Wei Liang, P.E., Ph.D.

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Research interests

Artificial intelligence for buildings, Data-driven modeling and controls, Robotics for building management, IoT and Smart Buildings, Indoor Environmental Quality

Education

2019 – 2024	**Carnegie Mellon University (CMU)** – Pittsburgh, PA, USA
	Ph.D. in Building Performance and Diagnostics
	Advisors: Prof. Erica Cochran Hameen & Prof. Vivian Loftness
2012 – 2014	**University of California, Merced (UC Merced)** – Merced, CA, USA
	Master of Science in Mechanical Engineering
	Advisor: Prof. Jian-Qiao Sun
2008 – 2012	**Nanjing University** – Nanjing, Jiangsu, China
	Bachelor of Science in Acoustics
	Advisor: Prof. Jiancheng Tao

Research experience

Jul 2024 – Present

Senior Research Fellow, National University of Singapore (NUS)

Mentors: Prof. Adrian Chong

- Authored major portions of successful proposals to secure funding from multiple funding agencies (NUS, A*STAR & GBIC) over SG$1.6M
- Led interdisciplinary research projects, including overseas collaborations, coordination with industrial partners, and supervising Ph.D. students
- Real-world implementation of optimal controls on building automation systems
- Adversarial inverse reinforcement learning for complex building HVAC systems

Aug 2019 – June 2024

Research Assistant, CMU

Advisors: Prof. Erica Cochran Hameen & Prof. Vivian Loftness

- Mobile sensing robot for indoor environmental quality assessments
- Spatiotemporal Gaussian Process modeling for indoor environmental quality
- Spatial mapping of thermal comfort with vSLAM and semantic segmentation
- Social robot for post-occupancy evaluation
- Iterative learning controls for building thermodynamics

May 2023 – Aug 2023	**Ph.D. Researcher, Lawrence Berkeley National Lab (LBNL)** Advisors: Dr. Tianzhen Hong • Physics-informed neural network (PINN) modeling for building thermodynamics • Model Predictive Control (MPC) to optimize building energy flexibility
Oct 2022 – May 2023	**Ph.D. Researcher, Pacific Northwest National Lab (PNNL)** Advisors: Dr. Michael Brambley • Created a gradient-boosting-based framework for long-term energy consumption prediction for packaged air conditioning units with limited information
Aug 2012 – Jun 2015	**Research Assistant, UCM** Advisors: Prof. Jian-Qiao Sun • ARMAX modeling for building thermodynamics and MPC optimal control for AHUs

Teaching experience

Jan 2022 – May 2024	**Instructor, 48722, Building Performance Modeling, CMU** Sole instructor of a graduate-level class • Teaching building simulations and Building Physics • Independently designed teaching materials and lab assignments • 15-30 enrollments with diverse academic and professional backgrounds
Fall 2020 – Fall 2021	**Teaching Assistant, Multiple courses, CMU** 48768, Indoor Environmental Quality, Fall 2021 48729, Sustainability, Health and Productivity, Fall 2021 48722, Building Performance Modeling, Spring 2021 48721, Building Controls and Diagnostics, Spring 2021 48116, Building Physics, Fall 2020
Spring 2013 – Spring 2014	**Lab Instructor and Teaching Assistant, Multiple courses, UC Merced** ME 021, Engineering Computing, Fall 2014, Summer 2014 & Fall 2013 ME 140, Vibration and Control, Spring 2014 & Spring 2013
Summer 2013 – Spring 2014	**Teaching Assistant, Multiple courses, UC Merced** ME 142, Mechatronics, Spring 2014 ENGR 065, Circuit Theory, Summer 2013

Industry experience

Aug 2015 – July 2019	**Mechanical Engineer, Gayner Engineers** – San Francisco, CA, USA • HVAC System and Building Automation System design for critical buildings • Building energy simulations for green building rating systems • Commissioning and Energy Auditing for MEP and medical equipment systems • Project management, construction administration, and drawing productions

Journal Publications

J1 **Liang**, W., Zhang, Y., Chong, A., Hameen, E. C., & Loftness, V. (2025). Exploring gaussian process regression for indoor environmental quality: Spatiotemporal thermal and air quality modeling with mobile sensing. *Building and Environment*, *281*, 113143. https://doi.org/10.1016/j.buildenv.2025.113143

J2 **Liang**, W., Li, H., Zhan, S., Chong, A., & Hong, T. (2024). Energy flexibility quantification of a tropical net-zero office building using physically consistent neural network-based model predictive control. *Advances in Applied Energy*, *14*, 100167. https://doi.org/10.1016/j.adapen.2024.100167

J3 **Liang**, W., Ma, S., Cochran, E., & Flanigan, K. A. (2023). Distributed MPC-ILC thermal control design for large-scale multi-zone building hvac system. *SIGENERGY Energy Inform. Rev.*, *3*(2), 34–46. https://doi.org/10.1145/3607114.3607118

J4 **Liang**, W., Quinte, R., Jia, X., & Sun, J.-Q. (2015). Mpc control for improving energy efficiency of a building air handler for multi-zone vavs. *Building and Environment*, *92*, 256–268. https://doi.org/10.1016/j.buildenv.2015.04.033

J5 Qaisar, I., **Liang**, W., Sun, K., Xing, T., & Zhao, Q. (2024). An experimental comparative study of energy saving based on occupancy-centric control in smart buildings. *Building and Environment*, *268*, 112322. https://doi.org/10.1016/j.buildenv.2024.112322

J6 Xiong, R., Shi, Y., Jing, H., **Liang**, W., Nakahira, Y., & Tang, P. (2024). Calibrating subjective data biases and model predictive uncertainties in machine learning-based thermal perception predictions. *Building and Environment*, *247*, 111053. https://doi.org/10.1016/j.buildenv.2023.111053

J7 Xiong, F., Qin, Z., Hernández, C., Sardahi, Y., Narajani, Y., **Liang**, W., Xue, Y., Schütze, O., & Sun, J. (2013). A multi-objective optimal pid control for a nonlinear system with time delay. *Theoretical and Applied Mechanics Letters*, *3*(6), 063006. https://doi.org/10.1063/2.1306306

J8 Hernández, C., Naranjani, Y., Sardahi, Y., **Liang**, W., Schütze, O., & Sun, J.-Q. (2013). Simple cell mapping method for multi-objective optimal feedback control design. *International Journal of Dynamics and Control*, *1*(3), 231–238. https://doi.org/10.1007/s40435-013-0021-1

Peer-reviewed Conference Publications

C1 **Liang**, W., & Chong, A. (2025). Learning adaptive mixed-mode ventilation policies via adversarial inverse reinforcement learning. *ICML 2025 CO-BUILD Workshop on Computational Optimization of Buildings*

C2 **Liang**, W., Zhang, Y., Zhang, J., & Hameen, E. C. (2024). An expeditious spatial mean radiant temperature mapping framework using visual slam and semantic segmentation [In 2024 CVPR Computer Vision in the Built Environment Workshop]. https://doi.org/10.48550/arXiv.2410.09443

C3   **Liang**, W., & Brambley, M. R. (2024). Event-based energy impact tracking and forecasting with limited measurements for rooftop units. *ASHRAE Transactions*, 239–248. https://doi.org/10.63044/s24lia26

C4   **Liang**, W., Ma, S., Hameen, E. C., & Flanigan, K. (2022). Integrated MPC-ILC control design for thermal control of a large-scale multi-zone building hvac system. *Proceedings of the 9th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, 129–138. https://doi.org/10.1145/3563357.3564068

C5   **Liang**, W., Xiong, R., Liu, P., Tang, P., & Hameen, E. C. (2022). Improving post-occupancy evaluation engagement using social robots. *Proceedings of the 9th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, 159–167. https://doi.org/10.1145/3563357.3564071

C6   Kumar, E., Hameen, E. C., & **Liang**, W. (2020). Global marginal carbon footprint evaluation of internet services with building energy models. *BuildSIM-Nordic 2020*

C7   Sardahi, Y., Naranjani, Y., **Liang**, W., Sun, J.-Q., Hernandez, C., & Schuetze, O. (2013). Multi-objective optimal control design with the simple cell mapping method. *ASME 2013 International Mechanical Engineering Congress and Exposition*, V04BT04A025. https://doi.org/10.1007/s40435-013-0021-1

Research Funding

Oct.2025 – Now   *Cost-Effective Wireless Occupant-Centric Controls for Energy-Efficient Whole Building Retrofit*, **Lead Researcher**
Building Construction Authority Green Buildings Innovation Cluster (GBIC) R&D Programme, **S$1,256,000**

Oct.2025 – Now   *Thermoelectric cooling with novel material composites for localised cooling in naturally ventilated and mixed-mode ventilated spaces*, **Lead Researcher**
Building Construction Authority Green Buildings Innovation Cluster (GBIC) R&D Programme, **S$1,648,000**

Apr.2025 – Now   *AI-Driven Climate Resilient Cooling: Robust Reinforcement Learning for Mixed-Mode Ventilation*, **Lead Researcher**
Japan Science and Technology Agency (JST) and the Agency for Science, Technology and Research of Singapore (A*STAR) Joint Grant for Artificial Intelligence, **S$345,000**

Nov.2024 – Nov.2025   *Towards Sustainable Cooling: Occupant-Centric Mixed-Mode Ventilation Control as a Climate Adaptation Solution*, **Lead Researcher**
Korea University-National University of Singapore Strategic Partner Funds, **S$20,000**

Apr.2024 – Apr.2025   *Comparative Energy Analysis and Optimization of Radiant Cooling Panels in Tropical Climates*, **Participating researcher**
Gift from SANKEN SETSUBI KOGYO CO., LTD, **S$200,000**

Oct.2020 – May.2024	*An automatic mobile sensing platform for indoor environmental quality assessments*, **Principal Investigator** Fund for Research & Creativity / Graduate Student Assembly Travel Fund / Scholarly Project Funding, CMU, **$10,500**
Oct.2022 – May.2023	*Total Estimated Cost Impact (TECI) Metrics Evaluation Project*, **Participating researcher** United States General Services Administration, **$300,000.**
Oct.2022 – May.2023	*National Outdoor Air Verification (NOVA) Project*, **Participating researcher** Fund for Research & Creativity / Graduate Student Assembly Travel Fund / Scholarly United United States General Services Administration, **$300,000.**

Honors and scholarships

2020-2023	Scholarly Project Funding × 4, Graduate Student Assembly, CMU
2020 - 2021	Letter of commendation × 2, School of Architecture, CMU
2014	Mechanical Engineering Bobcat Award, UC Merced
2013	UC Merced Graduate Summer Fellowship, UC Merced
2010	People's Scholarship, Nanjing University

Invited Talks

Jul.2025	Learning adaptive mixed-mode ventilation policies via adversarial inverse reinforcement learning *Poster Presentation at ICML 2025 CO-BUILD Workshop, Vancouver, BC, Canada*
Jun.2024	Event-based energy impact tracking and forecasting with limited measurements for rooftop units *Oral Presentation at ASHRAE Annual Conference 2024, Indianapolis, IN, USA*
Jun.2024	An expeditious spatial mean radiant temperature mapping framework using visual slam and semantic segmentation *Oral Presentation at CVPR 2024 CV4AEC Workshop, Seattle, WA, USA*
Nov.2023	Introduce Robotics to Building Management *Invited Seminar at Florida Agricultural & Mechanical University, Tallahassee, FL, USA*
Nov.2022	Improving Post-Occupancy Evaluation Engagement Using Social Robots *Oral Presentation at BuildSys'22, Boston, MA, USA*
Nov.2022	Integrated MPC-ILC Control Design for Thermal Control of a Large-Scale Variable Air Volume Reheat Systems in Buildings *Oral Presentation at BuildSys'22, Boston, MA, USA*

Service

Reviewer	Building and Environment, Energy and Buildings, Developments in the Built Environment, Journal of Building Engineering, Building Simulation (2024-Now)

Certifications and Memberships

2016 – Present	Full Member *American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)*
2017 – Present	Professional Mechanical Engineer (M38549) *Board for Professional Engineers, Land Surveyors, and Geologists - California*
2017 – 2021	LEED AP BD+C *Green Business Certification, Inc*
2018	Deep Learning Specialization (4LJHJDPJMNVS) *Coursera*

Technical skills

Expertise

Proficient: Building HVAC System, Building Energy Simulation, Indoor Environmental Quality, Model Predictive Control, Control Theory

Advanced: Building Automation System, Numerical Optimization, Deep Learning, Smart Grid, Reinforcement Learning, Robotics

Programming languages

Python & Pytorch, MATLAB, Julia, R, C, C++

AEC Software

EnergyPlus, IES VE, Design Builder, Modelica, Trace 700, eQuest, HOMER Pro, Autodesk Revit, AutoCAD, BlueBeam, Adobe Acrobat DC, Rhino, Grasshopper

Tools and Operating Systems

LaTeX, Git, Microsoft Office, Docker, MacOS, Ubuntu, Raspbian, Windows

Building Management System

ALC, Honeywell IQ, Siemens Apogee, Niagara Tridium, OSIsoft PI

Languages

English (Full professional proficiency), Chinese (Native), Spanish (Elementary)