Ziyu Yao

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Research Interests

I am interested in broad Natural Language Processing and Artificial Intelligence problems, particularly building natural language interfaces (e.g., question-answering systems) that can reliably and safely interact with humans while assisting them in knowledge discovery and task completion. Many of my papers are about interdisciplinary research topics, such as AI/NLP for Software Engineering, Education, Healthcare, and Psychology. Recently I have become very interested in Large Language Models (LLMs), including their applications for planning and reasoning, the safety and trustworthiness problems around them, and LLM interpretability.

Education

2015–2021   **Ph.D.**, The Ohio State University (OSU), Computer Science & Engineering.
(Thesis: On Advancing Natural Language Interfaces: Data Collection, Model Development, and User Interaction. Advisor: Prof. Huan Sun)

2011–2015   **B.E.**, Beijing University of Posts and Telecommunications (BUPT), Communication Engineering.

Professional Experience

2021–present   **Assistant Professor**, George Mason University (GMU).
Affiliation: C4I & Cyber Center, Center for Advancing Human-Machine Partnership, and Institute for Digital InnovAtion (IDIA) at GMU

2021 Summer   **Research Intern**, Microsoft Corporation (Mentor: Anthony Platanios).

2020 Summer   **Research Intern**, Carnegie Mellon University (Mentor: Graham Neubig).

2018 Summer   **Research Intern**, Microsoft Corporation (Mentor: Yizhe Zhang, Bill Dolan).

2017 Summer   **Research Intern**, Fujitsu Lab of America (Mentor: Mehdi Bahrami, Wei-Peng Chen).

2014–2015   **Research Intern**, Tsinghua University, Beijing (Mentor: Minlie Huang).

Awards and Honors

2024   **Recognition for Service on Hangs-On Generative AI Tutorial**, GMU College of Engineering and Computing.

2023   **Top Reviewer**, NeurIPS.

2023   **Accelerating Foundation Models Research Program**, Microsoft Research.

2023   **Editor Commendation**, Journal of Business and Psychology.

2021   **Best Paper Award**, The IEEE International Conference on Bioinformatics and Biomedicine (BIBM).

2021   **Graduate Student Research Award**, OSU, CSE.

2020   **Presidential Fellowship**, OSU.

2020   **Rising Star in EECS**, UC Berkeley.

2020   **Graduate Students Poster Award (Honorable Mention)**, CSE, OSU.

2019   **NSF Student Travel Award**, The Web Conference (WWW).

2019   **Graduate Students Poster Award (Honorable Mention)**, CSE, OSU.

2018   **Travel Grant for *Graduate Cohort for Women*, San Francisco**, CRA-W.

2015   **Beijing Outstanding Graduate Award**, Beijing, China.

2012, 2014   **First-class Scholarship (top 3%)**, BUPT, China.

2013   **Second-class Scholarship (top 5%)**, BUPT, China.

Publications

*my advisee; †equal contribution.

- Murong Yue*, Wijdane Mifdal*, Yixuan Zhang, Jennifer Suh, **Ziyu Yao**, "MathVC: An LLM-Simulated Multi-Character Virtual Classroom for Mathematics Education", **Preprint 2024; Project supported by Microsoft Research AFMR Award**. [Paper]

- Qineng Wang*, Chen Qian, Xiaochang Li, **Ziyu Yao**, Huajie Shao, "Lens: A Foundation Model for Network Traffic", **Preprint 2024**. [Paper]

- Murong Yue*, Jie Zhao, Min Zhang, and Liang Du, **Ziyu Yao**, "Large Language Model Cascades with Mixture of Thoughts Representations for Cost-efficient Reasoning", **ICLR 2024 (To Appear); Featured in Hugging Face Daily Papers on Oct 5, 2023**. [Paper][Code]

- Saurabh Srivastava*, Chengyue Huang, Weiguo Fan, and **Ziyu Yao**, "Instances Need More Care: Rewriting Prompts for Instances with LLMs in the Loop Yields Better Zero-Shot Performance", **ArXiv**. [Paper][Code]

- Mohamed Aghzal*, Erion Plaku, and **Ziyu Yao**, "Can Large Language Models be Good Path Planners? A Benchmark and Investigation on Spatial-temporal Reasoning", **ICLR 2024 Workshop on LLM Agents**. [Paper][Code]

- Saurabh Srivastava*, Gaurav Singh*, Shou Matsumoto, and Ali Raz, Paulo Costa, Joshua Poore, **Ziyu Yao**, "MAILEX: Email Event and Argument Extraction", **EMNLP 2023, acceptance rate 23.3%**. [Paper][Dataset&Code]

- Binfeng Xu, Xukun Liu, Hua Shen, and Zeyu Han, Yuhan Li, Murong Yue*, Zhiyuan Peng, Yuchen Liu, Ziyu Yao, Dongkuan Xu, "Gentopia: A Collaborative Platform for Tool-Augmented LLMs", **EMNLP 2023 (demo) (Open-source platform for creating, sharing, and evaluating Augmented Language Models)**[Paper][Code]

- Hao Yan*, Saurabh Srivastava*, Yintao Tai*, Sida I. Wang, Scott Wen-tau Yih, **Ziyu Yao**, "Learning to Simulate Natural Language Feedback for Interactive Semantic Parsing", **ACL 2023, acceptance rate: 20.73%**. [Paper][Code]

- Daking Rai*, Bailin Wang, Yilun Zhou, **Ziyu Yao**, "Improving Generalization in Language Model-based Text-to-SQL Semantic Parsing: Two Simple Semantic Boundary-based Techniques", **ACL 2023, acceptance rate: 20.73%**. [Paper][Code]

- Daking Rai*, Yilun Zhou, Bailin Wang, **Ziyu Yao**, "Explaining Large Language Model-based Neural Semantic Parsers", **AAAI 2023 (Student Abstract)**.[Paper]

- Philseok Lee, Shea Fyffe, Mina Son, Zihao Jia, and **Ziyu Yao**, "A paradigm shift from "human writing" to "machine generation" in personality test development: An application of state-of-the-art natural language processing", **Journal of Business and Psychology (2023) 38:163–190, IF 6.604 (Editor Commendation, one of the 13 selected papers out of over 1,000 submissions in 2022)**. [Paper]

- Tianbao Xie[†], Chen Henry Wu[†], Peng Shi, Ruiqi Zhong, Torsten Scholak, Michihiro Yasunaga, Chien-Sheng Wu, Ming Zhong, Pengcheng Yin, Sida Wang, Victor Zhong, Bailin Wang, Chengzu Li, Connor Boyle, Ansong Ni, **Ziyu Yao**, Dragomir Radev, Caiming Xiong, Lingpeng Kong, Rui Zhang, Noah A. Smith, Luke Zettlemoyer, Tao Yu, "UnifiedSKG: Unifying and Multi-Tasking Structured Knowledge Grounding with Text-to-Text Language Models", to appear at The 2022 Conference on Empirical Methods in Natural Language Processing (**EMNLP 2022**). [Preprint, Code, Project Website]

- Peizhao Li, Xuchao Zhang, **Ziyu Yao**, Wei Cheng, Haifeng Chen, Hongfu Liu, "Code Editing from Few Exemplars by Adaptive Multi-Extent Composition", The Deep Learning for Code Workshop at The Tenth International Conference on Learning Representations (**ICLR 2022 DL4Code**). [Paper]

- Xiang Yue, **Ziyu Yao**, Huan Sun, "Synthetic Question Value Estimation for Domain Adaptation of Question Answering", The 60th Annual Meeting of the Association for Computational Linguistics (**ACL 2022, acceptance rate: 20.75%**). [Paper, Code]

- **Ziyu Yao**, "On Advancing Natural Language Interfaces: Data Collection, Model Development, and User Interaction", The Ohio State University, **PhD Dissertation, 2021**. [Dissertation]

- **Ziyu Yao**, Frank Xu, Pengcheng Yin, Huan Sun, Graham Neubig, "Learning Structural Edits via Incremental Tree Transformations", The Ninth International Conference on Learning Representations (**ICLR 2021**). [Paper, Code]

- **Ziyu Yao**, Yiqi Tang, Scott Wen-tau Yih, Huan Sun, Yu Su, "An Imitation Game for Learning Semantic Parsers from User Interaction", 2020 Conference on Empirical Methods in Natural Language Processing (**EMNLP 2020, acceptance rate: 22.4%**). [Paper, Code]

- Xiang Yue, Xinliang Frederick Zhang, **Ziyu Yao**, Simon Lin, Huan Sun, "CliniQG4QA: Generating Diverse Questions for Domain Adaptation of Clinical Question Answering", **IEEE BIBM 2021 (Best Paper Award)**. [Paper, Code]

- **Ziyu Yao**, Yu Su, Huan Sun, Scott Wen-tau Yih, "Model-based Interactive Semantic Parsing: A Unified Formulation and A Text-to-SQL Case Study", 2019 Conference on Empirical Methods in Natural Language Processing (**EMNLP 2019, acceptance rate: 23.8%**). [Paper, Code]

- Boyuan Pan, Hao Li, **Ziyu Yao**, Deng Cai, Huan Sun, "Reinforced Dynamic Reasoning for Conversational Question Generation", Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics (**ACL 2019, acceptance rate: 25.7%**). [Paper, Code]

- **Ziyu Yao**, Jayavardhan Reddy Peddamail, Huan Sun, "CoaCor: Code Annotation for Code Retrieval with Reinforcement Learning", The Web Conference 2019 (**WWW 2019, acceptance rate: 18%**). [Paper, Code]

- **Ziyu Yao**, Xiujun Li, Jianfeng Gao, Brian Sadler, Huan Sun, "Interactive Semantic Parsing for If-Then Recipes via Hierarchical Reinforcement Learning", The AAAI Conference on Artificial Intelligence 2019 (**AAAI 2019, acceptance rate: 16.2%; SPOTLIGHT**). [Paper, Code]

- **Ziyu Yao**, Yizhe Zhang, Xiujun Li, Jianfeng Gao, Michel Galley, Chris Brockett, Huan Sun, Bill Dolan, "IEC: Towards Interest-Eliciting Neural Conversational Agents", **Manuscript 2019**, [Paper].

- Jayavardhan Reddy Peddamail, **Ziyu Yao**, Zhen Wang, Huan Sun, "A Comprehensive Study of StaQC for Deep Code Summarization", **SIGKDD 2018 Deep Learning Day**. [Paper]

- **Ziyu Yao**, Daniel S. Weld, Wei-Peng Chen, Huan Sun, "StaQC: A Systematically Mined Question-Code Dataset from Stack Overflow", The Web Conference 2018 (**WWW 2018, acceptance rate: 14.8%**). [Paper, Code]
- Li Zhao, Minlie Huang, **Ziyu Yao**, Rongwei Su, Yingying Jiang, Xiaoyan Zhu. "Semi-Supervised Multinomial Naive Bayes for Text Classification by Leveraging Word-Level Statistical Constraint", The AAAI Conference on Artificial Intelligence 2016 (**AAAI 2016, acceptance rate: 25.8%**). [Paper]
- **Ziyu Yao**, Shouzhong Tu, Minlie Huang, Xiaoyan Zhu. "A Semi-Supervised Method for Filtering Chinese Spam Tweets". **Journal of Chinese Information Processing 2016**, 30(5): 176-186. [Paper in Chinese]

Talks & Presentations

2024 **TBD**, Invited talk at Bloomberg. Host: Daniel Preotiuc-Pietro.

2024 **TBD**, Invited talk at Microsoft Research. Host: José Cambronero.

2024 **Building Natural Language Interfaces in the Age of Large Language Models**, Invited talk at Indiana University, Indianapolis. Host: Ming Jiang.

2024 **Towards Enhancing the Utilization of Large Language Models for Humans**, Invited talk at Virginia Tech. Host: Chang-Tien Lu.

2024 **Towards Enhancing the Utilization of Large Language Models for Humans**, Invited talk at University of Arizona. Host: Steven Bethard.

2023 **Building Natural Language Interfaces in the Age of Large Language Models**, Invited talk at Tsinghua University. Host: Minlie Huang.

2023 **Gentopia: A Collaborative Platform for Tool-Augmented LLMs**, Demo Presentation at EMNLP.

2023 **Large Language Model Cascades with Mixture of Thoughts Representations for Cost-efficient Reasoning**, Invited talk at Microsoft Semantic Machines. Host: Hao Fang.

2023 **Building Natural Language Interfaces in the Age of Large Language Models**, Invited talk at Google NLP Reading Group. Host: Pengcheng Yin.

2023 **Building Natural Language Interfaces in the Age of Large Language Models**, Invited talk at Apple Inc. Host: Yunyao Li.

2023 **Information Acquisition in the Age of Language Models**, Invited talk at GMU C4I & Cyber Center.

2022 **Challenges in Constructing Human-centric Natural Language Interfaces**, Invited talk at the GMU Statistics Department. Host: Nicholas Rios.

2022 **On Building Natural Language Interfaces for "Humans"**, Invited talk at ServiceNow Research, Canada (virtually). Host: Dzmitry Bahdanau.

2022 **Building Interactive and Adaptive Question Answering Systems**, Invited talk at CLSP (Center for Language and Speech Processing) Seminar, Johns Hopkins University. Host: Kevin Duh, Ben Van Durme.

2022 **Building Interactive and Adaptive Question Answering Systems**, Invited talk at Center for Advancing Human-Machine Partnership, George Mason University..

2021 **Building Interactive Natural Language Interfaces**, Invited talk at Brandeis University (virtually). Host: Hongfu Liu.

2021 **Building Interactive Natural Language Interfaces**, OSU AI Club (virtually).

2020 **An Imitation Game for Learning Semantic Parsers from User Interaction**, EMNLP (virtually).

2020	**On Building an Interactive Natural Language Interface: An intelligent agent that can communicate, collaborate and learn**, <u>Invited talk</u> at Microsoft Research AI Breakthroughs Workshop (virtually). Invited by: Ahmed Hassan Awadallah, Alex Polozov.
2020	**Building Natural Language Interfaces to Programs**, <u>Invited talk</u> at VMware, Beijing (virtually). Host: Jin He, Kevin Song.
2020	**Towards Building Interactive and Collaborative Natural Language Interfaces**, <u>Invited talk</u> at NeuLab, Carnegie Mellon University (virtually). Host: Graham Neubig.
2020	**Learning Semantic Parsers from User Interaction**, CSE AI Seminar, OSU.
2019	**Towards Building Interactive and Collaborative Natural Language Interfaces**, <u>Invited talk</u> at Chair of Management Information System, ETH Zurich, Host: Stefan Feuerriegel.
2019	**CoaCor: Code Annotation for Code Retrieval with Reinforcement Learning**, WWW, San Francisco, USA.
2019	**Interactive Semantic Parsing for If-Then Recipes via Hierarchical Reinforcement Learning**, AAAI, Hawaii, USA.
2018	**Interactive Semantic Parsing for If-Then Recipes via Hierarchical Reinforcement Learning**, CSE AI Seminar, OSU.
2018	**StaQC: A Systematically Mined Question-Code Dataset from Stack Overflow**, WWW, Lyon, France.

Grants

"Securing the Supply Chain of LLMs as Software", Virginia Commonwealth Cyber Initiative, $50,000 without overhead, 01/2024-12/2024. Role: PI.

"A Foundation Model-Simulated Virtual Classroom for PreK-12 STEM Education", Microsoft Research, Accelerating Foundation Models Research Program, $20,000 Azure credits. Role: PI.

"Collaborative Research: SHF: Medium: Toward Understandability and Interpretability for Neural Language Models of Source Code", National Science Foundation, ∼$1,100,000 (my part: ∼$400,000), 10/2023-09/2027. Role: PI at GMU.

"IARPA's STG AI-ML Solutions Program", Intelligence Advanced Research Projects Activity (sub-contract from UMD ARLIS), $100,000 (my part: ∼$30,000), 05/2023-05/2024. Role: Co-PI.

"NSF Convergence Accelerator Track G: Secure Texting over Non-cooperative Networks and Anti-jamming Enhancement in 5G", National Science Foundation, 09/2022-07/2023. Role: Senior Personnel.

"Securing Interactions Between Humans and Machines", Virginia Commonwealth Cyber Initiative, $60,000 (my part: ∼$30,000) without overhead, 12/2022-12/2023. Role: PI.

"AI Engineering Seedlings", US Department of Defense (sub-contract from CMU SEI and UMD ARLIS), $100,000 (my part: ∼$30,000), 07/2021–07/2022. Role: Co-PI.

Teaching Experience

<u>At GMU:</u>

2024 Spring	**EDUC 896: Special Topics in Education (College of Education and Human Development)**, Guest Lecture on "An LLM-Simulated Multi-Character Virtual Classroom for Mathematics Education".

2024 Spring	**HAP 780: Data Mining in Health Care (Department of Health Administration and Policy)**, Guest Lecture on "Large Language Models for Healthcare".
2024 Spring	**CS678: Advanced Natural Language Processing**.
2023 Fall	**CS678: Advanced Natural Language Processing**.
2023 Spring	**CS478: Natural Language Processing**.
2022 Fall	**CS678: Advanced Natural Language Processing**.
2022 Spring	**CS499: Natural Language Processing**.
2021 Fall	**CS695: Special Topics on Natural Language Processing**.

At OSU:

2020 Fall	**CSE Panel: Graduate School Experience and Expectation**, CSE, OSU. Panelist.
2020 Fall	**Foundations of Speech and Language Processing**, CSE, OSU. Guest lecturer.
2018 Fall	**Course Panel: Data Management in the Cloud**, CSE, OSU. Guest panelist.
2017 Spring	**Introduction to Computer Programming in C++**, CSE, OSU. Student instructor.

Mentoring Experience

Mentored PhD Students.

Hao Yan (Spring'22-)

Daking Rai (Spring'22-)

Saurabh Srivastava (Spring'22-)

Murong Yue (Fall'22-)

Mohamed Aghzal (Spring'23-, co-advised w/ Erion Plaku)

Mentored/Collaborated Master Students.

Sumanth Venkata Sai Krishna Manduru (Spring'24-)

Gaurav Singh (Spring'22)

Janit Bidhan (Fall'22)

Mentored/Collaborated Undergraduate Students.

Sai Adith Senthil Kumar (Spring'24-)

Saipavan Perepa (Spring'24-)

Jessica Nguyen (Spring'24-)

Wijdane Mifdal (Fall'23- through OSCAR FW)

Mariana Ritchie (Spring'22)

Brian Meike (Spring'22)

Soumithri Gadepalli (Spring'22)

Yintao Tai (Fall'21, remote intern from Univ. of Edinburgh)

Mentored/Collaborated Highschool Students.

Mihir Kulshreshtha (Summer'23, Thomas Jefferson High School for Science and Technology)

Anika Giri (Summer'23, Chantilly High School)

(Co-)Mentored/Collaborated Students (at OSU).

Jayavardhan Reddy Peddamail (Master Student; now at Google)

Varun Ranganathan Dhanvanth (Master Student; now at Facebook)

Heming Sun (Undergraduate Student)

Tianshu Zhang (PhD Student)

Leslie Zhou (Master Student)

School/Department Services

Department Committees.

SWE Master Recruiting Committee (Fall'23 - Spring'24)

PhD Recruiting Committee (Fall'22 - Spring'23)

Faculty Search Committee (Fall'21 - Spring'22)

Comprehensive Exam Committees.

Saurabh Srivastava (Spring'24)

Daking Rai (Fall'23)

Hao Yan (Fall'23)

Syeda Sabrina Akter (Fall'23)

Milind Agarwal (Fall'23)

Fahim Faisal (Fall'22)

Jonathan Mbuya (Fall'22)

Joost Bottenbley (Fall'22)

Md Mahfuz Ibn Alam (Spring'22)

Abhisekh Rana (Spring'22)

Thesis Proposal Exam Committees.

Md Mahfuz Ibn Alam (Spring'23)

Professional Activities

Editor Services.
ACM SIGAI: Newsletter co-editor   2022 –

Organizing Committees.
NAACL'24: 2024 Annual Conference of the North American Chapter of the Association for
Computational Linguistics (Diversity & Inclusion Chair)   2024
MASC-SLL: 10th Mid-Atlantic Student Colloquium on Speech, Language and Learning 2023
SUKI at NAACL'22: Workshop on Structured and Unstructured Knowledge Integration 2022
NLP4Prog at ACL'21: The First Workshop on NLP for Programming   2021

Area Chairs or Senior Program Committees.
ACL: Annual Meeting of the Association for Computational Linguistics   2023
AAAI: The AAAI Conference on Artificial Intelligence   2023,2024
EMNLP: Conference on Empirical Methods in Natural Language Processing   2022

Session Chair.
AAAI: The AAAI Conference on Artificial Intelligence   2023

Program Committees/Reviewers (Conference).

<u>ARR</u>: ACL Rolling Review	2021 –
<u>EACL SRW</u>: EACL Student Research Workshop	2021 –
<u>ICLR</u>: International Conference on Learning Representations	2024
<u>NeurIPS</u>: Annual Conference on Neural Information Processing Systems	2023
<u>NAACL</u>: Annual Conference of the North American Chapter of the Association for Computational Linguistics	2021
<u>EMNLP</u>: Conference on Empirical Methods in Natural Language Processing 2018, 2020,	2021
<u>MSR</u>: Mining Software Repositories Conference	2021
<u>AACL</u>: Conference of the Asia-Pacific Chapter of the Association for Computational Linguistics	2020
<u>AAAI</u>: The AAAI Conference on Artificial Intelligence	2020
<u>NLPCC</u>: Conference on Natural Language Processing and Chinese Computing	2020
<u>CoNLL</u>: Conference on Computational Natural Language Learning	2019

Secondary/External Reviewer:

<u>ACL</u>: Annual Meeting of the Association for Computational Linguistics	2018, 2020
<u>KDD</u>: SIGKDD Conference on Knowledge Discovery and Data Mining	2017, 2019, 2020
<u>NAACL</u>: Annual Conference of the North American Chapter of the Association for Computational Linguistics	2019
<u>ICDM</u>: International Conference on Data Mining	2016, 2018
<u>WWW</u>: International World Wide Web Conference	2017
<u>CIKM</u>: International Conference on Information and Knowledge Management	2016

Program Committees/Reviewers (Workshop).

<u>InterNLP at NeurIPS 2022</u>: Workshop on Interactive Learning for Natural Language Processing	2022
<u>BigData-IT at IEEE BigData 2022</u>: Workshop on Knowledge Discovery and Data Mining on IT Operations	2022
<u>HCI+NLP at NAACL 2022</u>: Bridging Human-Computer Interaction and Natural Language Processing	2022
<u>DL4Code at ICLR 2022</u>: Deep Learning for Code	2022
<u>IntEx-SemPar at EMNLP 2020</u>: Interactive and Executable Semantic Parsing Workshop	2020
<u>NLI at ACL 2020</u>: Natural Language Interface Workshop	2020
<u>SRW at ACL 2019</u>: Student Research Workshop	2019

Reviewers (Journal).

<u>TKDD</u>: ACM Transactions on Knowledge Discovery from Data	2022 –
<u>TKDE</u>: IEEE Transactions on Knowledge and Data Engineering	2022 –