Zhuoli Yin

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Research Interests

AI/ML-Augmented Combinatorial Optimization, Reinforcement Learning, Transportation and Logistics Systems, Sustainable Computing, Intelligent Tutoring Systems

Education

- **Purdue University** *08/2021 - 08/2026 (Expected)*
  ***Ph.D. in Industrial Engineering**, Advisor: Dr. Hua Cai* West Lafayette, IN, USA
  - Graduate Certificate in Applied Statistics
  - Interdisciplinary Computational Science and Engineering Graduate Program

- **Purdue University** *08/2019 - 08/2021*
  ***M.S. in Industrial Engineering**, Advisor: Dr. Hua Cai* West Lafayette, IN, USA

- **Beihang University** *09/2015 - 07/2019*
  ***B.E. in Electronic and Information Engineering**, Advisor: Dr. Xiaoqian Sun* Beijing, China

- **Polytechnic University of Madrid** *02/2019 - 05/2019*
  ***Exchange undergraduate student in Computer Science**, Advisor: Dr. Massimiliano Zanin* Madrid, Spain

Professional Experience

- **Amazon** *06/2025 - 09/2025*
  ***Applied Scientist Intern**, Global Transportation Services* New York, NY, USA
  - Developed Amazon's next-generation AI-driven decision-making tools for resilient and dynamic middle-mile network design.

Publications

Published

[C1] **Yin, Z.**, Ding, Y., Khir, R., & Cai, H. (2026). ViTSP: A Vision Language Models Guided Framework for Large-Scale Traveling Salesman Problems. *(Just accepted) The 14th International Conference on Learning Representations (ICLR).* https://arxiv.org/pdf/2509.23465

[J2] **Yin, Z.**, Bass, K., Karakaya, E., & Cai, H. (2026). Arthur: An Artificial Intelligence Powered Teaching Assistant Tool for Engineering Economy Class. *(Just accepted) International Journal of Artificial Intelligence in Education.*

[J3] Liu, Y., **Yin, Z.**, & Cai, H. (2025). Enhanced global oil spill dataset from 1967 to 2023 based on text-form incident information. *Scientific Data, 12(1), 1-14.* https://doi.org/10.1038/s41597-025-05601-9

[C4] **Yin, Z.**, Kou, Z., & Cai, H. (2023). A Deep Reinforcement Learning Model for Large-Scale Dynamic Bike Share Rebalancing with Spatial-Temporal Context. *In Proceedings of the 12th International Workshop on Urban Computing. ACM, Long Beach.* https://urban-computing.com/urbcomp2023/file/UrbComp2023_paper_7.pdf

[J5] **Yin, Z.**, Hardaway, K., Feng, Y., Kou, Z., & Cai, H. (2023). Understanding the Demand Predictability of Bike Share Systems: A Station-Level Analysis. *Frontiers of Engineering Management, 1-15.* https://doi.org/10.1007/s42524-023-0279-8

Under Review

[1] **Yin, Z.**, Kou, Z., & Cai, H. DeepBike: A Deep Reinforcement Learning Based Model for Large-scale Online Bike Share Rebalancing. *(Under Review) International Journal of Sustainable Transportation.* https://doi.org/10.21203/rs.3.rs-3998473/v1

[2] Li, S., **Yin, Z.**, & Cai, H. Assessing the Food-Emissions-Water-Land (FEWL) Impacts and Reduction Potentials of U.S. Household Diets. *(Under Review) Science of the Total Environment.*

[3] Chen, H., **Yin, Z.**, Jian, X., Dang, M., Chen, W., Cai, H., On-Demand Food Delivery Reshapes Urban Diets and Increases Emissions. *(Under Review) Nature Cities.*

Working Papers

[4] **Yin, Z.**, Khir, R., & Cai, H. Integrated Dynamic Rebalancing and Decentralized Charging Strategies for Electric Scooter Share Systems. *To be submitted to Transportation Research Part-B.*

[5] **Yin, Z.**, Bass, K., Karakaya, E., & Cai, H. Assessing the Effectiveness of An Artificial Intelligence Powered Teaching Assistant System on Student Learning in Engineering Economics Class. *To be submitted to Journal of Engineering Education.*

[6] **Yin, Z.**, Ding, Y., Khir, R. & Cai, H. When do AI use help improve sustainability? An evaluation of marginal benefits and additional costs in transportation models. *To be submitted to Environmental Science & Technology.*

[7] Liu, T., **Yin, Z.**, Hua, I., & Cai, H. Using Data Linkage Approach to Estimate the Urban Industrial Water Uses in the United States. *To be submitted to Environmental Science & Technology.*

PRESENTATIONS

[1] **Yin, Z.**, Ding, Y., Khir, R., & Cai, H. (2026). ViTSP: A Vision Language Models Guided Framework for Large-Scale Traveling Salesman Problems. *Oral Presentation at the 2026 TRB Annual Meeting*, Washington, DC, USA.

[2] **Yin, Z.**, Ding, Y., Khir, R., & Cai, H. (2025). Rethink Artificial Intelligence for Vehicle Routing: Towards Generalization and Sustainability. *Oral Presentation at the 2025 INFORMS Annual Meeting, Job Market Showcase Track*, Atlanta, GA, USA.

[3] **Yin, Z.**, Ding, Y., Khir, R., & Cai, H. (2025). ViTSP: A Vision Language Models Guided Framework for Large-Scale Traveling Salesman Problems. *Oral Presentation at the 2025 IISE Doctoral Colloquium 3MT Competition*, Atlanta, GA, USA.

[4] **Yin, Z.**, Karakaya, E., Bass, K., & Cai, H. (2025). Using Artificial Intelligence Powered Teaching Assistant Tool to Enhance Student Learning in Engineering Economics Class. *Oral Presentation at the 2025 IISE Annual Conference*, Atlanta, GA, USA.

[5] **Yin, Z.**, Khir, R., & Cai, H. (2025). Integrated Dynamic Rebalancing and Charging Strategy for Electric Scooter Sharing System. *Oral Presentation at the 2025 IISE Annual Conference*, Atlanta, GA, USA.

[6] **Yin, Z.**, Ding, Y., Khir, R., & Cai, H. (2025). ViTSP: A Vision Language Models Guided Framework for Large-Scale Traveling Salesman Problems. *Oral Presentation at the 2025 IISE Annual Conference*, Atlanta, GA, USA.

[7] **Yin, Z.**, Khir, R., & Cai, H. (2024). Integrated Dynamic Rebalancing and Charging Strategy for Electric Scooter Sharing System. *Oral Presentation at the 2024 INFORMS Annual Meeting*, Seattle, WA, USA.

[8] **Yin, Z.**, & Cai, H. (2024). DeepBike: A Deep Reinforcement Learning Based Model for Large-scale Online Bike Share Rebalancing. *Poster Presentation at the TRB Annual Meeting 2024*, Washington, DC, USA.

[9] **Yin, Z.**, & Cai, H. (2023). Optimal Rebalancing and Charging Strategies for Life Cycle Net Emissions for Shared Electric Scooter System. *Oral Presentation at the 2023 INFORMS Annual Meeting*, Phoenix, AZ, USA.

[10] **Yin, Z.**, Kou, Z., & Cai, H. (2023). DeepBike: A Deep Reinforcement Learning Based Model for Large-scale Online Bike Share Rebalancing. *Oral Presentation at the 2023 Purdue Research Symposium on Operations*, West Lafayette, IN, USA.

[11] **Yin, Z.**, Kou, Z., & Cai, H. (2023). DeepBike: A Deep Reinforcement Learning Based Model for Large-scale Online Bike Share Rebalancing. *Oral Presentation at the 12th International Workshop on Urban Computing (with KDD 2023)*, Long Beach, CA, USA.

[12] Liu, T., **Yin, Z.**, Hua, I., & Cai, H. (2023). Using Data Linkage Approach to Refine the Industrial Water Consumption Data Resolution in the United States. *Poster Presentation at the Ecological Sciences and Engineering 2023 Symposium*, West Lafayette, IN, USA.

[13] **Yin, Z.**, Kou, Z., & Cai, H. (2022). DeepBike: A Deep Reinforcement Learning Based Model for Large-scale Online Bike Share Rebalancing. *Oral Presentation at the 2022 INFORMS Annual Meeting*, Indianapolis, IN, USA.

[14] **Yin, Z.**, Kou, Z., & Cai, H. (2022). DeepBike: A Deep Reinforcement Learning Based Model for Large-scale Online Bike Share Rebalancing. *Oral Presentation at the 2022 IISE Annual Conference*, Seattle, WA, USA.

Grant Experience

[1] **Initiated the idea, prepared the proposal, and led the project** for "*Developing an AI-powered "TA" tool for IE343 (Engineering Economics)*", 05/2022 - 12/2022, Funder: Innovative Teaching Grant, Purdue University, PIs: Dr. Hua Cai and Dr. Erhan Karakaya, **Status: Awarded**, Amount: $41,481, Media Coverage: (i) A new kind of teaching assistant, (ii) Meet Arthur: Your AI Virtual Teaching Assistant.

[2] **Independently initiated the idea, prepared the proposal, and led the project** for "*Vision-aided Optimization: Transforming Routing Optimization with Generative AI*", 2025, Funder: NSF-CMMI-Operations Engineering, PIs: Dr. Hua Cai, Dr. Reem Khir, and Dr. Yi Ding, **Status: Pending**, Requested amount: $438,868.

[3] **Led the project as a solo student researcher** for "*Understanding the Net Environmental Impacts of AI models in Transportation System Optimization*", 2025, Funder: Graduate Research Grant, Institute for a Sustainable Future, Purdue University, **Status: Awarded**, Amount: $800.

[4] **Actively contributed to the proposal** for "*Autonomous Driving and Control Systems for AI-Based Aviation Baggage Transport Vehicles*", 2024, PIs: Dr. Byung-Cheol Min, Dr. Hua Cai, Dr. Inseok Hwang, and Dr. Damon Lercel, **Status: Not Selected**.

[5] **Initiated the idea, prepared the proposal, and conducted preliminary research** for "*Automating Emission Factor Extraction and Assignment from Life Cycle Assessment Literature*", 2023, Funder: Amazon Research Award, PIs: Dr. Hua Cai and Dr. Dan Goldwasse, **Status: Not Selected**, Requested amount: $102,138.

Research Projects and Collaborations

- **Graduate Research Assistant** *2025*
  Development of Indiana-Specific Trip Generation Procedures & Models of e-Commerce Demand: Implications for INDOT's Travel Demand Modeling and Investment Planning
  - Funder: Indiana Department of Transportation (INDOT)
  - PIs: Dr. Nadia Gkritza and Dr. Hua Cai
  - Responsibility: Co-lead the project and develop agent-based models integrating e-commerce demand with daily personal travel patterns based on survey data in Indianapolis.

- **Graduate Research Assistant** *2022*
  Teaching Innovation Project: Developing an AI-powered "TA" tool for IE343 (Engineering Economics)
  - Funder: Purdue Innovation Hub
  - PIs: Dr. Hua Cai and Dr. Erhan Karakaya
  - Leveraged Gradescope data to develop a web-based intelligent educational tool that predicts causes of incorrect answers and delivers personalized feedback.
  - Collaborated with software engineers and instructors for classroom deployment and evaluated the tool's effectiveness, resulting in two under-reviewed papers.
  - Highlighted by Purdue Today Article (A new kind of teaching assistant), and Purdue InnovatED Graduate Research Magazine (Meet Arthur: Your AI Virtual Teaching Assistant).

- **Graduate Research Assistant** *2021*
  A Computational Approach for Industrial Water Consumption Estimation, Prediction, and Impact Evaluation
  - Funder: Purdue College of Engineering Initiative on Smart City
  - PIs: Dr. Inez Hua and Dr. Hua Cai
  - Responsibility: Co-Led the project and developed optimization model and natural language processing approach for pairing large-scale water withdrawal and discharge.

Teaching Experience

- **Teaching Interests**
  Engineering Economics, Linear Programming, Integer Programming, Dynamic Programming, Stochastic Models, Probability and Statistics, Manufacturing Processes, Supply Chain and Logistics Modeling, Systems Simulation

- **Teaching Certificates** *Fall 2022*
  Certificate in Foundations of College Teaching, Purdue University

- **Instructor, Purdue University** *Fall 2023*
  IE 343 - Engineering Economics (In-person)
  - Enrollment: 148 undergraduate students from 10 different engineering disciplines.
  - Student evaluation score: 4.5 out of 5.0
  - Fully responsible for the class, and supervised two teaching assistants and two graders.
  - Topics covering the time value of money, cash flow analysis, capital depreciation, and cost-benefit analysis.
  - Administered a flipped class model to promote student-centered active learning.
  - Maintained an AI-based virtual teaching assistant tutoring system, supporting the practice of assignments.

◦ Evaluated students' learning outcomes for Accreditation Board for Engineering and Technology (**ABET**)

- **Guest Lecturer, Purdue University** *Fall 2024*
  EEE 560 - Environmental Data Science (In-person)
  ◦ Enrollment: 37 graduate students
  ◦ Developed a session on leveraging artificial intelligence for environmental problem solving using applicable data.
  ◦ Led the discussion on the state-of-the-art artificial intelligence algorithms.
  ◦ Provided feedback to students' group research proposals.

- **Teaching Assistant, Purdue University** *Fall 2021 - Fall 2025*
  IE 343 - Engineering Economics (In-person; Online in Spring 2022 and Summer 2024)
  ◦ Nine sections in total
  ◦ Enrollment: 100-200 undergraduate students per section
  ◦ Average student evaluation scores across eight sections: 4.6 out of 5.0
  ◦ Hosted regular office hours and led the online forum discussion.
  ◦ Mentored graders for developing solution keys and grading assignments.
  ◦ Taught review sessions to facilitate the preparation for the exams.
  ◦ Designed exams and case study projects.
  ◦ Provided ABET assessment materials for the courses.

- **Teaching Assistant, Purdue University** *Spring 2024*
  IE 590 / EEE 595 - Urban Mobility Optimization (In-person)
  ◦ Enrollment: 22 graduate students
  ◦ Student evaluation score: 4.8 out of 5.0
  ◦ Developed example codes to showcase the application of Gurobi modeling.
  ◦ Organized the forum discussion on the latest topics in urban mobility, such as electric vehicles, autonomous vehicles, and ride sharing.
  ◦ Mentored the case study project and supported coding, data processing, and results analysis.

STUDENT MENTORING

- **Quan The Dinh** *08/2023 - 12/2023*
  Undergraduate Student in Computer Science, Purdue University
- **Karen Fortunat, Elaine Sui** *02/2023 - 05/2023*
  Undergraduate Students in Industrial Engineering, Purdue University
- **Laura Almeida Tinjaca** *08/2022 - 02/2023*
  Undergraduate Student with the National University of Colombia-Purdue Program
  ◦ Admitted into MS program in Environmental and Ecological Engineering at Purdue with Lynn Fellowship
- **Kalei Bass** *05/2022 - 08/2022*
  Undergraduate Student in Industrial Engineering, Purdue University

Professional Service

- **Journal Reviewer**
  - *Journal of Cleaner Production*
  - *Networks and Spatial Economics*
  - *IEEE Transactions on Intelligent Transportation Systems (ITS)*
  - *Engineering Applications of Artificial Intelligence*
- **Conference Reviewer**
  - International Symposium for Sustainable Systems and Technology (ISSST) 2024
  - Neural Information Processing Systems (NeurIPS) 2025
  - Transportation Research Board Annual Meeting (TRBAM) 2026
- **External Service to Professional Societies**
  - Session Chair, IISE Annual Conference & Expo 2022
  - Support team, 2023 Purdue Research Symposium on Operations
- **Internal Service at Purdue University**
  - Vice President, Industrial Engineering Graduate Student Organization (05/2022 - 05/2023)
    - Organized the Industrial Engineering research symposium.
    - Coordinated a series of bi-weekly IE graduate student research showcases.
    - Invited external speakers and facilitated workshops on Resume writing
  - Judge, 2022 Summer Undergraduate Research Symposium, College of Engineering (07/2022)
  - Graduate Student Representative, Industrial Engineering Graduate Showcase (08/2022)
  - Moderator, Prospective Ph.D. Student Panel, School of Industrial Engineering (03/2023)
  - Student representative on the faculty search committee (10/2023 - 12/2023)

Honors and Awards

- **IISE Doctoral Colloquium** (3 participants nominated per department), 2025
- **NSF IISE Annual Conference Student Travel Award**, 2025
- **IISE Future Faculty Fellow** (15 participants selected per year), 2024–2025
- **InnovatED Graduate Research Magazine**, Purdue University (10 out of 65 articles selected), 2024
- **Lee A. Chaden Fellowship in Industrial Engineering**, Purdue University, 2023–2024
- **Graduate Student Government Travel Award (Tier 1)**, Purdue University, 2023
- **Graduate School Summer Research Grant**, Purdue University, 2023
- **Frederick N. Andrews Environmental Travel Grant Award**, Purdue University, 2023
- **Student Scholarship**, Seth Bonder Foundation INFORMS, 2022
- **Honorable Mention Poster Award** (5.3% award rate), Purdue Engineering Graduate Showcase, 2022
- **Center for the Environment Travel Grant**, Purdue University, 2022