

Xinran Zhao

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RESEARCH FOCUS

My research probes the intersection of Natural Language Processing (NLP) and Machine Learning (ML). My recent focus is on improving the **retrieval** and **planning** capabilities of large language models (LLM) in complex and realistic scenarios, including reasoning, scientific question answering, symbolic planning, code generation, and video understanding. Currently, I am interested in studying how to measure and address the uncertainty in various components during LLM information seeking and utilization.

EDUCATION

- 2023– **Ph.D. student at Language Technologies Institute (LTI),**
Carnegie Mellon University, PA
Advisor: Tongshuang Wu
- 2021–23 **M.S. of Computer Science**
Stanford University, CA
Advisor: Christopher Manning
- 2016–20 **B.Eng. in Computer Science and Engineering**
Hong Kong University of Science and Technology, Hong Kong
Advisor: Yangqiu Song, Dit-Yan Yeung
- 2018–19 **Exchange student in Computer Science and Engineering**
Cornell University, NY
Advisor: Claire Cardie

PROFESSIONAL EXPERIENCE

- 2025 **The Allen Institute for Artificial Intelligence**, Research Intern [P.1]
with Varsha Kishore, Aakanksha Naik, Joseph Chang, Jay DeYoung, and Jena Hwang
May 2025 - Dec 2025, Seattle
- 2024 **Google DeepMind**, Student Researcher [P.2, P.7, PT.1]
with Azade Nova and Hanie Sedghi
May 2024 - Nov 2024, Mountain View
- 2022,23 **Tencent AI Lab @ Bellevue**, Research Intern in NLP [P.17, P.11]
with Hongming Zhang, Xiaoman Pan, Wenlin Yao, Dong Yu, and Jianshu Chen
June 2022 - Sep 2022; June 2023 - Aug 2023, Bellevue
- 2021–23 **Stanford NLP Group**, Research Assistant [P.21, W.2]
with Dr. Shikhar Murty and Prof. Christopher Manning
Oct 2021 - June 2023, Stanford

- 2020-21 **HKUST ML Group**, Research Assistant [P.19, W.5]
with Prof. Dit-Yan Yeung
 Sep 2020 - Feb 2021, HKUST
- 2019-21 **HKUST KnowComp Group**, Research Assistant [P.27, P.25, P.23, P.22]
with Prof. Yangqiu Song
 June 2019 - August 2021, HKUST
- 2019-20 **Cornell NLP Group**, Research Assistant [P.24]
with Dr. Esin Durmus and Prof. Claire Cardie
 Oct 2019 - August 2020, Cornell

PUBLICATIONS

Manuscripts and Pre-prints

* denotes equal contribution

- 2025 P.1 **Xinran Zhao**, Aakanksha Naik, Jay DeYoung, Joseph Chee Chang, Jena D. Hwang, Tongshuang Wu, and Varsha Kishore. Improving Attributed Long-form Question Answering with Intent Awareness. In *Submission*, 2025
- P.2 **Xinran Zhao**, Hanie Sedghi, Azade Nova, and Tongshuang Wu. Pivot-ICL: Adaptive Exemplar Selection for In-Context Learning. In *Submission*, 2025
- P.3 **Xinran Zhao**, Boyuan Zheng, Chenglei Si, Haofei Yu, Ken Liu, Runlong Zhou, Ruochen Li, Tong Chen, Xiang Li, Yiming Zhang, and Tongshuang Wu. **The Ramon Llull's Thinking Machine for Automated Ideation**. In *Submission*, Presented at LM4Sci @ COLM 2025
- P.4 Danqing Wang*, Zhuorui Ye*, **Xinran Zhao***, Fei Fang, and Lei Li. **Strategic Planning and Rationalizing on Trees Make LLMs Better Debaters**. In *Submission (on arXiv)*, 2025
- P.5 Fengyu Cai, Tong Chen, **Xinran Zhao**, Sihao Chen, Hongming Zhang, Tongshuang Wu, Iryna Gurevych, and Heinz Koepll. **Revela: Dense Retriever Learning via Language Modeling**. In *Submission (on arXiv)*, 2025
- P.6 Yixiao Zeng, Tianyu Cao, Danqing Wang, **Xinran Zhao**, Zimeng Qiu, Morteza Ziyadi, Tongshuang Wu, and Lei Li. **RARE: Retrieval-Aware Robustness Evaluation for Retrieval-Augmented Generation Systems**. In *Submission (on arXiv)*, 2025

Peer-reviewed Conference and Journal Publications

* denotes equal contribution

- 2025 P.7 **Xinran Zhao**, Hanie Sedghi, Bernd Bohnet, Dale Schuurmans, and Azade Nova. **Improving Large Language Model Planning with Action Sequence Similarity**. In *Proceedings of the 13th International Conference on Learning Representations*, ICLR 2025
- P.8 **Xinran Zhao***, Jushaan Singh Kalra*, To Eun Kim, Fengyu Cai, Fernando Diaz, and Tongshuang Wu. **MoR: Better Handling Diverse Queries with a Mixture of Sparse, Dense, and Human Retrievers**. In *In Proceedings of the 2025 Conference on Empirical Methods in Natural Language Processing*, EMNLP 2025

- P.9 Yilin Zhang, **Xinran Zhao**, Zora Zhiruo Wang, Chenyang Yang, Jiayi Wei, and Tongshuang Wu. **cAST: Enhancing Code Retrieval-Augmented Generation with Structural Chunking via Abstract Syntax Tree**. In *Findings of the 2025 Conference on Empirical Methods in Natural Language Processing*, EMNLP 2025
- P.10 Qianou Ma*, Dora Zhao*, **Xinran Zhao**, Chenglei Si, Chenyang Yang, Ryan Louie, Ehud Reiter, Diyi Yang+, and Tongshuang Wu+. **SPHERE: An Evaluation Card for Human-AI Systems**. In *Findings of the 63rd Annual Meeting of the Association for Computational Linguistics*, ACL 2025
- 2024 P.11 **Xinran Zhao**, Hongming Zhang, Xiaoman Pan, Wenlin Yao, Dong Yu, Tongshuang Wu, and Jianshu Chen. **Fact-and-Reflection (FaR) Improves Confidence Calibration of Large Language Models**. In *Findings of the 62nd Annual Meeting of the Association for Computational Linguistics*, ACL 2024
- P.12 Fengyu Cai, **Xinran Zhao**, Hongming Zhang, Iryna Gurevych, and Heinz Koepll. **GeoHard: Towards Measuring Class-wise Hardness through Modelling Class Semantics**. In *Findings of the 62nd Annual Meeting of the Association for Computational Linguistics*, ACL 2024
- P.13 **Xinran Zhao**, Tong Chen, Sihao Chen, Hongming Zhang, and Tongshuang Wu. **Beyond Relevance: Evaluate and Improve Retrievers on Perspective Awareness**. In *Proceedings of the 1st Conference on Language Modeling*, COLM 2024
- P.14 Tong Chen, Hongwei Wang, Sihao Chen, Wenhao Yu, Kaixin Ma, **Xinran Zhao**, Hongming Zhang, and Dong Yu. **Dense X Retrieval: What Retrieval Granularity Should We Use?**. In *Proceedings of the 2024 Conference on Empirical Methods in Natural Language Processing*, EMNLP 2024
- P.15 Cheng Qian, **Xinran Zhao**, and Tongshuang Wu. **"Merge Conflicts!" Exploring the Impacts of External Distractors to Parametric Knowledge Graphs**. In *Proceedings of the 1st Conference on Language Modeling*, COLM 2024
- P.16 Fengyu Cai, **Xinran Zhao**, Tong Chen, Sihao Chen, Hongming Zhang, Iryna Gurevych, and Heinz Koepll. **MixGR: Enhancing Retriever Generalization for Scientific Domain through Complementary Granularity**. In *Proceedings of the 2024 Conference on Empirical Methods in Natural Language Processing*, EMNLP 2024
- 2023 P.17 **Xinran Zhao**, Hongming Zhang, Xiaoman Pan, Wenlin Yao, Dong Yu, and Jianshu Chen. **Thrust: Adaptively Propels Large Language Models with External Knowledge**. In *Proceedings of the 37th Conference on Neural Information Processing Systems*, NeurIPS 2023
- P.18 Xiang Li, Jiangwei Yu, **Xinran Zhao**, Hongming Zhang, and Yu-Xiong Wang. **Video State-changing Object Segmentation**. In *Proceedings of the IEEE/CVF International Conference on Computer Vision*, ICCV 2023

- P.19 **Xinran Zhao**, Esin Durmus, and Dit-Yan Yeung. *Towards Reference-free Text Simplification Evaluation*. In *Findings of the 61st Annual Meeting of the Association for Computational Linguistics*, ACL 2023
- 2022 P.20 BIG bench collaboration. *Beyond the Imitation Game: Quantifying and extrapolating the capabilities of language models*. In *Transactions on Machine Learning Research*, TMLR 2022
- P.21 **Xinran Zhao***, Shikhar Murty*, and Christopher Manning. *On Measuring the Intrinsic Few-Shot Hardness of Datasets*. In *Proceedings of the 2022 Conference on Empirical Methods in Natural Language Processing*, EMNLP 2022
- P.22 **Xinran Zhao**, Hongming Zhang, and Yangqiu Song. *PCR4ALL: A Comprehensive Evaluation Benchmark for Pronoun Coreference Resolution*. In *Proceedings of the Language Resources and Evaluation Conference*, LREC 2022
- P.23 Ziqian Zeng, Weimin Ni, Tianqing Fang, Xiang Li, **Xinran Zhao**, and Yangqiu Song. *Weakly Supervised Text Classification Using Supervision Signals from a Language Model*. In *Findings of the 2022 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, NAACL 2022
- 2021 P.24 **Xinran Zhao**, Esin Durmus, Hongming Zhang, and Claire Cardie. *Leveraging Topic Relatedness for Argument Persuasion*. In *Findings of the 59th Annual Meeting of the Association for Computational Linguistics*, ACL 2021
- P.25 Nedjma Ousidhoum, **Xinran Zhao**, Tianqing Fang, Yangqiu Song, and Dit-Yan Yeung. *Probing Toxic Content in Large Pre-Trained Language Models*. In *Proceedings of the 59th Annual Meeting of the Association for Computational Linguistics*, ACL 2021
- P.26 Yue Xi, Jiale Huo, **Xinran Zhao**, Yushi Jiang, and Qiang Yang. *The Effects of Fear of Missing Out on Social Media Posting Preferences*. In *European Journal of Marketing*, EJM 2021
- 2020 P.27 **Xinran Zhao***, Hongming Zhang*, and Yangqiu Song. *WinoWhy: A Deep Diagnose of Essential Commonsense Knowledge for Answering Winograd Schema Challenge*. In *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics*, ACL 2020

Workshop Papers, Technical Reports, and Extended Abstracts

- 2024 W.1 Zirui Wang, **Xinran Zhao**, Simon Stepputtis, Woojun Kim, Tongshuang Wu, Katia P. Sycara, and Yaqi Xie. *HiMemFormer: Hierarchical Memory-Aware Transformer for Multi-Agent Action Anticipation*. In *VLM Workshop @ 38th Conference on Neural Information Processing Systems*, VLM @ NeurIPS 2024
- 2022 W.2 **Xinran Zhao**(lead), Tina Li, Xiaoyuan Ni, and Christopher Manning (advising). *Can Pre-trained Language Models Understand Definitions?*. In *CS 224N Final Project*, Stanford 2022

- 2021 W.3 Hongming Zhang, **Xinran Zhao**, and Yangqiu Song. *A Brief Survey and Comparative Study of Recent Development of Pronoun Coreference Resolution in English*. In *4th Workshop on Computational Models of Reference, Anaphora and Coreference @ Conference on Empirical Methods in Natural Language Processing*,
CRAC @ EMNLP 2021
- W.4 Hongming Zhang, Yintong Huo, **Xinran Zhao**, Yangqiu Song, and Dan Roth. *Learning Contextual Causality between Daily Events from Time-consecutive Images*. In *Causality in Vision Workshop @ IEEE/CVF Conference on Computer Vision and Pattern Recognition*,
CIV @ CVPR 2021
- W.5 **Xinran Zhao**. An Online Learning Platform with Natural Language Processing Supported Teaching Assistant. In *Final Year Project, advised by Dit-Yan Yeung*,
HKUST 2021

Patents

- 2025 PT.1 **Xinran Zhao**, Hanie Sedghi, Bernd Bohnet, Dale Schuurmans, and Azade Nova. Improving Large Language Model Planning with Action Sequence Similarity.
US Patent (submitted), 2025

SELECTED HONORS AND AWARDS

- 2025 Amazon AI PhD Fellowship (2-year full tuition and stipend)
- 2024 Google RSGCP Award on LLM Planning (\$30,000)
Google RS Conference Scholarship Travel (\$3,000)
- 2021 HKUST Academic Achievement Medal (Top 1%)
- 2016-20 Continuous Undergraduate Scholarship (Top 5%)
First Class Honors, Dean's List for active semesters

COLLABORATION AND MENTORING EXPERIENCE

- 2024-25 **Yilin Zhang** (CMU MS, now interning at Google)
Retrieval augmented code generation [P.9].
- Jushaan Kalra** (CMU MS, now interning at JP Morgan)
Multi-domain retrieval augmented generation [P.8].
- Zhuorui Ye** (visited CMU, now PhD student at Princeton University)
Agents for Competitive Debates [P.4].
- Jack Zeng** (CMU MS, now interning at Amazon)
Scaled time-sensitive multi-domain retrieval evaluation [P.6].
- 2023 **Cheng Qian** (visited CMU, now PhD student at UIUC)
Knowledge Conflicts between external and parametric model knowledge [P.15].
- 2022-24 **Fengyu Cai** (HKUST senior student, now PhD student at TU Darmstadt)
Retrieval augmented generation and data hardness [P.5, P.16, P.12].

INVITED TALKS

- 2025 **Improving Large Language Model Planning with Action Sequence Similarity**
H2 Group at UW (Summer 2025)
- 2024 **Improving Large Language Model Planning with Action Sequence Similarity**
Google DeepMind Internal Talk (Summer 2025)
Towards Building Retrieval Systems in Complex Realistic Scenarios
Samaya AI (Summer 2024)
- 2022 **On Task Difficulty of Few-shot Learning**
ICML 2022 Commonsense Tutorial (Summer 2022)
NLP as a Tool for Scientific Discovery
Department of Marketing @ the National University of Singapore (Spring 2022)

PROFESSIONAL SERVICE

Teaching Assistant

- 2025 CMU LTI 11763: Inference Algorithms for Language Modeling
2020 HKUST COMP 4332: Big Data Mining and Management (affiliated helper)

Area Chair

- NLP **ACL 2024–25, EMNLP 2024–25, NAACL 2025**

Paper Reviewer

- NLP **ACL 2020–23, EMNLP 2021–23, EACL 2023–24, NAACL 2021–24, AACL 2023**
ML **NeurIPS 2024–25, ICLR 2025, AAAI 2023–24, AKBC 2021**
CV **ECCV 2022**

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