Ruizhe Shi

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Education

Tsinghua University, Beijing, China **Sept. 2021 – Present**

*Undergraduate at Special Pilot Class in Computer Science (**Yao class**)*

- Major: *Computer Science and Technology* *GPA 3.93/4.00*
- Minor: *Chinese Language and Literature* *GPA 4.00/4.00*

University of Washington, Seattle, USA **Feb. 2024 – July 2024**

Research Visitor at Paul G. Allen School of Computer Science

Publications & Manuscripts

(∗ *indicates equal contribution.*)

[5] **(Manuscript)** Ruizhe Shi*, Runlong Zhou*, Simon S. Du. "The Crucial Role of Samplers in Online Direct Preference Optimization".[link]

[4] **(NeurIPS 2024)** Ruizhe Shi, Yifang Chen, Yushi Hu, Alisa Liu, Hannaneh Hajishirzi, Noah A. Smith, Simon S. Du. "Decoding-Time Language Model Alignment with Multiple Objectives".[link]

[3] **(ICML 2024)** Chenhao Lu, Ruizhe Shi*, Yuyao Liu*, Kaizhe Hu, Simon S. Du, Huazhe Xu. "Rethinking Transformers in Solving POMDPs".[link]

[2] **(ICLR 2024)** Ruizhe Shi*, Yuyao Liu*, Yanjie Ze, Simon S. Du, Huazhe Xu. "Unleashing the Power of Pre-trained Language Models for Offline Reinforcement Learning".[link]

[1] **(NeurIPS 2023)** Yanjie Ze, Yuyao Liu*, Ruizhe Shi*, Jiaxin Qin, Zhecheng Yuan, Jiashun Wang, Huazhe Xu. "H-InDex: Visual Reinforcement Learning with Hand-Informed Representations for Dexterous Manipulation".[link]

Selected Research Experiences

Optimization Theory of Online DPO **May 2024 – Sept. 2024**

Supervised by Prof. Simon S. Du *CSE, University of Washington*

- We study convergence rates of (online) DPO from optimization perspective, and show the impact of samplers through a theoretical separation and empirical experiments. Under review.

Multi-Objective Language Model Alignment **Dec. 2023 – May 2024**

Supervised by Prof. Simon S. Du *CSE, University of Washington*

- We propose a training-free, simple yet effective decoding-time algorithm for multi-objective alignment of language models, with optimality guarantees. First-authored work accepted by **NeurIPS 2024**.

Representation Theory of Transformer in Decision-Making **Nov. 2023 – Jan. 2024**

Supervised by Prof. Huazhe Xu *IIIS, Tsinghua University*

- We challenge the common wisdom and prove theoretically and empirically that Transformers are not suitable for Partially Observable RL, while advocating Linear RNN as a promising alternative. Second-authored work accepted by **ICML 2024**.

Training Language Model for Decision-Making **June 2023 – Sept. 2023**

Supervised by Prof. Huazhe Xu *IIIS, Tsinghua University*

- We leverage the power of pre-trained Language Models for low-level motion control in offline reinforcement learning. First-authored work accepted by **ICLR 2024**.

Selected Awards & Honors

First-level Comprehensive Scholarship **Sept. 2024**

Tsinghua University *top scholarship*

Yao Award (Silver Medal) **Sept. 2024**

IIIS, Tsinghua University *top scholarship [link]; 3 students institute-wide*

Jiang Nanxiang Scholarship **Nov. 2023**

Tsinghua University *top scholarship; 1 student institute-wide*

China National Endeavor Scholarship **Oct. 2022**

Beijing Education Bureau *1 student institute-wide*

First Prize in National High School's Mathematics Competition of China **Oct. 2020**

Chinese Mathematical Society *top 20 province-wide*

Service

Conference Reviewer
NeurIPS 2024, ICLR 2025, AISTATS 2025

Yao Class Seminar Host **2024 Fall – Present**
Co-organize weekly research seminars [link] *Tsinghua University*

Teaching Assistant **2024 Fall**
Natural Language Processing *Tsinghua University*

Voluntary Drop-in Tutoring **Oct. 2022 – July 2024**
Tutor freshmen in basic Courses *Tsinghua University*

*I have **157** hours of officially recorded volunteering work.*

Selected Courses

Mathematics and Theory: Calculus ($\mathbf{A}^+$), Linear Algebra (**A**), Abstract Algebra (**A**), Introduction to Complex Analysis (**A**), Probability and Statistics (**A**), Basic Topology (**93**), Introduction to Optimization (**A**), Theory of Computation (**A**), Physics of Information (**A**);
Programming and AI: Introduction to Programming in C/C++ ($\mathbf{A}^+$), Intelligent Unmanned System ($\mathbf{A}^+$), Type-safe Modern System Practice (**A**), Machine Learning (**A**), Artificial Intelligence: Principles and Techniques (**A**), Natural Language Processing (**A**).

Technical Skills

Programming Skills: Python, C/C++, LaTeX, Bash, Scala, Matlab.
Language Skills: Chinese Mandarin (native), English (TOEFL 104 [R30/L26/S23/W25], GRE 327+3.5 [V157/Q170]).