

## Curriculum Vitae of FU Yuguang

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### Summary

Dr. Fu's research has been primarily in the areas of smart sensing & diagnostic technologies, advanced experimental techniques, and their applications in infrastructure monitoring and digital construction. Prof. Fu has published 20+ journal papers and holds 4 patents. He participated in several critical projects as PI, co-PI or key personnel, funded by NASA, NSF, FRA (in the USA), NSFC (in China), and MOE, AI Singapore (in Singapore). He acted as the key personnel for next-gen wireless smart sensor development and enabled the world's largest wireless sensor network in Ain Dubai Ferris Wheel for construction monitoring, with nearly 200 nodes. He developed a smart IoT system, commercialized it via the support of NSF-SBIR, and successfully deployed it on over 10 railroad bridges in North America. He also coordinated the development of a multi-physics cyber-physical testbed to enable unprecedented testing of resilient strategies of deep space infrastructure at scale, and the achievement has been reported by WSJ.

### Education

University of Illinois at Urbana-Champaign, USA

Ph.D. in Civil Engineering, Sept. 2019

Tongji University, China

Bachelor-Master Joint Program in Civil Engineering, July. 2014

### Professional Experience

Assistant Professor, Nanyang Technological University, Aug. 2021-present

MSc (Civil Engineering) Program Director, Jul. 2023-present

NTU-CEE Seminar Committee Member, Feb. 2023-present

Postdoctoral Research Associate, Purdue University, Dec. 2019-Jul.2021

Research Scientist, Embedor Technologies, Jul.2019-Dec.2019

Associate Editor, *Frontiers in Built Environment*, Sep. 2023-present

Early Career Editorial Board Member, *Earthquake Engineering and Resilience*, May. 2022-present

Topical Advisory Panel Member & Special Issue Editor, *Sensors*, May. 2022-present

Topical Advisory Panel Member & Special Issue Editor, *Buildings*, Feb. 2023-present

Invited Journal Reviewers, *Structural Control and Health Monitoring*, *Engineering Structures*, *Structural Health Monitoring*, *Smart Structures and Systems*, *Mechanical Systems and Signal Processing*, *Automation in Construction*, *ASCE Journal of Aerospace Engineering*, *Measurement*, etc.

### Professional Memberships

Member, EMI-SHMC Committee and EMI-Dynamics Committee, *American Society of Civil Engineers*, 2013-Present

Early Career Researchers Committee Member, *International Society for Structural Health Monitoring of Intelligent Infrastructure*, 2022-Present

Student Liaison Officer, *Institution of Engineers Singapore-The Institution of Structural Engineers*, 2022-Present.

### Awards, Honors and Scholarships

1. Highly Commended in the engineering category in The Global Undergraduate Awards, as the supervisor, 2023.
2. First Prize, as main collaborator, Jiangsu Talents Digital Economy Unveiling Competition, 2022.

3. Second Prize, 1st International Project Competition for Structural Health Monitoring, 2020.
4. Best Student Paper Award (3<sup>rd</sup> Place), ASCE EMI conference, Caltech, 2019.
5. LIU Huixian Earthquake Engineering Scholarship Award, 2018
6. Mavis Future Faculty Fellow, UIUC, 2017
7. YEE Fellowship Award, College of Engineering, UIUC, 2017
8. List of Teachers Ranked as Excellent by Their Students, UIUC, 2016
9. National Scholarship, Ministry of Education, China (Top 2%), 2009,2010,2013
10. Bayer-Tongji Sustainability Development Chair Scholarship (Top 2%), 2013
11. Best Student Paper Award (2<sup>nd</sup> Place), National Civil Engineering Forum, China, 2012
12. First Prize, ASCE Mid-Pacific Student Conference, UC Berkeley, 2012

### **Selected Journal Publications**

1. Gomez, F., **Fu, Y.\***, Hoang, Tu., Mechitov, K., Spencer, B. F. (2023) "Estimation of Dynamic Interstory Drift in Buildings using Wireless Smart Sensors", *Journal of Structural Engineering*, (accepted).
2. Yu, X., **Fu, Y.\***, Li, J., Mao, J., Hoang, T., Wang, H. (2023) "Recent advances in wireless sensor networks for structural health monitoring of civil infrastructure", *Journal of Infrastructure Intelligence and Resilience*, (accepted).
3. Mondal, T.G., Zhou, J., **Fu, Y.\***, Mao, J. (2023) "A hybrid deep neural network compression approach enabling edge intelligence for data anomaly detection in smart structural health monitoring systems", *Smart Structures and Systems*, 32(3):179.
4. Zheng, Y., Zhang W.\*, Zhang C., **Fu, Y.**, Shi, J., Du, X. (2023) "Quasi-static cyclic loading experiment and analysis of mechanical properties of the Sc-FS", *Soil Dynamics and Earthquake Engineering*, 174, 108146.
5. Ni, Y., Mao, J., Wang, H.\*, **Fu, Y.**, Zhuo, X. (2023) "Corroded and loosened bolt detection of steel bolted joint based on improved you only look once network and line segment detector", *Smart Structures and Systems*, 32(1), 23-25.
6. Laflamme, S., Ubertini, F., Di Matteo, A., Pirrotta, A., Perry, M., **Fu, Y.**, Li, J., Wang, H., Hoang, T., Glisic, B. and Bond, L.J., (2023). "Roadmap on Measurement Technologies for Next Generation Structural Health Monitoring Systems", *Measurement Science and Technology*.
7. Ni, Y., Mao, J., **Fu, Y.**, Wang, H.\*, Zong, H., Luo, K. (2023) "Damage Detection and Localization of Bridge Deck Pavement Based on Deep Learning", *Sensors*, 23(11), 5138.
8. **Fu, Y.**, Zhu, Y.\*, Hoang, T., Mechitov, K. and Spencer, B.F. (2022) "xImpact: Intelligent Wireless System for Cost-Effective Rapid Condition Assessment of Bridges under Impacts", *Sensors*, 22(15), 5701.
9. Chou, J.Y. **Fu, Y.**, Huang, S.K.\*, Chang, C.M. (2022) "SHM Data Anomaly Classification Using Machine Learning Strategies: A Comparative Study", *Smart Structures and Systems*, 29(1), 77-91.
10. **Fu, Y.\***, Hoang, T., Mechitov, K., Spencer Jr, B.F. (2021) "xShake: Intelligent Wireless System for Cost-effective Real-time Seismic Monitoring", *Smart Structures and Systems*, 28 (4), 483-497.
11. **Fu, Y.**, Mechitov, K., Hoang, T., Kim, J.R., Memon, S.A., Spencer Jr, B.F.\* (2020). "Efficient and High-precision Time Synchronization for Sudden Event Monitoring using Wireless Smart Sensors", *Structural Control and Health Monitoring*, e 2643.
12. Hoang, T., **Fu, Y.**, Mechitov, K., Gomez, F., Spencer Jr, B.F.\* (2020) "Autonomous End-to-end Wireless Monitoring System for Railroad Bridges", *Advances in Bridge Engineering*, 1(1), 1-27.
13. Maghareh, A.\*, **Fu, Y.**, Montoya H., Wang, Z., Dyke, S. (2020). "A Reflective Framework for Performance Management of Real-time Hybrid Simulation", *Frontiers in Built Environment*, 6, 159.
14. Veluthedath, S.A., Chow, R., Mechitov, K., **Fu, Y.**, Hoang, T., Spencer, B.F.\* (2020). "Development of synchronized high-sensitivity Wireless accelerometer for structural health monitoring". *Sensors*, 20(15), 4169.

15. **Fu, Y.**, Peng, C., Gomez, F., Narazaki, Y., Spencer Jr, B.F.\* (2019). “Sensor Fault Management Techniques for Wireless Smart Sensor Networks in Structural Health Monitoring”, *Structural Control and Health Monitoring*, 26(7), e2362.
16. Mao, J.X., Wang, H.\*, **Fu, Y.**, Spencer Jr, B.F. (2019). “Automated modal identification using principal component and cluster analysis: Application to a long-span cable-stayed bridge”. *Structural Control and Health Monitoring*, 26(10), e2430.
17. **Fu, Y.**, Mechitov, K., Hoang, T., Kim, J.R., Lee, D., Spencer Jr, B.F.\* (2019). “Development and Full-scale Validation of High-fidelity Data Acquisition on a Next-generation Wireless Smart Sensor Platform”, *Advances in Structural Engineering*, 22(16), 3512-3533.
18. **Fu, Y.\***, Hoang, T., Mechitov, K., Spencer Jr, B.F., Kim, J. (2018). “Sudden Event Monitoring of Civil Infrastructure using Demand-based Wireless Smart Sensors”, *Sensors*, 18(12), 4480.
19. Zhu, L., **Fu, Y.**, Chow, R., Spencer Jr, B.F.\*, Park, J.W., Mechitov, K. (2018). “Development of a High- Sensitivity Wireless Accelerometer for Structural Health Monitoring.” *Sensors*, 18(1), 262.
20. **Fu, Y.**, Tong, L.\*, He, L., Zhao, X.L. (2016). “Experimental and Numerical Investigation on Behavior of CFRP-Strengthened Circular Hollow Section Gap K-Joints.” *Thin-Walled Structures*, 102, 80-97.
21. **Fu, Y.**, Tong, L.\*, Liu, B. (2016). “Research on Detection of Fatigue Crack Propagation of Steel Structures Based on Beach Marking Technique.” *Engineering Mechanics*, 33(8), 93-100.
22. Tong, L., **Fu, Y.**, Liu, Y., Zhao, X.L.\* (2014). “Stress Concentration Factors of Diamond Bird-beak SHS T-joints under Brace Loading.” *Thin-Walled Structures*, 74, 201-212.
23. Huang, S.\*, **Fu, Y.** (2014). “Study of Seismic Characteristic of Chuan-Dou Style (or Column and Tie Joint) Wood Frame House.” *Structural Engineers*, 30(1), 107-112.
24. Fu, Y.\*, Wang, M., Ge, H., Li, L. (2012). “Experimental Study of Mechanical Properties of Bamboo’s Joints under Tension and Compression Load.” *Advanced Materials Research*, 450-451, 749-755.

#### Patents Granted

1. **Fu, Y.**, Tong, L., Zhou, H. “A Design Method for FRP-Strengthened Circular Hollow K-joints”. Invention Patent in China, ZL 201510174183.3, issued August 2<sup>nd</sup>, 2017.
2. **Fu, Y.**, Shao, B., Fu, S., Chen, S., Wang, P. “Bamboo-Cable Composite Structural Members”. Invention Patent in China, ZL 201310161674.5, issued May 13th, 2015.
3. Shao, B., **Fu, Y.**, Fu, S., Chen, S., He, X. “Sleeve-Gypsum Bamboo Joints”. Invention Patent in China, ZL 201310166059.3, issued January 21st, 2015.
4. **Fu, Y.**, Wang, M., Li, L., Ge, H. “Sleeve-Cement Bamboo Joints”. Utility Patent in China, ZL 201220095107.5, issued December 5th, 2012.

#### Organized Workshop/Mini Symposium

1. Co-Chair of Organizing Committee, 9th International Colloquium on Performance, Protection & Strengthening of Structures Under Extreme Loading & Events (PROTECT2024), Singapore.
2. Session Chair, Mini-symposium, “Smart sensing and artificial intelligence for civil infrastructure monitoring”, ASCE-EMI Annual Conference, Georgia Tech, Atlanta, GA, June 6-9, 2023.

#### Selected Conference Proceedings

1. Yang, Q., Shen, W., **Fu, Y.\*** (2023). “Graph Neural Network-based Structural Damage Detection”, SHMII-12, Hangzhou, China.
2. Zhang, R., Du L., Shen, W., **Fu, Y.\*** (2023). “A Novel Tunnel Deterioration Assessment Model Utilizing Artificial Intelligence Methods”, SHMII-12, Hangzhou, China.
3. **Fu, Y.**, Wang, Z., Maghareh, A., Dyke, S., Jahanshahi, M., Shahriar, A. (2023). “Impact Detection and Localization Using Deep Learning and Information Fusion”, EMI, Atlanta.
4. Cui, S.W., **Fu, Y.** (2023). “Prototyping of An Edge-Intelligence-Enabled Smart Adaptive Triggering Mechanism for Wireless Vibration-based Structural Health Monitoring”, EMI, Atlanta.

5. **Fu, Y.**, Wang, Z., Maghareh, A., Dyke, S., Jahanshahi, M., Shahriar, A. (2021). “Scalable Impact Detection and Localization Using Deep Learning and Information Fusion”, IWSHM, Stanford.
6. Zhang, X., **Fu, Y.\***, Sharma, S., Dyke, S. (2021). “Auto-tuning Bayesian Filtering for Model Identification and Updating Using Reinforcement Learning”, *ACAM10*, Adelaide, Australia.
7. **Fu, Y.**, Hoang, T., Mechitov, K., Spencer Jr, B.F. (2021). “Rapid Condition Assessment of Bridges under Impacts: from System Design to Decision Making”, *ASCE-EMI*, New York, NY, USA.
8. **Fu, Y.**, Hoang, T., Mechitov, K.A., Kim, J., Spencer Jr, B.F. (2019). “An Intelligent Wireless System for Real-time Seismic Monitoring of Civil Infrastructure”, IWSHM, Stanford, CA, USA.
9. **Fu, Y.**, Hoang, T., Mechitov, K.A., Spencer Jr, B.F. (2019). “Real-time Wireless Data Acquisition Framework for Structural Health Monitoring”, *Proc. 9th International Conference on Structural Health Monitoring of Intelligent Infrastructure*, St. Louis, MO, USA.
10. **Fu, Y.**, Hoang, T., Mechitov, K.A., Spencer Jr, B.F. (2019). “An Intelligent Wireless Monitoring System for Real-Time Condition Assessment of Civil Infrastructures”, *ASCE-EMI*, Caltech, CA.
11. **Fu, Y.**, Gomez, F., Spencer Jr, B.F. (2018). “Instability Monitoring of Space Grid Structures under Blizzards”, *Proc. 7th World Conference on Structural Control and Monitoring*, Qingdao, China.
12. **Fu, Y.**, Hoang, T., Mechitov, K., Spencer Jr, B.F. (2018). “Demand-based Wireless Smart Sensors Enabling Sudden Event Monitoring of Civil Infrastructure”, *ASCE-EMI*, Boston, MA, USA.
13. **Fu, Y.**, Zhu, L., Hoang, T., Mechitov, K., Spencer Jr, B.F. (2018). “Demand-based Wireless Smart Sensors for Earthquake Monitoring of Civil Infrastructure”, *SPIE Smart Structures/NDE*, Denver.
14. **Fu, Y.**, Zhu, L., Park, J.W., Spencer Jr, B.F. (2017). “Earthquake Monitoring of Civil Infrastructure using Wireless Smart Sensors”, *Proc. 3rd HIFEE*, Urbana, IL, USA.
15. **Fu, Y.**, Peng, C., Park, J.W., Spencer Jr, B.F. (2017). “Fault Detection and Classification for Wireless Sensor Network using Full-scale Monitoring Data”, *ASCE-EMI*, San Diego, CA, USA.
16. Peng, C., **Fu, Y.**, Spencer Jr, B.F. (2017). “Sensor Fault Detection, Identification, and Recovery Techniques for Wireless Sensor Networks: A Full-scale Study”, *Proc. 13th ANCRiSST*, Tokyo, Japan.
17. **Fu, Y.**, Mechitov, K.A., Hoskere, V., Spencer Jr, B.F. (2016). “Development of RTOS-based wireless SHM system: benefits in applications.” *Proc. International Conference on Smart Infrastructure and Construction*, Cambridge, UK.
18. **Fu, Y.**, Tong L. (2015). “Experimental Study on Behavior of CFRP-Strengthened Circular Hollow Section Gap K-Joints.” *Proc. 6AESE/11ANCRiSST*, Champaign, IL, USA.
19. **Fu, Y.**, Hu, L., Hu, Y., He, X., (2014). “Study on the Innovative Application of Bamboo-Cable Composite Structures.” XXV International Union of Architects World Congress, Durban, South Africa.
20. **Fu, Y.**, Shao, B., Fu, S. (2013). “Comparative Study of Mechanical Performance of Bamboo Joints.” *Proc. World Congress on Advances in Structural Engineering and Mechanics*, Jeju, South Korea.
21. **Fu, Y.**, Tong, L. (2013). “Application of Beach Marking Method in the Detection of Fatigue Crack Propagation.” *Proc. 26th KKHTCNN Symposium on Civil Engineering*, Singapore.

### Recent Research Grants

- PI, *Developing a learning analytics model to facilitate adaptive blended learning*, S\$25,040, NTU Edex Grants, Oct. 2022 - Mar. 2024.
- PI, *A smart digital twin framework using advanced modelling and data analytics for monitoring and management of underground transportation infrastructure*, S\$100,000, Ministry of Education Tier 1 Seed Fund, Jan. 2022 - Dec. 2024.
- PI, *Edge Intelligence Enabling Smart IoT Networks for Autonomous Long-term Monitoring of Civil Infrastructure*, S\$100,000, Ministry of Education Tier 1 Generic, Jan. 2022 - Jun. 2024.
- PI, *Artificial Intelligence of Things Framework for Smart Sensing and Diagnostics of Civil Infrastructure*, S\$275,000, NTU Start-up Grant, Jan. 2022 - Jun. 2024.
- PI, *A novel framework for occupant comfort and building energy management to accelerate decarbonization*, S\$12,000, Imperial-NTU collaboration seed fund, Sept. 2021- Sept. 2025.

- Co-PI, *Novel context-aware multivariate time series modelling for underground transportation infrastructure monitoring and management*, S\$2,968,800, AI Singapore, May. 2022 - Apr. 2025.
- Key Personnel, *Resilient ExtraTerrestrial Habitats Institute*, National Aeronautics and Space Administration, \$15,000,000, Sept. 2019 - Aug.2024.
- Co-PI, *SBIR Phase I: Smart IoT System for Rapid Condition Assessment of Bridges under Sudden Events*, National Science Foundation, \$224,700, July. 2019 - April.2020.
- Key Personnel, *Condition Assessment of Railroad Bridges using Wireless Smart Sensors*, Federal Railroad Administration, \$335,400, Oct. 2016 - June. 2019.
- Key Personnel, *Rare Event Detection and Rapid Condition Assessment using Wireless Smart Sensors*, ZJU-UIUC Institute Research Program, \$75,000, Mar. 2017 - Mar.2018.

### **Invited Talks**

1. “Rapid Condition Assessment of Civil Infrastructures using Smart IoT System and Edge Intelligence”, *School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta*, June 2023.
2. “Building Safe and Disaster - Intelligent & Resilient Infrastructure”, *Civil Service College, Singapore*, June 2023.
3. “Rapid Condition Assessment of Structures using Edge Intelligence”, *School of Civil Engineering and Transportation, South China University of Technology*, May 2023.
4. “Rapid Damage Assessment of Structures Using Smart IoT Systems and Edge Intelligence”, One Day Workshop on Maintenance of Concrete Structures – Durability Assessment, Repair, New NDT Method Introduction, AI & i-Construction Application in Japan, *NTU*, Mar 2022.
5. “System of Systems Modeling and Testbed for Development of Resilient Deep Space Habitats”, *School of Civil Engineering, Tianjin University, Tianjin*, Nov 2021.
6. “Intelligent Infrastructure: Enabling Resilient Built Environment under Multiple Hazards”, *School of Civil Engineering, Harbin Institute of Technology, Shenzhen*, Nov 2021.
7. “Intelligent Infrastructure: Enabling Sustainable Built Environment under Multiple Hazards”, *School of Civil and Environmental Engineering, NTU, Singapore*, Dec 2020.
8. “Smart IoT System: Enabling Intelligent Infrastructure under multiple hazards”, *School of Civil Engineering, Tianjin University, Tianjin, China*, Nov 2020.
9. “Smart IoT System for Sustainable Civil Infrastructure Management under hazard events”, *Lyles School of Civil Engineering, Purdue University, West Lafayette, IN*, Oct 2020.
10. “Smart IoT System for Rapid Condition Assessment of Bridges under Sudden Events”, *Illinois Center for Transportation, University of Illinois at Urbana-Champaign, Champaign, IL*, Nov 2019.
11. “Intelligent Wireless Monitoring Systems for Rapid Condition Assessment under Sudden Events”, *Dept. Civil, Environmental & Architectural Engineering, University of Kansas, KS*, Aug 2019.
12. “Demand-based Wireless Smart Sensors for Sudden Event Monitoring of Civil Infrastructure”, *College of Civil Engineering & Architecture, Zhejiang University, Hangzhou, China*, June 2018.