

# Jiajing Huang, Ph.D.

ASU-Mayo Center for Innovative Imaging (AMCII)  
School of Computing and Augmented Intelligence (SCAI)  
Arizona State University, Tempe, AZ 85821, USA

Email: [jhuan177@asu.edu](mailto:jhuan177@asu.edu) | Cell: (732) 319-5732 | Web: <https://horatiowong0713.github.io/>

## EDUCATION

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**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

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- 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

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**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
  - Developed an information-theoretical based causal learning approach for Bayesian network structure constructions to support building fault diagnosis
  - Developed 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
  - Developed an effective, information-theoretical based decision-making metric for baseline constructions to support building fault detection
  - Proposed 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
  - Developed a robust information-theoretical approach to address multiclass, multivariate imbalance data classification issues
  - Proposed a machine learning and statistical inference approach for building simulation analysis

Clinical research:

- *Biomarker Signature to Predict the Persistence of Post-Traumatic Headache*, Sponsored by National Institute of Health (NIH R33/R61), 08/2019 – 07/2025

- Proposed a novel information-theoretical decomposition approach for clinical analysis on fMRI brain connectivity data
- Conducted hypothesis testing on clinical trials for patients' headache prediction
- o *PFI-RP: Avoiding Kidney Injuries with Evidence – Based Smart Technology*, Sponsored by National Science Foundation, 09/2021 – 08/2024
- Coordinated Mayo Clinic with analyses for biomarker monitoring on sepsis prediction on swine

#### **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) from 01/2014 to 07/2014
- 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**

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

### **PUBLICATIONS**

#### **Journal Papers**

- **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," *Energy and Buildings*, vol. 317, pp. 114378, 2024. (Impact Factor: 6.7)

- 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," *Science and Technology for the Built Environment*, pp. 1-14, 2024.
- **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. (Impact Factor: 8.1)
- **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. (Impact Factor: 6.7)

#### Conference Proceedings

- **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," accepted 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," accepted at *the 8th International High Performance Buildings Conference*.
- **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.*)

#### Technical Report

- Z. O'Neill, J. Wen, T. Wu, K.S. Candan, L. Ren, Q. Zhu, G. Li, **J. Huang**, and O. Pradhan. "Securing Grid-interactive Efficient Buildings (GEB) through Cyber Defense and Resilient System (CYDRES)," USDOE Office of Energy Efficiency and Renewable Energy (EERE), Washington, DC, USA, Tech. Rep. DOE-TAMU-EE9150\_Final, 2024. [Online]. Available: <https://doi.org/10.2172/2331215>.

#### Under Review

- 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*.

#### 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

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- Invited Presentation, "A Data-driven AFDD Approach Using Acoustic Emission In Building HVAC Systems", the 8th International High Performance Buildings Conference, Jul. 16, 2024, West Lafayette, IN.
- Invited Presentation, "An Informatics Framework for Decision-Making Support", CSIE 2023 & the 13<sup>th</sup> 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.

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- 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

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- **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

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### 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

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- 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

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### Teresa Wu, Ph.D.

Fulton Professor, School of Computing and Augmented Intelligence  
Professor (affiliated), Department of Radiology, College of Medicine, Mayo Clinic  
Director, ASU-Mayo Center for Innovative Imaging  
Associate Dean for Global Engagement

Email: [teresa.wu@asu.edu](mailto:teresa.wu@asu.edu)

Phone: (480) 965-4157

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**K. Selcuk Candan, Ph.D.**

Professor, School of Computing and Augmented Intelligence, Arizona State University  
Director, Center for Assured and Scalable Data Engineering (CASCADE)

Email: [candan@asu.edu](mailto:candan@asu.edu)

Phone: (480) 965-2770

**Rong Pan, Ph.D.**

Professor, School of Computing and Augmented Intelligence, Arizona State University

Email: [rong.pan@asu.edu](mailto:rong.pan@asu.edu)

Phone: (480) 965-4259

**Jin Wen, Ph.D.**

Professor, Department of Civil, Architectural and Environmental Engineering, Drexel University

Associate Dean for Research and Innovation

Email: [jinwen@drexel.edu](mailto:jinwen@drexel.edu)

Phone: (215) 895-4911

**Zheng O'Neill, Ph.D., P.E.**

J. Mike Walker '66 Career Development Professor

Department of Mechanical Engineering, Texas A&M University

Email: [zoneill@tamu.edu](mailto:zoneill@tamu.edu)

Phone: (979) 845-4931

**Giulia Pedrielli, Ph.D.**

Associate Professor, School of Computing and Augmented Intelligence, Arizona State University

Email: [giulia.pedrielli@asu.edu](mailto:giulia.pedrielli@asu.edu)

Phone: (480) 965-3727