

# Yifei He | Curriculum Vitae

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My research interest is centered around trustworthy machine learning. I currently work on i) improving the multi-task capabilities of foundation models and ii) multi-objective LLM alignment. Previously, I have also worked on multimodal learning and domain adaptation/generalization.

## 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.  
*Under review*

### [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 [4].)

### [4] 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**)

### [5] 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**)

### [6] 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

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### 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

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**Reviewer:** UAI, NeurIPS, ICLR, AISTATS, ICML

## Teaching Experience

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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

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

**Framework:** PyTorch, DeepSpeed, TensorFlow, Keras, Gym