SHU ZHAO

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RESEARCH INTERESTS

My research focuses on developing tool-using agents, particularly search agents, that can effectively interact with external environments, leveraging LLM post-training techniques to improve model performance, alignment, and specialized capabilities for autonomous and practical AI systems. Additionally, I investigate robust and parameter-efficient fine-tuning approaches for vision-language models, working to develop methods that enhance multimodal performance while maintaining computational efficiency and generalization across diverse visual and textual tasks. These research directions converge on creating more capable, reliable, and versatile AI systems that can better understand and interact with the complex, multimodal world.

EDUCATION

The Pennsylvania State University–University Park *Aug. 2022 - Dec. 2025 (Expected)*
Ph.D. in Computer Science *Pennsylvania, USA*

University of Chinese Academy of Sciences *Sep. 2018 - Jun. 2021*
M.E. in Computer Technology *Beijing, China*

Anhui University *Sep. 2013 - Jun. 2017*
B.E. in Information Security *Anhui, China*

PUBLICATIONS AND PREPRINTS

1. **Beyond the limitation of a single query: Train your LLM for query expansion with Reinforcement Learning**.
   arXiv:2510.10009. 2025.
   Shu Zhao, Tan Yu, Anbang Xu.
2. **ParallelSearch: Train your LLMs to Decompose Query and Search Sub-queries in Parallel with Reinforcement Learning**.
   arXiv:2508.09303. 2025.
   Shu Zhao, Tan Yu, Anbang Xu, Japinder Singh, Aaditya Shukla, Rama Akkiraju.
3. **Windsock is Dancing: Adaptive Multimodal Retrieval-Augmented Generation**.
   UniReps Workshop @ Neural Information Processing Systems (**NeurIPS Workshop**), 2025.
   Shu Zhao, Tianyi Shen, Nilesh Ahuja, Omesh Tickoo, Vijaykrishnan Narayanan.
4. **HRScene: How Far Are VLMs from Effective High-Resolution Image Understanding?**
   International Conference on Computer Vision (**ICCV**), 2025.
   Yusen Zhang, Wenliang Zheng, Aashrith Madasu, Peng Shi, Ryo Kamoi, Hao Zhou, Zhuoyang Zou, **Shu Zhao**, Sarkar Snigdha Sarathi Das, Vipul Gupta, Xiaoxin Lu, Nan Zhang, Ranran Haoran Zhang, Avitej Iyer, Renze Lou, Wenpeng Yin, Rui Zhang.
5. **Rethinking the Safety Landscape for Foundation Models: A Multi-Modal Perspective**
   Building Foundation Models You Can Trust Workshop @ International Conference on Computer Vision (**ICCV Workshop**), 2025.
   Xi Li, **Shu Zhao**, Fei Zhao, Runlong Yu.
6. **SafeMap: Robust HD Map Construction from Incomplete Observations**.
   International Conference on Machine Learning (**ICML**), 2025.
   Xiaoshuai Hao, Lingyu Liu, Yunfeng Diao, Rong Yin, Pengwei Wang, Jing Zhang, Lingdong Kong, **Shu Zhao**.
7. **Learning Conditional Space-Time Prompt Distributions for Video Class-Incremental Learning**.
   Computer Vision and Pattern Recognition (**CVPR**), 2025.
   Xiaohan Zou, Wenchao Ma, **Shu Zhao**.

8. **Insect Agent: Improving Insect Recognition via Dynamic Knowledge Augmentation Using Multi-modal Large Language Models**.
   IEEE Computer Society Annual Symposium on VLSI (**ISVLSI**), 2025.
   Shu Zhao, Ajay Narayanan Sridhar, Harland Patch, Vijaykrishnan Narayanan.
9. **KALAHash: Knowledge-Anchored Low-Resource Adaptation for Deep Hashing**.
   AAAI Conference on Artificial Intelligence (**AAAI**), 2025.
   Shu Zhao, Tan Yu, Xiaoshuai Hao, Wenchao Ma, Vijaykrishnan Narayanan.
10. **MapFusion: A Novel BEV Feature Fusion Network for Multi-modal Map Construction**.
    Information Fusion. 2025.
    Xiaoshuai Hao, Yunfeng Diao, Mengchuan Wei, Yifan Yang, Peng Hao, Rong Yin, Hui Zhang, Weiming Li, **Shu Zhao**, Yu Liu.
11. **Reconstruct before Query: Continual Missing Modality Learning with Decomposed Prompt Collaboration**.
    arXiv:2403.11373. 2024.
    Shu Zhao, Xiaohan Zou, Tan Yu.
12. **Less is More: Toward Zero-Shot Local Scene Graph Generation via Foundation Models**.
    arXiv:2310.01358. 2023.
    Shu Zhao, Huijuan Xu.
13. **NEUCORE: Neural Concept Reasoning for Composed Image Retrieval**.
    UniReps Workshop @ Neural Information Processing Systems (**NeurIPS Workshop**), 2023.
    Shu Zhao, Huijuan Xu.
14. **Rescuing Deep Hashing from Dead Bits Problem**.
    International Joint Conference on Artificial Intelligence (**IJCAI**), 2021.
    Shu Zhao, Dayan Wu, Yucan Zhou, Bo Li, Weiping Wang.
15. **Technical Report for EPIC-KITCHENS-100 2021 Multi-Instance Retrieval Challenge**.
    EPIC-Kitchens Challenges @ Computer Vision and Pattern Recognition (**CVPR Workshop**), 2021.
    Xiaoshuai Hao, Wanqian Zhang, Dejie Yang, **Shu Zhao**, Dayan Wu, Bo Li, Weiping Wang.
16. **Asymmetric Deep Hashing for Efficient Hash Code Compression**.
    ACM International Conference on Multimedia (**ACM MM, Oral**), 2020.
    Shu Zhao, Dayan Wu, Wanqian Zhang, Yu Zhou, Bo Li, Weiping Wang.

RESEARCH EXPERIENCE

Machine Learning Engineer Intern @ NVIDIA. Santa Clara, California, USA *May. 2025 - Aug. 2025*
Advised by Dr. Tan Yu, Japinder Singh, Dr. Anbang Xu, Aaditya Shukla

Topic: Deep Search Agent with Reinforcement Learning with Verifiable Rewards; Deep Research Agent

Research Intern @ Baidu Research. Beijing, China *Apr. 2022 - Jul. 2022*
Advised by Dr. Tan Yu

Topic: Large Multimodal Models for Image Retrieval

Research Assistant @ IIE, Chinese Academy of Sciences. Beijing, China *Mar. 2019 - Jun. 2021*
Advised by Prof. Dayan Wu and Prof. Bo Li

Topic: Deep Image Hashing

REVIEW SERVICES

Annual Conference on Neural Information Processing Systems (NeurIPS)

Computer Vision and Pattern Recognition (CVPR)

International Conference on Computer Vision (ICCV)

ACM International Conference on Multimedia (ACM MM)