Jiajing Huang

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EDUCATION

Data Science, Analytics and Engineering, Ph.D. 05/2024
Arizona State University, Tempe, AZ, USA
Dissertation: An Information-theoretical Framework for Data-driven Building Automatic Fault Detection and Diagnosis Support (Advisor: Prof. Teresa Wu)

Industrial Engineering, M.S. 12/2020
Arizona State University, Tempe, AZ, USA

Statistics, M.S. 05/2018
Rutgers University, New Brunswick, NJ, USA

Materials Science and Engineering, B.S. 07/2013
Shenzhen University, Shenzhen, Guangdong, P.R. China

RESEARCH INTERESTS

- Data-driven based decision-making support for building fault detection and energy efficiency
- Statistical modeling and machine learning for health informatics, clinical trials and disease diagnosis

PROFESSIONAL EXPERIENCE

Graduate Research Associate 08/2018-07/2024
ASU-Mayo Center for Innovative Imaging, Tempe, AZ, USA
- I have actively involved in the following research projects:

Building research:

- *PIRE: Building Decarbonization via AI-empowered District Heat Pump Systems*, Sponsored by National Science Foundation (NSF), 01/2023 – 08/2025
  - Develop an information-theoretical based causal learning approach for Bayesian network structure constructions to support building fault diagnosis
  - Develop a novel information-theoretical feature extraction on simulation data to support real building fault detection
- *Securing Grid-interactive Efficient Buildings through Cyber Defense and Resilient Systems*, Sponsored by U.S. Department of Energy (DoE), 05/2020 – 12/2023
  - Develop an effective, information-theoretical based decision-making metric for baseline constructions to support building fault detection
  - Propose a deep learning method utilizing signal processing tools for building fault detection via acoustic data analysis
- *PFI-RP: Data-Driven Services for High Performance and Sustainable Buildings*, Sponsored by National Science Foundation (NSF), 09/2018 – 08/2022
  - Develop a robust information-theoretical approach to address multiclass, multivariate imbalance data classification issues
  - Propose a machine learning and statistical inference approach for building simulation analysis

Clinical research:

- Propose a novel information-theoretical decomposition approach for clinical analysis on fMRI brain connectivity data
- Conduct hypothesis testing on clinical trials for patients' headache prediction

Ph.D. Intern – Buildings Research 06/2022-08/2022
Pacific Northwest National Laboratory (PNNL), Richland, WA, USA
- Designed a computational framework for streetlights energy consumption data management at a large scale (1500 streetlights in Portland, OR, and each one has two-year records, each record with 300K+ sensor readings)
- Developed a scalable Python-based pipeline system by integrating multi-modules from the SQL database to support cross-source data processing, utilized MySQL language for data queries, and conducted predictions for long-term energy consumption by using cloud computing platform (Azure and Google Cloud)
- Used Gitlab to manage version control for building research programming codes
- Realized a systematic, integrated approach to manage, organize and analyze the energy consumption data

Research Assistant 09/2017-05/2018
The Cardiovascular Institute of New Jersey, New Brunswick, NJ
- Conducted unsupervised learning (cluster analysis) to analyze factors related to cardiovascular diseases
- Built a personalized disease (Bayesian) network using over 20 symptom factors to support disease diagnosis
- Used R to run experiments on patients' and health data with identified factors to predict likelihood of diseases
- Summarized the experimental clinical discoveries/findings and wrote a research paper

Trainee Consultant 10/2013-10/2014
Productivity (Shenzhen) Consulting Co., Ltd., Shenzhen, Guangdong, P.R. China
Professional training at Hong Kong Productivity Council (HKPC) 01/2014-06/2014
- Assisted with the project management on "General Support Program" aiming to raise the awareness of advanced manufacturing technologies in Hong Kong
- Invited overseas professors from Northwestern and Ohio State as keynote speakers on advanced manufacturing seminars
- Conducted research on simulations of laser-sintered products, estimated optimal production parameters to ensure product qualities and shared these research outcomes through oral presentation to the public

HONORS & AWARDS

Graduate College Completion Fellowship, Arizona State University	2024
SCAI Doctoral Fellowship, Arizona State University	2023
2022-23 Graduate College Travel Award, Arizona State University	2022 & 2023
Data Analytics Competition Finalist, 2022 IISE Annual Conference & Expo	2022
GPSA Travel Award, Arizona State University	2022 & 2023
SCAI Travel Award, Arizona State University	2022 & 2023
2021-22 Graduate College Travel Award, Arizona State University	2021 & 2022
Best Paper Award Finalist (DAIS Track), 2022 IISE Annual Conference & Expo	2021
2020-21 Graduate College Travel Award, Arizona State University	2021
CIDSE Doctoral Fellowship, Arizona State University	2018
University Scholarship (Academic Performance), Shenzhen University	2011
University Scholarship (Social Services), Shenzhen University	2011

PUBLICATIONS

Journal Papers
- **J. Huang**, H. Yoon, T. Wu, K.S. Candan, O. Pradhan, J. Wen and Z. O'Neill, "Eigen-Entropy: A metric for multivariate sampling decisions," *Information Sciences*, vol. 619, pp. 84-97, 2023.
- **J. Huang**, H. Yoon, O. Pradhan, T. Wu, J. Wen, Z. O'Neill and K.S. Candan, "A Cosine-based Correlation Information Entropy Approach for Building Automatic Fault Detection Baseline Construction," *Science and Technology for the Built Environment,* vol. 28, no. 9, pp. 1138-1149, 2022.
- **J. Huang**, J. Wen, H. Yoon, O. Pradhan, T. Wu, Z. O'Neill and K.S. Candan, "Real vs. Simulated: questions on the capability of simulated datasets on building fault detection for energy efficiency from a data-driven perspective," *Energy and Buildings*, vol. 259, pp. 111872, 2022.
- O. Pradhan, D. Halleberg, Z. Chen, J. Wen, N. Varman, **J. Huang**, T. Wu, K.S. Candan, and Z. O'Neill, "Evaluation of Data Imputation Approaches for Multi-Stream Building Systems Data", accepted at *Science and Technology for the Built Environment,* 2024.

Conference Proceedings

- **J. Huang**, T. Li, Y. Xu, T. Wu, H. Yoon, J.R. Charlton and K.M. Bennett, "EE-SMOTE: An oversampling method in conjunction with information entropy for imbalanced learning," in Proceedings of 2022 IISE Annual Conference, 2022, pp. 1-6.
- **J. Huang**, T. Wu, H. Yoon, O. Pradhan, J. Wen and Z. O'Neill, "Automatic Fault Detection Baseline Construction for Building HVAC Systems using Joint Entropy and Enthalpy, " in Proceedings of 2021 IISE Annual. Conference, 2021, pp.536-541. (***This paper is awarded Finalist in IISE Annual Conference (DAIS Track) Best Paper Award***.)

Under Review

- **J. Huang**, N. Ghalamsiah, A. Patharkar, O. Pradhan, M. Chu, T. Wu, J. Wen, Z. O'Neill and K. S. Candan, "An entropy-based causality framework for cross-level fault diagnosis and isolation in building HVAC systems," under review at *Energy and Buildings*.
- A. Patharkar, **J. Huang**, T. Wu, E. Forzani, L. Thomas, M. Lind, N. Gades, "Eigen-Entropy based Time Series Signatures to Support Multivariate Time Series Classification," under review at *Scientific Reports*.
- G. Li, L. Ren, O. Pradhan, J. Wen, Z. Yang, Y. Fu, M. Chu, **J. Huang**, T. Wu, K. S. Candan, V. Adetola, and Q. Zhu, "Emulation and detection of physical faults and cyber-attacks on building energy systems through real-time hardware-in-the-loop experiments," under review at *Energy and Buildings*.
- **J. Huang**, A. Patharkar, T. Wu, J. Wen, Z. O'Neill and K. S. Candan, "A feature extraction framework with entropy on graphs for cross-dataset building fault detection," under review at *IEEE CASE 2024*.
- **J. Huang**, Z. Yang, G. Li, T. Wu, Z. O'Neill, J. Wen and K. S. Candan, "A Data-driven AFDD Approach Using Acoustic Emission In Building HVAC Systems," under review at *the 8th International High Performance Buildings Conference*.

Working Papers

- "An entropy graph-based feature extraction approach for cross-datasets fault detection in building HVAC systems," TBD.
- "EE-GFE: An entropy-based feature extraction on graphs for cognitive disease classification," TBD

INVITED PRESENTATIONS

- Invited Presentation, "An Informatics Framework for Decision-Making Support", CSIE 2023 & the13th CIEDH, Hong Kong University of Science and Technology (Guangzhou), Aug. 11, 2023, Guangzhou, Guangdong, China.
- Invited Talk, "An Informatics Framework for Decision-Making Support", Nanjing University of Science and Technology, Jun. 20, 2023, Nanjing, Jiangsu, China.
- Invited Presentation, "A Cosine-based Correlation Information Entropy Approach for Building Automatic Fault Detection Baseline Construction", 2023 ASHRAE Winter Conference, Feb. 6, 2023, Atlanta, GA.
- Invited Presentation, "EE-SMOTE: An Oversampling Method in Conjunction with Information Entropy for Imbalanced Learning", 2022 IISE Annual Conference & Expo, May 22, 2022, Seattle, WA.
- Invited Presentation, "Eigen-entropy: A Metric For Sampling Design", 2021 INFORMS Annual Meeting, Oct. 25, 2021, Virtual.
- Invited Presentation, "Automatic Fault Detection Baseline Construction for Building HVAC Systems using Joint Entropy and Enthalpy", 2021 IISE Annual Conference & Expo, May. 24, 2021, Virtual.

TEACHING EXPERIENCE

- **IEE 505 Information Systems Engineering** (ASU graduate course, Spring 2024): Served as a teaching assistant for in-person sections. Responsibilities included creating machine learning course materials, leading laboratory sessions, developing course projects, composing exam questions and homework assignments, teaching lessons, and conducting review sessions.
- **IEE 305 Information Systems Engineering** (ASU undergraduate course, Fall 2020): Served as a teaching assistant for in-person sections. Tasks involved authoring and assessing quizzes/tests, instructing during class periods, and leading review sessions.

- **IEE 475 Simulating Stochastic Systems** (ASU undergraduate course, Fall 2018): Served as a teaching assistant for in-person/online sections. Innovated a new laboratory curriculum, created and evaluated quizzes/tests, participated in classroom instruction, and facilitated review.
- **960:540 Statistical Quality Control I** (Rutgers Graduate Course, Spring 2017): Served as a teaching assistant for in-person sections. Responsibilities included composing and grading quizzes/tests, assisting in teaching sessions, and conducting review sessions.

SERVICES

Reviewer:

- Expert Systems with Applications
- Engineering Applications of Artificial Intelligence
- Journal of Medical Imaging
- Science and Technology for the Built Environment
- The 2024 ACM/SIGAPP Symposium on Applied Computing
- IEEE Transactions on Automation Science and Engineering
- IEEE Conference on Automation Science and Engineering (IEEE CASE)

Conference Session Organizing:

- **Session Co-chair**, "Applications of machine learning and AI for physical and mental health", Data Mining (DM) Society. 2024 INFORMS Annual Meeting
- **Session Chair, "**Data-driven vs. Rule-based: The Capability of Data-Driven Solutions for Real-World Applications", Data Mining (DM) Society. 2023 INFORMS Annual Meeting

PROFESSIONAL AFFILIATIONS

- Institute for Operations Research and the Management Sciences (INFORMS)
- Institute of Industrial and Systems Engineers (IISE)
- The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- Upsilon Pi Epsilon

REFERENCES

Teresa Wu, Ph.D.
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