hong Kong

- Homework/exam grading
- Mentored students on research and final year projects

Graduate Student Advising:

Graduate advisees:

Name	Degree	Thesis Title	Graduation Year
Perry, Brandon	MS (Thesis)	A novel infrastructure inspection technique based on unmanned aerial vehicles (UAVs)	2019
Dong, Yue	PhD	Development of a Prediction Model for Windborne Debris Damage Assessment of Coast Communities Under Hurricanes	2023
Perry, Brandon	PhD	A Streamlined Bridge Inspection Framework Utilizing Unmanned Aerial Vehicles (UAVS)	2023
Anarak, Kimiya Yousefi	PhD	N/A	2026 (expected)
Fatehi, Seyed Pejman	PhD	N/A	2026 (expected)
Elnahla, Mahmoud Said	PhD	N/A	2026 (expected)
Chen, Luke	PhD	N/a	2024 (expected)
Jankord,Garrett	MS (Thesis)	N/A	2024 (expected)

Professional Affiliations and Activities:

***Memberships in Professional Societies**:*

- American Society of Civil Engineers
- American Association for Wind Engineering

Memberships in Professional Committees:

- ASCE EMI Dynamics Committee
- ASCE EMI Structural Health Monitoring & Control Committee
- ASCE/SEI Methods of Monitoring Structural Performance Committee
- IABSE Task Group 5.9 - Remote Inspection of Bridges

***Journal Paper Reviewer**:*

- Journal of Structural Engineering (ASCE)
- Journal of Sound and Vibration
- Mechanical Systems and Signal Processing
- Advances in Structural Engineering
- Journal of Nondestructive Evaluation
- Structural Safety
- International Journal of Structural Stability and Dynamics
- Wind and Structures
- Measurement
- Journal of Civil Structural Health Monitoring
- Journal of Bridge Engineering

- Frontiers in Built Environment
- Journal of Engineering Mechanics
- Computer-Aided Civil and Infrastructure Engineering

***Grant Reviewer**:*

- Panel Fellow in National Science Foundation (NSF) Division of Civil, Mechanical, and Manufacturing Innovation's (CMMI) Game Changer Academies, 2021
- Ad-hoc Reviewer for National Science Foundation, 2018

Editorial Board:

- Topic Editor for Research Topic "Fluid-Structure Dynamics in Wind Engineering" in Frontiers in Built Environment, 2023
- Guest Editor for Special Issue "Applications of Machine Learning to Wind Engineering" in Wind and Structures, 2022
- Guest Editor for Special Issue "Structural Health Monitoring (SHM) of High-rise Buildings and Spatial Structures" in Journal of Civil Structural Health Monitoring, 2020-2021