

Arash Jalil Khabbazi, MS

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Research interests

I work on control, machine learning, optimization, and data science for energy systems and buildings.

Education

- Purdue University**, IN, United States 2023 – Present
PhD in Mechanical Engineering — **GPA:** 4.0/4.0
(Minor: Computational Science and Engineering)
Adviser: [Kevin J. Kircher](#)
- University of British Columbia**, BC, Canada 2021 – 2023
MS in Mechanical Engineering — **GPA:** 4.33/4.33 (94%)
Thesis: [Mixing gaseous hydrogen into natural gas distribution pipelines](#)
Adviser: [Sunny Ri Li](#)
- University of Tabriz**, EA, Iran 2016 – 2020
BS in Mechanical Engineering — **GPA:** 4.0/4.0 (19.12/20) — **Rank:** 1/155+
Thesis: *Thermodynamic analysis of Kalina cycle system 11*
Adviser: [S. Mohammad S. Mahmoudi](#)

Publications

Journal articles

2. **A.J. Khabbazi**, E.N. Pergantis, L.D. Reyes Premer, P. Papageorgiou, A.H. Lee, J.E. Braun, G.P. Henze and K.J. Kircher, “Lessons learned from field demonstrations of model predictive control and reinforcement learning for residential and commercial HVAC: A review,” *arXiv preprint*, 2025 ([doi](#))
1. **A.J. Khabbazi**, M. Zabihi, R. Li, M. Hill, V. Chou, and J. Quinn, “Mixing hydrogen into natural gas distribution pipeline system through Tee junctions,” *International Journal of Hydrogen Energy*, 2024. ([doi](#))

Conference proceedings

5. E.N. Pergantis, L.D. Reyes Premer, **A.J. Khabbazi**, Priyadarshan, F. Wu, D. Ziviani and K.J. Kircher, “Active current limiting control of residential appliances for breaker panel protection across the US: a parametric study,” *CISBAT 2025 International Scientific Conference on the Built Environment in Transition*, 2025, *accepted*
4. **A.J. Khabbazi**, E.N. Pergantis, L.D. Reyes Premer, A.H. Lee, J. Ma, H. Liu, G.P. Henze, K.J. Kircher, “What Have We Learned From Field Demonstrations of Advanced Commercial HVAC Control?,” *International High Performance Buildings Conference*, 2024, pp. 1–10. ([doi](#))
3. **A.J. Khabbazi**, M. Zabihi, R. Li, V. Chou, and J. Quinn, “Blending of Hydrogen into a Natural Gas Distribution Pipeline in British Columbia through a Tee Junction for Reducing GHG Emissions,” *Canadian Society for Mechanical Engineering International Congress*, 2023, pp. 1–6. ([doi](#))
2. **A. Khabbazi**, R. Li, and J. Quinn, “Green Hydrogen Supply to Urban Infrastructure and Buildings through Blending into the Existing Grid,” *Canadian Society for Mechanical Engineering International Congress*, 2022, pp. 1–1. ([doi](#))
1. **A. Khabbazi**, R. Li, and J. Quinn, “The Blending and Transmission of Hydrogen and Natural Gas in Transmission and Distribution Pipelines,” *International Green Energy Conference (IGEC-XIII)*, 2021, pp. 1–1. ([doi](#))

Honors & awards

Selected

ASHRAE Graduate Student Grant-in-Aid Award. (link in).	ASHRAE, 2025
Best Paper Award at CSME 2023 Conference. (link in).	CSME, 2023
Best Presentation Award at CSME 2022 Conference, Advanced Energy Symposium. (link in).	CSME, 2022

Others

Purdue University Graduate School "Say It In 6" Finalist.	Purdue, 2024
UBC Graduate Scholarship.	UBC, 2022
UBC Dean's Entrance Scholarship.	UBC, 2021
2 nd rank in CGPA (4.0/4.0) among 155+ students.	BS, 2016 – 2020

Conferences

8th International High Performance Buildings Conference, West Lafayette, USA	07/2024
ASHRAE Winter Conference, Chicago, USA	01/2024
Canadian Society for Mechanical Engineering 2023 Conference, Sherbrooke, Canada	05/2023
Canadian Society for Mechanical Engineering 2022 Conference, Edmonton, Canada	07/2022
13th International Green Energy Conference, Virtual	07/2021

Workshops & seminars

Intelligent Building Operations (IBO) Workshop, West Lafayette, USA	07/2024
What have we learned from field demonstrations of advanced commercial HVAC control? (Recording)	

Industry experience

PhD Intern, Tesla (Reno, NV, United States)	05/2025 – 08/2025
<ul style="list-style-type: none">Developed machine learning models for applications in Drive Unit Inverter team.	
Student Researcher, FortisBC, Renewable Gas Supply (Greater Vancouver, Canada)	09/2021 – 09/2023
<ul style="list-style-type: none">Reviewed project progress and contributed to technical assessments on natural gas pipeline systems, including UBC H₂Lab construction.Analyzed distribution pipeline data and collaborated with the FortisBC team to support renewable gas supply initiatives.	

Research experience

PhD Research Assistant, Purdue University (IN, USA)	09/2023 – Present
<ul style="list-style-type: none">Contributed to the commissioning of Herrick Labs as a testbed for advanced HVAC control by assisting in retrofitting its Building Automation System (BAS) with Tridium Niagara and integrating ModBus for real-time monitoring. Helped develop occupant-facing dashboards for comfort and energy feedback.Developed machine learning models for smart HVAC control at Herrick Labs, using CO₂ sensor data to detect occupancy with 98.3% accuracy. Automated data pipelines in Python and optimized real-time analysis with InfluxDB and Linux, integrating results into control strategies for dynamic energy management.Designed and simulated MPC and DeePC-based HVAC control using MATLAB CVX and Python CVXPY, optimizing energy use and comfort. Evaluated MPC's model-based vs. DeePC's data-driven approach, showing DeePC's ability to match MPC performance without an explicit system model.Reviewed 100+ peer-reviewed studies on field demonstrations of advanced HVAC control in residential and commercial buildings. Used Python and visualization tools to analyze research trends. Presented findings at one conference and one workshop; a high-impact journal review paper is in preparation.Conducted thermodynamic modeling of low-GWP refrigerants in heat pump systems for cold climates. Developed cycle models in EES, analyzing efficiency trade-offs to inform sustainable HVAC design and decarbonization efforts.	

- Conducted a **comprehensive study** on the **injection of hydrogen into natural gas pipelines**, including **CFD analysis**, real gas modeling in **C**, and CAD-based **pipeline design**.
- **Analyzed 1 TB of data**, published **one journal paper**, and presented findings at **three conferences**, earning **two awards**.

Teaching experience

- Co-taught fundamental and specialized **mechanical engineering courses**, including Engineering Analysis I, Fluid Mechanics II Lab, and Heat Transfer Applications Lab.
- Achieved an overall satisfaction rate **exceeding 80%**, based on course evaluations.

Skills

Programming: Python, C, MATLAB, Markdown, Git, HTML, R

Machine Learning & Data Science: TensorFlow, Keras, NumPy, Pandas, scikit-learn, SciPy, Matplotlib, Seaborn

Data Management & Operating Systems: MySQL, Grafana, InfluxDB, Linux

Communication Protocols: Modbus, IO-Link, MTConnect

Engineering Tools: EES, ANSYS Workbench, OpenFOAM, Tecplot, SOLIDWORKS, CATIA

Selected courses

Thermal and Energy Systems: Distributed Energy Resources (ME597) — Analysis of Thermal Systems (ME518) — Advanced Thermodynamics (ME500) — Thermodynamics I&II — Refrigeration Systems — Power Plants — Heat Transfer I

Applied Mathematics & Data Science: Applied Machine Learning (ENGR418) — Statistical Methods (STAT511) — Advanced Mathematics I (MA527) — Numerical Computations

Automation, Control, and IoT: Introduction to Convex Optimization (AAE561) — Industrial IoT Implementation (ME597)

Fluids: Computational Fluid Dynamics (CFD) — Fundamentals of CFD — Multiphase Flows — Turbulence — Fluid Mechanics I&II

Academic services

Society memberships:

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)	2023 – present
Canadian Society for Mechanical Engineering (CSME)	2021 – present

Reviewing:

8th International High Performance Buildings Conference, West Lafayette, USA	07/2024
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Certifications

Supervised Machine Learning: Regression and Classification. (Certificate).	Deep learning.AI
Introduction to Data Science in Python. (Certificate).	Coursera
Applied Plotting, Charting & Data Representation in Python. (Certificate).	Coursera
Python Data Structures. (Certificate).	Coursera