Xinwei Zhuang

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RESEARCH EMPHASIS

Energy and Environment: AI for sustainable energy transition; Building stock analysis; Urban building energy modeling; Energy conservation and projection; Ventilation and daylighting optimization

Computation: Machine learning; Data science; Network science; Computer vision; Computer graphics

EDUCATION

Massachusetts Institute of Technology — Cambridge, United States
IvyPlus Exchange Scholar, Department of Urban Studies and Planning — Sept 2024 − Aug 2025

University of California, Berkeley — Berkeley, United States
Ph.D. in Architecture — Aug 2020 − Aug 2025
  Dissertation: From Morphogenesis to Synergetic Resilience: Artificial Intelligence-Powered Urban Neighborhood Energy Transition

Bartlett School of Architecture, University College London — London, United Kingdom
M.S. in Architectural Computation — Sept 2016 − Nov 2017
  Dissertation: Space Frame Optimization with Spectral Clustering Algorithm

Edinburgh Napier University — Edinburgh, United Kingdom
B.S. in Civil Engineering — Sept 2012 − May 2016
  Dissertation: Influence of Particle Loss on Soil Behaviour

EXPERIENCE

Texas A&M University — College Station, United States
Assistant Professorr — Aug 2025 − Present

Lawrence Berkeley National Lab — Berkeley, United States
Research assistant — May 2022 − July 2025
- Decarbonizing Energy through Collaborative Analysis Routes and Benefits (DECARB)
- Multi-scale Energy Conservation Measurement (ECM) evaluation and projection for U.S. residential and commercial building sectors, provide policy insight for ECMs and regulations

Robotic Plus — Shanghai, China
Software developer — March 2020 − July 2020

Architecture Studio — Shanghai, China
Architectural designer — Aug 2018 − Mar 2020

China Shanghai Architectural Design & Research Institute Co. Ltd — Shanghai, China
Research assistant — Nov 2017 − Aug 2018

INVITED TALK

Dec. 2024 The role of architecture in the urban energy landscape
Guest lecture at the Manchester Urban Institute, University of Manchester, UK

Nov. 2024 Decomposing and recomposing of the urban energy environment with building archetype and urban building energy modeling
Guest lecture at Foster + Partner, UK

June 2023 Performance-driven architectural design with deep learning
Invited talk at 33rd Young Scholar Forum, Nanjing University, China

May 2023 ZNE house case study and machine learning for building stock analysis
Invited talk at Center for the Built Environment (CBE), USA

Awards

2024	Advance Humanity through Science: $10k graduate student research grant
	Lau Just Climate Futures: $35k research grant
2023	Eric T. Andresen Memorial Scholarship (ASHRAE): Research in energy conservation
2021	Golden Gate Chapter Scholarship (ASHRAE): Research contributing to the energy sector
2017	Alistair Turner Prize (Bartlett School of Architecture): Best master's dissertation

Publication

* equal contribution

1. **Zhuang X.**, Lyv G., Zhao Z. and Caldas. L (2025) Rapid Assessment of Solar Potential for Building Surfaces in Complex Urban Morphologies Based on Vector Processing, *Solar Energy*, Volume 294, 2025, 113482, ISSN 0038-092X, DOI: 10.1016/j.solener.2025.113482

2. **Zhuang X.**, Zhu P., Yang A. and Caldas L. (2025) Machine Learning for Generative Architectural Design: Advancements, Opportunities, and Challenges, *Automation in Construction*, Volume 174, 2025, 106129, ISSN 0926-5805, DOI: 10.1016/j.autcon.2025.106129.

3. Chen X., Lyv G., **Zhuang X.**, Duarte C. and Schiavon S. (2024) Integrating Symbolic Neural Networks for Advanced Modeling in Building Physics: A Study and Proposal. https://arxiv.org/abs/2411.00800

4. **Zhuang X.**, Chu X., Liang, J., Zhu P., Gonzalez, M. and Caldas, L. (2024) Across scales: Hierarchical Urban Graph for Neighborhoods Partition and Decentralized Energy Autonomy, in *2024 Conference on Association for Computer Aided Design in Architecture (ACADIA)*, Calgary, Canada. [paper]

5. **Zhuang X.***, Huang Z.*, Zeng W., and Caldas L. (2023) MARL: Multi-scale Archetype Representation Learning for Urban Building Energy Modeling, workshop on Computer Vision Aided Architectural Design (CVAAD), at *International Conference on Computer Vision (ICCV)*, Paris, France. DOI: 10.1109/ICCVW60793.2023.00171

6. **Zhuang X.***, Huang Z.*, Zeng W., and Caldas L. (2023) Encoding Urban Ecologies: Automated Building Archetype Generation through Self-Supervised Learning for Energy Modeling, in *2023 Conference on Association for Computer Aided Design in Architecture (ACADIA)*, Denver, United States of America. papers.cumincad.org/cgi-bin/works/paper/acadia23_v2_532

7. **Zhuang X.**, Luo, N., Hong T. and Koenig, M. (2023) What can we learn from Honda Smart Home with high-resolution monitored performance data: A zero-net energy home in California, in *18th International IBPSA Conference and Exhibition* In Shanghai, China. DOI: 10.26868/25222708.2023.1315

8. Li F.* and **Zhuang X.*** (2023) Evaluating an Auto Decoder-based Generative Model for the Infomorphism Urban Planning Framework, in *18th International IBPSA Conference and Exhibition* In Shanghai, China. DOI: 10.26868/25222708.2023.1393

9. **Zhuang X.**, Ju Y., Yang A. and Caldas L. (2023) Synthesis and Generation for 3D Architecture Volume with Generative Modeling, in *International Journal of Architectural Computing*, Vol. 21, Issue 2: AI, Architecture, Accessibility, & Data Justice. DOI: 10.1177/14780771231168233

10. **Zhuang X.** (2022) Rendering sketches: Interactive rendering generation from sketches using conditional generative adversarial neural network, in *40th Education and research in Computer Aided Architectural Design in Europe (eCAADe)*. In Brussels, Belgium papers.cumincad.org/cgi-bin/works/paper/ecaade2022_273

11. **Zhuang X.** and Caldas L. (2022) Prediction of Ventilation Performance in Urban Area with CFD Simulation and Conditional Generative Adversarial Networks, in *5th International Conference on Building Energy and Environment (COBEE)*. In Montreal, Canada DOI: 10.1007/978-981-19-9822-5_15