

Zhuoli Yin

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SUMMARY

I possess extensive experience leveraging big data analytics, advanced artificial intelligence techniques, and operations research methodologies to tackle decision-making and optimization challenges. I have led multiple full life-cycle AI (GenAI & RL) development projects addressing problems in transportation, logistics, and sustainability, following MIOps Principles. I am dedicated to working cross-functionally to deliver scalable and generalizable optimization solutions and have a proven track record of collaborating with and mentoring diverse and multidisciplinary students and teams.

EDUCATION

Purdue University, West Lafayette, IN, USA

Ph.D. Candidate in Operations Research, School of Industrial Engineering (GPA: 3.9/4.0) 8/2021-08/2026(Expected)

- Dissertation: “*Understanding and Optimizing Emerging Systems: from Electrified Mobility to AI*”
 - Fused multimodal generative AI and exact solvers to effectively solve large-scale routing problems.
 - Designed approximate heuristics algorithms to optimize rebalancing and recharging problems for real-world electric-scooter sharing systems
 - Developed an assessment framework to evaluate the energy cost and solution improvement of AI models with different configurations for routing problems to justify the opportunities of responsible computing.
- Graduate Certificate in Applied Statistics; Interdisciplinary Computational Science and Engineering Graduate Program
- M.S. in Operations Research**, School of Industrial Engineering (GPA: 4.0/4.0) 08/2019-08/2021
- Thesis: “*Dynamic Bike Sharing Rebalancing: A Hybrid Framework Based on Deep Reinforcement Learning and Mixed Integer Programming*”
 - Developed a deep reinforcement learning based approach to enable real-time bike rebalancing decisions in bike sharing systems for systems with 600+ service zones, 10+ workers, and 5000+ vehicles.

Beihang University, Beijing, China

B.E., School of Electronic and Information Engineering (GPA: 3.7/4.0, top 5%)

08/2015-07/2019

PROFESSIONAL EXPERIENCE

Amazon.com, New York, NY

Applied Scientist Intern, Global Transportation Services

06/2025-09/2025

- Developed next-generation AI-driven decision-support tools to **modernize middle-mile network design** across fulfillment centers, sortation stations, and delivery stations in the U.S to better manage demand uncertainty.
- Designed a graph neural network-based reinforcement learning framework that **shifts from single-day static optimization to dynamic, resilience-aware network design**, leading to higher promised-delivery rate and measurable reductions in warehouse backlog.
- **Collaborated cross-functionally** with applied scientists and data engineers to build multi-source data pipeline, including national-scale network portfolio, performance metrics, network similarity, and customer demands.
- **Led the full project cycle** from conceptualization, multi-source data analysis, large-scale simulation, AI model training, and minimum viable product (MVP) delivery.

RESEARCH PROJECTS

ViTSP: A Vision Language Models Guided Framework for Large-Scale Traveling Salesman Problems 10/2024 – 08/2025

- Developed a novel hybrid generative AI-OR path enabling large-scale traveling salesman problems (TSPs, more than 10k nodes) optimization where learning-based methods and classical OR methods struggle.
- Leveraged pre-trained Vision Language Models (VLMs) to derive decomposition heuristics without dedicated training for the first time.
- Conducted experimental comparison among TSP baselines to demonstrate ViTSP’s performance. ViTSP outperforms LKH-3 by reducing its gaps by 12% to 100% and consistently surpasses existing learning-based approaches

A Deep Reinforcement Learning Model for Large-Scale Dynamic Bike Share Rebalancing with Spatial-Temporal Context

10/2020 – 10/2021

- Designed deep reinforcement learning models to optimize real-world station inventory for bike share systems, targeting systems with 600+ service zones, 10+ workers, and 5000+ vehicles.
- Enabled real-time rebalancing decision-making to meet high-frequent system operations, surpassing classical mixed-integer programming method and greedy methods.

LLM-based Automating Emission Factor Extraction and Assignment from Literature

01/2023 – 11/2023

- Implemented a real-time workflow for automatically processing JSON and XML-based literature metadata.
- Devised a large language model-powered system for unsupervised emission factor extraction of life cycle assessment literature from long documents with 90%+ accuracy, validated with ground-truth data.
- Collaborated with scholars in computer science and environment to write a proposal for Amazon Research Award.

Developing an AI-powered teaching assistant tool for Engineering Economics*Graduate Research Assistant, Purdue University, West Lafayette, IN, USA*

05/2022-08/2022

- Led a complete development lifecycle of a machine-learning-based educational assistant tool in predicting personalized mistakes and managed a domain-specific dataset of 3,000+ entries.
- Collaborated with software engineers to maintain website functionality over 2 years after implementation.
- Developed novel feature mask-based data augmentation techniques to improve prediction accuracy.
- Initiated copyright disclosure with the Office of Technology Commercialization at Purdue University.

A Computational Approach for Industrial Water Consumption Estimation*Graduate Research Assistant, Purdue University, West Lafayette, IN, USA*

05/2021 – 12/2021

- Implemented advanced natural language processing approaches to classify 20k+ raw Indiana Water Facility records, achieving 85%+ accuracy validated by human experts.

SELECTED PUBLICATIONS

Peer Reviewed & Under Review

- [1] 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>
- [2] 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
- [3] 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>
- [4] Yin, Z., Ding, Y., Khir, R., and Cai, H. ViTSP: A Vision Language Models Guided Framework for Large-Scale Traveling Salesman Problems. (*Under Review*) ICLR 2026. <https://arxiv.org/pdf/2509.23465.pdf>
- [5] Yin, Z., Bass, K., Karakaya, E., & Cai, H. Arthur: An Artificial Intelligence Powered Teaching Assistant Tool for Engineering Economy Class. (*Second-round Review*) *International Journal of Artificial Intelligence in Education*.
- [6] 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*.
- [7] 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*.

Working Papers

- [8] 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*.
- [9] 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*

TEACHING EXPERIENCE

Instructor, Purdue University, IE343 – *Engineering Economics*

08/2023 – 12/2023

- Taught 150 undergraduate students from 10 different engineering disciplines.
- Fully responsible for the class and supervised two teaching assistants and two graders.

Guest Lecturer, Purdue University, EEE560 – *Environmental Data Science*

10/2024 – 10/2024

- Taught 40 graduate students on leveraging artificial intelligence and applicable data for environmental problems.
- Led the discussion on the state-of-the-art artificial intelligence algorithms and provided feedback to students' group research proposals.

AWARDS & HONORS

Graduate Showcase Honorable Mention Poster Award, Purdue (2022); Seth Bonder Foundation Student Scholarship (2022); Graduate School Summer Research Grant, Purdue (2023); Lee A. Chaden Fellowship in Industrial Engineering, Purdue (2023); IISE Future Faculty Fellow (2024); National Science Foundation Student Travel Award (2025)

LEADERSHIP & SERVICE

Vice President, Industrial Engineering Graduate Student Organization, Purdue (2022-2023); Student representative in faculty search committee (2023); Graduate Mentor in research, advised 6 undergraduate students, including 4 women.

SKILLS

- **Programming & Software:** Python (Pandas, NumPy, Matplotlib), Linux, Object-oriented programming, Git, SQL
- **AI & ML:** vLLM, Google Cloud Platform, Hugging Face, AWS, TensorFlow, PyTorch, Scikit-Learning, XGBoost
- **Optimization:** Mixed integer programming, Simulation Optimization, Reinforcement learning, Gurobi, NVIDIA cuOpt
- **Statistics:** Hypothesis testing, Regression analysis, Inferential statistics