Zenghui Liu (Gracian)

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EDUCATION

Tianjin University **2023.09-2026.06**

Master of Building Technology (Jointly cultivated with **Tianjin Fire Research Institute**)

Weighted Average Grade:87.44

Research area: Artificial Intelligence-Driven Intelligent Firefighting Technology

International exchange: CESI School of Engineers, France. About: BIM Sustainable Building

Shenyang Jianzhu University **2019.09-2023.06**

Bachelor of Management in Engineering Management (Cost Estimation)

Weighted Average Grade:90.82 (1/70)

RESEARCH INTERESTS

Impact assessment of climate adaptation technologies, Energy transition equity, Data-driven decision-making, and Transformative solutions at the nexus of humans, infrastructure, energy, and urban systems.

RESEARCH EXPERIENCE

Artificial Intelligence-Driven Intelligent Fire Detection Technology for Buildings

Master's Research Project 2023.09-2025.06

- Large-scale simulation and experimental data management.
- Deep learning algorithm construction.
- Sensor device development.
- Intelligent evacuation algorithm development.

Exploring Inequities and Sustainability in Data-Driven Urban Environment, Energy, Food, and Resilience

Project 1: **Resilience** 2024.02-2024.07

- Rapid Prediction of Urban Residential Fire Losses Combining Explainable Machine Learning and Imbalanced Data Processing Techniques.
- Investigating Heterogeneity in Post-Disaster Outcomes of Various Features in UK Cities Using the SHAP Method.

Project 2: **Energy** 2024.04-present

- Developing an Integrated Assessment Model to Quantify the Employment Effects of Biomass Co-Firing Technology in Coal-Fired Power Plants and Optimize Its Blending Ratio.
- Revealing the Limitations of Biomass Co-Firing Technology in Large-Scale Coal Power Plant Phase-Outs and Promoting Energy Justice Transition.

Project 3: **Environment** 2024.09-present

- Carrying out large-scale wind farm numerical simulations and field tests.
- Taking the height and layout combination of existing buildings as parameters, a quantitative study on the inequality of natural ventilation acquisition caused by existing design strategies.

Project 4: **Food** 2024.05-present

- Developed a machine learning model for yield prediction in smart agriculture, enhancing accuracy through wireless sensor data, and supporting supply chain decisions.

- Designed an SLSQP auction mechanism to reduce transportation costs and improve resource efficiency in agricultural supply chains.

Project 5: **Energy** 2024.09-present

- Employs spatial econometric models to examine the regional disparities of industrial and commercial distributed photovoltaic (IC-DPV) systems in China and explores the influence of socioeconomic and built environment factors on IC-DPV adoption.

Intelligent Assessment of Infection Risk in Hospital Waiting Rooms

Research Assistant Project 2022.09-2023.09

- Implemented the waiting room personnel behavior simulation using AnyLogic.
- Utilized Fluent to simulate the airflow organization of 990 waiting room spaces.
- Revealed the influence mechanism of spatial and ventilation design parameters on the risk distribution.
- Established a rapid prediction model of infection risk in waiting room space through ANN.

PUBLICATIONS

Publications:

[1] **Liu, Z***., Zhuang, Y., 2024. An investigation using resampling techniques and explainable machine learning to minimize fire losses in residential buildings. **Journal of Building Engineering** 95, 110080.

[2] Zhai, M., Tian, X., **Liu, Z**., Zhao, Y., Deng, Y., Yang, W., 2024. Advancing Just Transition: The Role of Biomass Co-Firing in Emission Reductions and Employment for Coal Regions. **Sustainable Energy Technologies and Assessments**

[3] Liu, G[1]., **Liu, Z[1]**., Qu, G., Ren, L., Wang, L., Yan, M., 2024. Dual-Agent Intelligent Fire Detection Method for Large Commercial Spaces Based on Numerical Databases and Artificial Intelligence. **Process Safety and Environmental Protection**.

[4] Qu, G[1]., **Liu, Z[1]**., Ren, L., Liu, G., Zhang, Y., Zhan, M., Yan, M., Liu, W., Li, W., 2024. Intelligent generation method of infection risk map and management system in hospital waiting room for respiratory infectious diseases. **Journal of Building Engineering** 96, 110571.

[5] **Liu, Z.**, Lin, J.,2024. Combinatorial machine learning approaches for high-rise building cost prediction and their interpretability analysis. **Journal of Asian Architecture and Building Engineering**.

[6] Ren, L., Qu, G., Liu, G., **Liu, Z**., Zhang, Y., Yan, M., 2024. The passive optimization mechanism of winter thermal performance in commercial complex based on coupled multi-spatial parameters. **Journal of Building Engineering** 96, 110579.

[7] Wang, L., Lu, H., Qu, G., Ren, L., Xu, Z., Liu, G., Yan, M., **Liu, Z**., 2024. Cross-physical field prediction method for smoke field distribution in commercial building fire based on distributed optical fiber sensor. **Journal of Building Engineering** 87, 109027.

Publications in Process:

[1] **Liu, Z.**, Qu, G., Ren, L., Wang, L., Yan, M., Liu, G.,2024. Deep Learning-Driven for the Spatiotemporal Distribution Prediction of Fire Hazard Factors in Large Building Spaces. **Reliability Engineering & System Safety** (Under Review)

[2] Feng Y, Chen Y, **Liu Z***.,2024. Machine Learning-Driven Smart Agriculture Yield Prediction and SLSQP Auction Transport Mechanism under the WNS Background. **Annals of Operations Research** （R2)

[3] Lin J, **Liu Z***, Zhai M, Yang W.,2024. Basic Design Parameters Driving Indoor and Outdoor Ventilation Inequality in Dormitory Building Complexes: A Numerical and Field Study. **Energy and Buildings** （Under Review)

[4] Ma C*, Hu H, Ding Y, Wang Q, Yi S, Gu C, Chen J, **Liu Z**.,2025. Regional disparity of industrial and commercial distributed PV adoption in China: The roles of socioeconomic and built environment factors. **Renewable Energy**（Under Review)

[5] Yang W, Tian S, Zhai M*, Li, Huo D, Wang S, Liu S, **Liu Z**., 2025 Can Sustainable Policies Drive TOD Effectively? Insights from Multi-Scenario Simulations. **Journal of Environmental Management** (R1)

AWARDS

- **National Scholarship (2024, China's highest student honor)**
- **Liaoning Provincial Government Scholarship** (2021)
- American Student Mathematical Modeling Competition-Honorable prize (2024)
- National University Mathematics Competition-National Second Prize (2024)
- National Student Mathematical Modeling Competition- Provincial First Prize (2024)

ADDITIONAL EXPERIENCE

- **Assistant construction engineer, China Construction Corporation (2022)**
- **Grant:** National-level undergraduate innovation project (Grant ID:202210153006, First host)
- **Grant:** Tianjin University engineering master's innovation project (2024-2025)
- Graduate student representative of the School of Future Technology, Tianjin University
- **Class president, Tianjin University**
- SFPE Student Member
- Architectural Society of China Student Member
- Member of The International Society for Urban Informatics
- Member of The International Building Performance Simulation Association

SKILLS AND HOBBIES

- Software: Matlab, Python, Origin, Visio, FDS, Fluent, Comsol, AutoCAD, Revit (BIM Modeler Certification)
- Hobbies: Basketball, Electric Guitar, Ping-Pang Ball.

Updated on 22 February 2025