Sicheng Zhan

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Enabling intelligent and high-performance buildings by integrating machine learning and digital twins

Education

National University of Singapore — *Singapore*
PhD Smart Building — *Feb 2018 - Nov 2022*
- Thesis title: Data-centric model predictive control for HVAC systems in tropical office buildings
- Advisor: Assi. Prof. Adrian Chong

Carnegie Mellon University — *Pittsburgh, United States*
MSc Advanced Infrastructure System — *Aug 2016 - Dec 2017*
- LEED Accredited Professional Building Design + Construction

Zhejiang University — *Hangzhou, China*
BSc Energy and Environment Systems Engineering — *Sept 2012 - June 2016*
- Secondary degree: BSc Industrial Design

Professional Experience

Postdoctoral Associate — *Boston, United States*
Massachusetts Institute of Technology — *Sept 2024 - Present*

Research Fellow — *Singapore*
National University of Singapore — *Oct 2022 - Aug 2024*

Research Consultant — *Boston, United States*
Mitsubishi Electric Research Laboratories (North America) — *May - Aug 2021*

Research Associate — *Singapore*
National University of Singapore — *Feb - Aug 2018*

Awards & Scholarships

2023 **National Award for Outstanding Self-financed Students Abroad**, China Scholarship Council
2023 **NUS Annual Teaching Excellence Award (TA)**, National University of Singapore
2018 - 2022 **NUS Research Scholarship**, National University of Singapore
2021 **Energy and Built Environment 2021 Best Paper**, Energy and Built Environment
2021 **NUS Annual Digital Education Award (TA)**, National University of Singapore
2019 **BS2019 Student Travel Award**, International Building Performance Simulation Association
2016 - 2017 **Civil and Environmental Engineering Department Scholarship**, Carnegie Mellon University
2016 **Honor of Excellent Graduation Thesis**, Zhejiang University
2016 **Scholarship for Excellence in Research and Innovation**, Zhejiang

Selected Publications

Journal Articles

Zhan, **S.**, Zhu, M., Cheng, S., & Chong, A. (2024). Bridging performance gap for existing buildings: The role of calibration and the cascading effect. *Building Simulation*.

Zhan, **S.**, Dong, B., & Chong, A. (2023). Improving energy flexibility and pv self-consumption for a tropical net zero energy office building. *Energy and Buildings*, 112606.

Zhan, **S.**, Lei, Y., Jin, Y., Yan, D., & Chong, A. (2022). Impact of occupant related data on identification and model predictive control for buildings. *Applied Energy*, *323*, 119580.

Zhan, **S.**, Wichern, G., Laughman, C., Chong, A., & Chakrabarty, A. (2022). Calibrating building simulation models using multi-source datasets and meta-learned bayesian optimization. *Energy and Buildings*, 112278.

Zhan, **S.**, & Chong, A. (2021a). Building occupancy and energy consumption: Case studies across building types. *Energy and Built Environment*, *2*(2), 167–174.

Zhan, **S.**, & Chong, A. (2021b). Data requirements and performance evaluation of model predictive control in buildings: A modeling perspective. *Renewable and Sustainable Energy Reviews*, *142*, 110835.

Zhan, **S.**, Chong, A., & Lasternas, B. (2020). Automated recognition and mapping of building management system (bms) data points for building energy modeling (bem). *Building Simulation*, 1–10.

Zhan, **S.**, Liu, Z., Chong, A., & Yan, D. (2020). Building categorization revisited: A clustering-based approach to using smart meter data for building energy benchmarking. *Applied Energy*, *269*, 114920.

Presentations

Invited Talks

Nov 2023. *Towards reliable digital twins applications in buildings: a data perspective*. University of Nottingham Ningbo, China.

Sept 2023. *Application-oriented performance evaluation of digital twins for buildings*. IBPSA Workshop 2, Shanghai.

June 2023. *Digital twin for buildings: identification, calibration, and applications*. Bosch Corporate Research.

Nov 2022. *Model Predictive Control in Buildings: from Model-Centric to Data-Centric*. Bosch Center for Artificial Intelligence.

July 2022. *Digital twins and downstream applications in buildings*. Inovance Technology, China.

June 2022. *Improving Energy Flexibility with MPC in a Tropical Net Zero Energy Office Building*. Syracuse University.

Oct 2019. *Building Energy Benchmarking Based on Time-Series Smart Meter Data*. Tsinghua University, China.

Contributed Presentations

Sept 2021. *A Virtual Testbed for Robust and Reproducible Calibration of Building Energy Simulation Models*. Building Simulation 2023, Shanghai, China.

May 2023. *Comparing model predictive control and reinforcement learning for the optimal operation of building-PV-battery systems*. 11th international conference on indoor air quality, ventilation & energy conservation, Tokyo, Japan.

Jan 2023. *Reimagining Digital Twins: an Active-Learning Approach to Calibrating Models for Complex Systems*. 2023 Global Young Scientists Summit, Singapore.

Nov 2022. *From Model-Centric to Data-Centric: A Practical MPC Implementation Framework for Buildings*. The 9th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation, Boston, United States.

Sept 2021. *Data Requirements and Performance Evaluation for Control-Oriented Models: a Case Study on Internal Heat Gain*. Building Simulation 2021, Virtual.

Sept 2019. *A Robust Unsupervised Framework for High-Resolution Building Energy Consumption Profiling*. Building Simulation 2019, Rome, Italy.

Dec 2018. *A Text Mining Framework to Map BMS Data to BEM*. The 4th Asia Conference of International Building Performance Simulation Association, Hong Kong, China.

Teaching Experience

2019-2021 **BPS5229 Data Science for the Built Environment**, Teaching Assistant

2019-2023 **BPS5112 Green Building Design and Evaluation Studio**, Teaching Assistant, Workshop Instructor

2017 **12-780 - Advanced Python and Web Prototyping for Infrastructure Systems**, Teaching Assistant

2017 **12-748 - Mechanical and Electrical System Design for Buildings**, Teaching Assistant