Hongqiang Fang

Personal details:

Gender: male Birth: Nov 22, 1993
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Employment:

- ✧ Jun. 2024 – now **Research associate**
  Fire Research Division, Engineering Laboratory, National Institute of Standards and Technology, United States
- ✧ Sep. 2023- Jun. 2024 **Postdoctoral fellow**
  Department of Architecture and Civil Engineering, School of Engineering, City University of Hong Kong (CityU), Hong Kong

Educational qualifications and professional affiliations:

- ✧ Feb. 2023-Aug. 2023 **Visiting scholar**
  School of Mechanical and Aerospace Engineering, Nanyang technological university (NTU), Singapore
- ✧ Sep. 2019- Aug. 2023 **Doctor of architecture engineering**
  Department of Architecture and Civil Engineering, School of Engineering, City University of Hong Kong (CityU), Hong Kong
- ✧ Sep. 2016-Jun. 2019 **MSc in Safety Science and Engineering**
  State Key Laboratory of Fire Science, University of Science and Technology of China (USTC), China
- ✧ Sep. 2012-Jun. 2016 **BEng in Marine Engineering**
  School of Naval Architecture, Ocean and Energy Power Engineering, Wuhan University of Technology (WHUT), China

Research experience:

Research Interests:

- ➢ AI-based firefighting and evacuation
- ➢ Fire risk assessment and performance-based design
- ➢ Facilitate management
- ➢ Numerical simulation in built environment

Project participation:

- ✧ Supporting the Fire Service: Research Needs for Emerging Electrification Fire Risks | NIST (Jun.2024-, United States)
- ✧ Artificial Intelligence Enabled Smart Firefighting | NIST (Jun.2024-, United States)
- ✧ Development of a smart elevator evacuation system | RGC-GRF project (Sep.2020-Jun.2023, Hong Kong)
- ✧ An IoT-based smart fire evacuation system for hospitals and elderly Homes | RGC-GRF project (Sep.2021-present, Hong Kong)

Honors and Awards:

- ✧ 2025 Distinguished research associate award at NIST
- ✧ 2022 HK TECH 300 seed fund-Project of D.I.Y negative pressure air shield device for elderly homes
- ✧ 2021 Best Presentation Award (the 14th USTC-CityU PhD student online workshop, Nov 18-19, 2021)
- ✧ 2019 Best Presentation Award (2019 9th international conference on fire science and fire protection engineering)

Teaching & Skills:

- ✧ **Teaching experience:** teaching assistant (CA4174 Sustainable architecture design & development, GE1332 Beauty of Ancient Chinese Architecture, CA3226 Introduction to Urban Design, CA4527 Integrated Building project development, Construction site visit)

- ✧ **Skills:** Skilled in using the following software: Python (ML package TensorFlow & Pytorch); MATLAB; SPSS; CFD and Evacuation Simulation software (Fluent, FDS, CFAST, Pathfinder); Uncertainty analysis software (GeNIe, Hugin). Experiment skills: Temperature measurement with thermocouple; smoke concentration measurement with a smoke analyzer.

Research Publications:

- ✧ **Dissertations:**
  System Architecture for Smart Fire Evacuation in High-Rise Buildings (2023, PhD Dissertation)
  Study on fire risk assessment of urban electric power cable tunnels (2019, in Chinese, Masters Dissertation)

- ✧ **Journal article:**
  [1] **Fang, H.***, Zhang, B., Tam, W. C., Yang, C., & Lo, S. (2025). A Deep Learning-Based Approach for Unsafe Area Prediction in Building Fire Evacuation. *Journal of Building Engineering*, 113723.
  [2] **Fang, H.*,** and Tam, W. (2025), Fire Data Generator (FD-Gen) v1.0.0, *Technical Note (NIST TN)*, National Institute of Standards and Technology, Gaithersburg, MD.
  [3] **Fang, H.**, Xu, M.*, Chen, X., Lo, S., & Wan, M. P. (2025). Development of a Performance-Based Approach for Optimizing Sensor Placement in Building Fire Detection. *Fire Technology*, 1-28.
  [4] **Fang, H.***, Xu, M., Zhang, B., & Lo, S. M. (2023). Enabling fire source localization in building fire emergencies with a machine learning-based inverse modeling approach. *Journal of Building Engineering*, 78, 107605.
  [5] **Fang, H.***, Wang, Q., Qiu, H., Yang, C., & Lo, S. M. (2023). Investigation of elevator-aided evacuation strategies for older people in high-rise elderly housing. *Journal of Building Engineering*, 64, 105664.
  [6] **Fang, H.***, Qiu, H., Lin, P., Lo, S. M., & Lo, J. T. Y. (2022). Towards a Smart Elevator-Aided Fire Evacuation Scheme in High-Rise Apartment Buildings for Elderly. *IEEE Access*, 10, 90690-90705. (Q2, IF=3.9)
  [7] **Fang, H.***, Lo, S., & Lo, J. T. Y. (2021). Building Fire Evacuation: An IoT-Aided Perspective in the 5G Era. *Buildings*, 11(12), 643.
  [8] **Fang, H.***, Lo, S. M., Zhang, Y., & Shen, Y. (2021). Development of a Machine‐Learning Approach for Identifying the Stages of Fire Development in Residential Room Fires. *Fire Safety Journal*. doi:10.1016/j.firesaf.2021.103469.
  [9] Fan, L., **Fang, H**., Liang, T., Tam, W. C.*, & Zhang, Q. (2025). A cost-effective data-driven approach to flashover prediction across diverse residential layouts for enhanced firefighters situational awareness. Journal of Building Engineering, 100, 111728.
  [10] Zhang, B., Lo, J. T.*, **Fang, H.**, Xie, C., Tang, T., & Lo, S. (2024). Directed rooted forest based direction setting method: A step toward automated dynamic exit signs. Journal of Building Engineering, 85, 108504.
  [11] Zhang, B., Lo, J. T.*, **Fang, H.**, Xie, C., Tang, T., & Lo, S. (2024). Coupled simulation-optimization model for pedestrian evacuation guidance planning. Simulation Modelling Practice and Theory, 134, 102922.

[11] Shen, Y., Ma, J.*, **Fang, H.**, Lo, S. M., & Shi, C. (2022). Deep reinforcement learning based train door adaptive control in metro tunnel evacuation optimization. *Tunnelling and Underground Space Technology*, 128, 104636.
[12] Qin, C., **Fang, H.**, Wu, S., & Lu, W.* (2022). Establishing multi-criteria optimization of return vent height for underfloor air distribution system. *Journal of Building Engineering*, 57, 104800.

✧ **Conferences Papers:**

[1] **Fang H.**, Tong Q., Fan L., Tam W.C., Development of a real-time occupant tenability model with the use of FED data generator. In 13th Asia Oceania symposium on fire science and technology. 21-25 Oct, Daegu, Korea.
[2] **Fang H.,** Lo, S. M. Identifying the Stages of Fire Development from Compartment Temperatures with GMM-HMMs: A Case Study of Room Fires. In *Proceedings of the 3rd International Civil Engineering and Architecture Conference: CEAC 2023*, 17-20 March, Kyoto, Japan.
[3] **Fang H.,** Zhang J, Huang D et al . Simulation-based quantitative risk assessment of fire in urban electrical cable tunnels, In *9th International conference on fire science and fire protection engineering*, Chengdu, China, 18-20 Oct. 2019.
[4] Sun, J., **Fang, H**., Wu, J., Sun, T., & Liu, X. (2019, May). Application of Bayesian Belief Networks for Smart City Fire Risk Assessment Using History Statistics and Sensor Data. In *International Conference on Data Service* (pp. 3-11). Springer, Singapore.

GitHub tools:

[1] Fang, Hongqiang, Tam, Wai Cheong (2025), Fire Data Generator (FD-Gen) , National Institute of Standards and Technology, https://github.com/usnistgov/FD-Gen.

International Association roles and Seminar Talk:

✧ **International Association roles:**

International Association for Fire Safety Science-IAFSS member
SFPE AI-related task sub-working group

✧ **Seminar Talk:**

[1]. 14th International Symposium on Fire Safety Science, AI/ML in Fire Safety Engineering workshop, Tsukuba, Japan, October 21-27, 2023.
[2].NIST internal fire research seminar, Jul 2023 (Online)
[3] Jensen Hughes tech talk. June 2025 (online)