

# Xinwei Zhuang

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## RESEARCH EMPHASIS

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**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

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**Massachusetts Institute of Technology** Cambridge, United States  
IvyPlus Exchange Scholar, Department of Urban Studies and Planning Sept 2024 – Present

**University of California, Berkeley** Berkeley, United States  
Ph.D. candidate in Architecture **GPA: 3.95/4.00** Aug 2020 – Present

**Dissertation:** Performance-driven morphogenesis for urban neighborhood energy resilience

**Bartlett School of Architecture, University College London** London, United Kingdom  
M.S. in Architectural Computation **GPA: 70.5/100 (Distinction)** Sept 2016 – Nov 2017

**Dissertation:** Space frame optimization with spectral clustering algorithm

**Edinburgh Napier University** Edinburgh, United Kingdom  
B.S. in Civil Engineering **GPA: 79.7/100 (First Honor)** Sept 2012 – May 2016

**Dissertation:** Influence of Particle Loss on Soil Behaviour

## EXPERIENCE

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**Lawrence Berkeley National Lab** Berkeley, United States  
*Research assistant* May 2022 – Present

- Decarbonizing Energy through Collaborative Analysis Routes and Benefits
- 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

- Energy consumption control and optimization for commercial buildings with neural network, a part of 13th national 5-year project

## INVITED TALK

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**March 2025** AI for sustainable energy transition

*Guest lecture at University of California, Berkeley*

**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

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- 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

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\* 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, accepted in *Solar Energy*.
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](https://doi.org/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](https://doi.org/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. [[paper](#)]
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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://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](https://doi.org/10.1007/978-981-19-9822-5_15)