Hao Bai

MS in Computer Science, UIUC

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Interests: Reinforcement Learning, Representation Learning

Education

MS in Computer Science	UIUC, USA	Aug 2023 - May 2025
BS in Computer Engineering (Dual)	UIUC, USA	Aug 2019 - May 2023
BE in Computer Engineering (Dual)	Zhejiang University, China	Sep 2019 - Jul 2023

Professional Experience

UC Berkeley **Dec 2023 - Present**

Visiting Scholar, Advisor: Sergey Levine, Yi Ma *Berkeley, CA*

- Reinforcement learning algorithms and environments for visual language agents.
- Mathematically principled language transformer architectures with better neuron-level interpretability.

Microsoft Research **Nov 2022 - May 2023**

Research Intern, Advisor: Shilin He *Beijing, CN*

- Language-model-based large-scale outage interpretation and prediction.

Selected Papers

DigiRL: Training Real-World GUI Agents with Scaled Autonomous RL [PDF] ***Preprint***

Hao Bai*, *Yifei Zhou**, *Mert Cemri, Jiayi Pan, Alane Suhr, Sergey Levine, Aviral Kumar* *UC Berkeley*

- Proposed DigiRL, the first algorithmic framework for task-solving Android agents using RL, and introduced a hierarchical reinforcement learning algorithm that achieves 300% better performance than current state-of-the-art methods. I'm the equally main technical contributor in this project.

RL4VLM: Fine-Tuning Large VLMs as Decision-Making Agents via RL [PDF] ***Preprint***

*Y. Zhai, **H. Bai**, J. Pan, S. Tong, Y. Zhou, A. Suhr, S. Xie, Y. LeCun, Y. Ma, S. Levine* *UC Berkeley*

- Proposed an algorithmic framework to fine-tune VLMs with RL, which provides a task description and then prompts it to generate chain-of-thought (CoT) reasoning to enable the VLM to efficiently explore intermediate reasoning steps that lead to the final text-based action. I proposed and implemented format-oriented auto-regressive fine-tuning for better policy initialization, and managed most scaling-up and speed optimization.

White-Box Transformers via Sparse Rate Reduction: Compression Is All There Is? [PDF] ***JMLR***

*Y. Yu, S. Buchanan, D. Pai, T. Chu, Z. Wu, S. Tong, **H. Bai**, Y. Zhai, B. Haeffele, Y. Ma* *UC Berkeley*

- As part of the research, I designed and pre-trained two mathematically principled language transformers, CRATE-BERT and CRATE-GPT, and empirically show that the architecture is scalable to the GPT-2 level with a comparable performance when halving the parameter size.

Progressive Responses with Real-Time Internet Search for Conversations [PDF] ***WSDM'24***

*Revanth Reddy, Sharath Suresh, **Hao Bai**, ..., Chengxiang Zhai* *UIUC*

- As a participant of the Alexa SocialBot challenge, I implemented the progressive response generation to blend search results into the bot's responses while ensuring low response latency, which cuts down user waiting time by 50%.

Social Conversational Commonsense-Guided Search Query Generation [PDF] ***EMNLP'23***

*Revanth Reddy, **Hao Bai**, Wentao Yao, Sharath Suresh, Heng Ji, Chengxiang Zhai* *UIUC*

- I was in charge of most of the implementation in this work. We proposed to integrate commonsense knowledge to the query generator by generating initial responses from a commonsense response generator and followed by distilling knowledge from LLM. Our model outperforms zero-shot T5 on the quality of the generated query and also final response.

Leadership

- Co-leader of the DigiRL project. Advised by Aviral Kumar and Sergey Levine.
- Led a small group in the EMNLP'23 project. Advised by Chengxiang Zhai.
- Leader of CS441 course project and a campus application.