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) — **Urbana, IL, USA**
Ph.D. in Computer Science — *May 2023 - Present*
M.S. in Computer Science — *Aug 2021 - May 2023*
Advisor: Prof. Han Zhao

University of Michigan (UM) — **Ann Arbor, MI, USA**
B.S.E. in Data Science, minor in Mathematics — *Aug 2019 - Apr 2021*
Summa Cum Laude

Shanghai Jiao Tong University (SJTU) — **Shanghai, China**
B.S.E. in Electrical and Computer Engineering — *Sept 2017 - Aug 2021*

Industry Experience

Amazon — **Seattle, WA, USA**
Applied Scientist Intern, Search Science and AI — *May 2023 - Aug 2023*
Mentors: Dr. Xiaohu Xie & Weiyi Lu

- 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

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 - Oct 2023*

- 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, DeepSpeed, TensorFlow, Keras, Gym