

Jianru JING

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EDUCATION

University of Illinois Urbana–Champaign (UIUC)

MEng in Energy Systems

- GPA: 3.89/4.0

IL, USA

Aug. 2024 – Present

University of Nottingham Ningbo China (UNNC)

BEng (Hons) Architectural Environment Engineering, First Class Honours

- Provost's Scholarship (Top 5%)
- Zhejiang Provincial Government Scholarship 2023
- Outstanding Graduate of UNNC

Zhejiang, China

Aug. 2020 – Jul. 2024

RESEARCH EXPERIENCES

Exploiting Building Thermal Mass for Demand Response

Jun. 2025 – current

Individual Project|Yun Kyu Yi Research Group|UIUC

- Built a grey-box RC model from ResStock metadata to separate short-term and long-term thermal dynamics, Extract state-space parameters and dominant time constants for thermal mass characterization
- Design a double-layer MPC framework: slow layer for load shifting and demand response, fast layer for comfort control
- Implement Kalman filtering to estimate unmeasured structural thermal states

Impact of data length on Modelica-based energy modeling calibration

Nov. 2023 – Apr. 2024

Individual Project|Zhiang Zhang Research Group|UNNC

- Explored the effect of calibration data length on the calibration performance of a Modelica-based MAU model using real operational data from an industrial plant (Tongwei Industry located in Chengdu, China)
- Clean the data to use for calibration and validation to eliminate incorrect data and select the representative subset with different data length from the cleaned data
- Calibrate and validate the MAU model by using 10-kold cross-validation and compare the performance of the model before and after calibration based on simple optimization by using different subsets

Energy-Saving Retrofit and Optimization of Cooling System in PV Plant

Jun. 2023 – Aug. 2023

Individual Project|Zhiang Zhang Research Group|UNNC

- Developed physics-based models of the medium-temperature water system, MAU, and terminal units (DCC) for testing and sensitivity analysis to evaluate the impact of key parameters on system performance
- Conducted sensitivity analysis by integrating measured data with simulation models to address the issues of hardware limitations and missing monitoring points
- Designed and implemented a humidity controller for the terminal system of Tongwei's Chengdu plant, primarily operating with MAU dehumidification and DCC cooling

PUBLICATIONS

- Kong, D., **Jing, J.**, Gu, T., Wei, X., Sa, X., Yang, Y., & Zhang, Z. (2023). Theoretical Analysis of Integrated Community Energy Systems (ICES) Considering Integrated Demand Response (IDR): A Review of the System Modelling and Optimization. *Energies*, 16(10), 4129. [\[DOI\]](#)

WORK EXPERIENCE

Shanghai D-TNRIUG Technology Co., Ltd

Jun. 2023 – Aug. 2023

Model Development Intern

Shanghai, China

- Redesigned thermal zoning for multiple factory buildings to improve the accuracy of models and control strategies, and calibrated thermal zones in the original EnergyPlus models
- Developed and tested a parametric modeling interface in a Docker environment to enable coupled simulations between EnergyPlus and Modelica
- Implemented Python scripts based on hybrid models to conduct error analysis and sensitivity testing, validating model accuracy and robustness under varying load conditions

COURSE PROJECTS

Lecture: Data-driven Design Methods

Jan. 2025 – May. 2025

- Developed surrogate-based RBDO frameworks for beam structures under uncertainty; implemented constraint sampling and MPC-style iterative evaluations to improve data efficiency
- The methodology supports digital twin models of smart buildings by enabling real-time structural adaptation under uncertain loads and improving MPC prediction fidelity via physics-informed surrogate models

Lecture: Advanced Computer Control

Aug. 2024 – Dec. 2024

- Combined MPC with a gradient adaptivity law for vehicle trajectory tracking.
- Integrated the gradient adaptivity law into the MPC framework, using a gain $\alpha = 0.001$ and setting the external disturbance as the error signal. Achieved 98% trajectory tracking accuracy and improved cornering performance by 20% under external disturbances.

Lecture: Smart Energy and the Built Environment

Feb. 2023 – Jun. 2023

- Used Modelica to design an energy system (e.g. schematic diagram of energy system, cost evaluation, sustainable strategy) for a simulated park to meet its supply needs and achieve low carbon operation and high energy efficiency
- Analyze the feasibility of the system to respond to emergencies (e.g. power failure)

Lecture: Environmental Performance Modelling

Sep. 2022 – Jun. 2023

- Coursework 1: Used MATLAB to calculate the cooling load on July 21 for specific buildings (no windows, doors or internal heat sources) with room temperature at 25°C; The internal gains of conduction, convection and radiation were considered
- Coursework 2: Conducted building performance analysis for the Center for Sustainable Landscapes (CSL) in Pittsburgh, USA: developed an IESVE model to capture key characteristics of building performance so as to provide feasible solutions (e.g. Add humidifiers in winter)

TECHNICAL SKILLS

Modeling & Simulation: RC Grey-box Modeling, MPC, Kalman Filtering

Programming & Modeling Languages: Python, MATLAB/Simulink, Modelica

Building Energy Simulation Tools: EnergyPlus, IESVE, DesignBuilder

Other Tools: ANSYS Fluent, Docker