

Yifei He | Curriculum Vitae

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My research goal is to build efficient and robust machine learning systems. I work on trustworthy machine learning, including multi-task learning, multimodal learning and domain adaptation/generalization. Recently, I have been working on improving robustness and reliability of foundation models.

Education

University of Illinois Urbana-Champaign (UIUC)

Ph.D. in Computer Science

M.S. in Computer Science

Advisor: Prof. Han Zhao

Urbana, IL, USA

May 2023 - Present

Aug 2021 - May 2023

University of Michigan (UM)

B.S.E. in Data Science, minor in Mathematics

Summa Cum Laude

Ann Arbor, MI, USA

Aug 2019 - Apr 2021

Shanghai Jiao Tong University (SJTU)

B.S.E. in Electrical and Computer Engineering

Shanghai, China

Sept 2017 - Aug 2021

Industry Experience

Amazon

Applied Scientist Intern, Search Science and AI

Mentors: Dr. Xiaohu Xie & Weiyi Lu

Seattle, WA, USA

May 2023 - Aug 2023

- Improved large-scale multi-task pre-finetuning of foundation models by dynamic task weighting.
- Developed a vision-language retrieval foundation model with instruction tuning.

Publications

(* denotes equal contribution)

- [1] Robust Multi-Task Learning with Excess Risks.
Yifei He, Shiji Zhou, Guojun Zhang, Hyokun Yun, Yi Xu, Belinda Zeng, Trishul Chilimbi, Han Zhao.
Under review.
- [2] Gradual Domain Adaptation: Theory and Algorithms.
Yifei He*, Haoxiang Wang*, Bo Li, Han Zhao.
Arxiv preprint.
- [3] Efficient Modality Selection in Multimodal Learning.
Yifei He*, Runxiang Cheng*, Gargi Balasubramaniam*, Yao-Hung Hubert Tsai, Han Zhao.
*In *Journal of Machine Learning Research*. (JMLR 2024)*
(Extended version of publication [5].)
- [4] Generative Gradual Domain Adaptation with Optimal Transport.
Yifei He*, Haoxiang Wang*, Han Zhao.
*In *ICML Principles of Distribution Shift (PODS) Workshop, 2022*.*
- [5] Greedy Modality Selection via Approximate Submodular Maximization.
Runxiang Cheng*, Gargi Balasubramaniam*, **Yifei He***, Yao-Hung Hubert Tsai, Han Zhao.
*In *Proceedings of the 38th Conference on Uncertainty in Artificial Intelligence*. (UAI 2022)*
- [6] A Hierarchical Approach to Multi-Event Survival Analysis.
Donna Tjandra, **Yifei He**, Jenna Wiens.
*In *Proceedings of the 35th AAAI Conference on Artificial Intelligence*. (AAAI 2021)*

- [7] Conformer-RL: A Deep Reinforcement Learning Library for Conformer Generation.
Runxuan Jiang, Tarun Gogineni, Joshua Kammeraad, **Yifei He**, Ambuj Tewari, Paul Zimmerman.
In *Journal of Computational Chemistry*.

Research Experience

Balancing Knowledge and Alignment in LLMs

Urbana, IL, USA

Advisor: Prof. Han Zhao, Department of Computer Science, UIUC

Nov 2023 - Present

- Use task vector arithmetic to balance pre-trained knowledge and instruction-following abilities in LLMs.

Multi-Objective Optimization for Robust Multi-task Learning

Urbana, IL, USA

Advisor: Prof. Han Zhao, Department of Computer Science, UIUC

July 2022 - Present

- Developed an adaptive task balancing algorithm using excess risk estimation to address task noise.
- First-authored paper under review.

Generative Gradual Domain Adaptation

Urbana, IL, USA

Advisor: Prof. Han Zhao, Department of Computer Science, UIUC

Mar 2022 - Sept 2022

- Developed a framework to generate intermediate domains, improving domain adaptation under large distribution shift, alleviating the burden of data collection and extending the applications of gradual domain adaptation (GDA).
- First-authored publication at ICML PODS workshop 2022.

Modality Selection in Multimodal Learning

Urbana, IL, USA

Advisor: Prof. Han Zhao, Department of Computer Science, UIUC

Aug 2021 - June 2022

- Theoretically proved how to select the most informative subset of modalities given computational constraints.
- First-authored publication at UAI 2022.
- First-authored extended version published at JMLR.

Reinforcement Learning (RL) for Sequential Conformer Search

Ann Arbor, MI, USA

Advisor: Prof. Ambuj Tewari, Department of Statistics, UM

July 2020 - Apr 2021

- Applied RL algorithms to efficiently find the most stable structure of large molecules.
- Publication at Journal of Computational Chemistry.
- Open-sourced Python library "conformer-rl".

Deep Learning for Multi-Event Survival Analysis

Ann Arbor, MI, USA

Advisor: Prof. Jenna Wiens, Department of Computer Science, UM

Apr 2020 - Sept 2020

- Applied multi-task and hierarchical learning to better model the inter-event relations in survival analysis.
- Publication at AAAI 2021.

Professional Service

Reviewer: UAI, NeurIPS, ICLR, AISTATS, ICML

Teaching Experience

CS 357 Numerical Methods I (UIUC)

2022 Fall, 2022 Spring

CS 441 Applied Machine Learning (UIUC)

2021 Fall

EECS 445 Intro to Machine Learning (UM)

2020 Fall

Skills

Programming: Python, Java, C++, Matlab, R, \LaTeX , Mathematica

Framework: PyTorch, TensorFlow, Keras, DeepSpeed, Gym