Yucheng Pan

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EDUCATION

B.S. Mathematics and Physics, Tsinghua University Sep. 2021 - Jun. 2025 (expected)
GPA: 3.874/4.000 Beijing, China

RESEARCH INTERESTS

Primary LLM Agents, Reinforcement Learning, Lifelong learning, Bio-inspired AI
Supplementary Multi-Agent Systems, AI Safety, Deep Learning

RESEARCH EXPERIENCE

Research Internship, Princeton University (Remote) May. 2024 - Present
Department of Electrical and Computer Engineering
Mentor: Prof. Mengdi Wang (Princeton), Prof. Huazheng Wang (Ohio State)

· ***Deception and Defense of LLM Agents***

- Co-led the cross-disciplinary project with Princeton's Department of Psychology.
- Designed and implemented a Public Goods Game framework for LLM agents with communication features and defectors, as well as the prompts for LLM agents.
- Conducted experiments analyzing deceptive behaviors in LLM agents.
- Developed and evaluated defense strategies based on the results and insights.
- Authored the first draft of a research paper for submission.

· ***LLM Agent Data Augmentation***

- Conducted initial experiments and identified key research questions, focusing on the generalization capabilities of LLM agents.
- Redesigned environments/benchmarks to enhance and evaluate LLM agent performance across different generalization dimensions.

Research Internship, University of Carolina at Chapel Hill (Remote) Feb. 2024 - Present
Department of Statistics and Operations Research
Mentor: Prof. Yao Li (UNC Chapel Hill), Prof. Minhao Cheng (Penn State)

· ***Orthogonal Audio Watermarking***

- Led the project.
- Conducted literature reviews, determined research directions and questions.
- Redesigned and implemented AudioSeal, an open-source watermarking neural network, for multi-source watermark embedding without interference.
- Modified the architecture and training processes to enhance watermark robustness.

Undergraduate Research Assistant, Tsinghua University Sep. 2023 - Present
Center for Statistical Science
Mentor: Prof. Ke Deng

· ***Enhancing Precision in Isotope Nuclear Radius Estimation through Statistical Analysis***

- Led the project.
- Constructed and processed datasets of nuclear radii and isotope shifts across multiple spectra.
- Developed and implemented statistical computing algorithms to reduce estimation errors with theoretical measurement error models.
- Validated our methods using Bootstrap with simulated and real-world data.
- Authored the first draft of a research paper for submission.

· ***Nucleotide Sequences Based on Language Models***

- Developing a BERT model to predict nucleotide sequences and explore artificial protein design by leveraging patterns in amino acid and nucleotide datasets.

· ***Diffusion Model combined with Monte Carlo Markov Chain***

- Conducting preliminary research on integrating diffusion models with Monte Carlo Markov Chain methods.

***Track the Light* Research Program for Undergraduates, Tsinghua University** Jul. 2022 - Sep. 2023
Department of Astronomy
Mentor: Prof. Zheng Cai

· ***JWST-Based Study of High-Redshift Universe Through Stellar Mass Function***

- Gathered and processed high-redshift galaxy data from James Webb Space Telescope (JWST).
- Analyzed galaxy stellar mass functions and verified the ΛCDM model.

SCIENTIFIC TALKS

Oral Presentation Jul. 2024
Topics on Frontiers of Cross-Sciences, Beijing
· Enhancing Isotope Charge Radius Measurement Precision with Statistical Analysis

Oral Presentation Dec. 2023
Tsinghua Text Analysis Symposium, Beijing
· PLMs as Meta-function: Learning In-context Learning for Named Entity Recognition

SELECTED COURSE PROJECTS

Large Language Models and Alignment Sep. 2024 - Present
· Pre-training, instruction fine-tuning, and RLHF on LLMs, with a focus on CUDA/DPU programming.
· In progress.

Deep Reinforcement Learning Mar. 2024 - Jun. 2024
· Conducted literature reviews, designed experiments, and developed algorithms to improve offline RL performance under limited data scenarios.
· Delivered a project paper and oral presentation; achieved an A.

Machine Learning and Big-data Nov. 2023 - Dec. 2023
· Designed and implemented deep learning models (ANN, RNN, CNN) to predict Autonomous Underwater Vehicle health.

C++ Programming for Linux Jul. 2023
· Developed a simplified remote system administration tool for web servers.

Observational Astronomy Mar. 2023 - Jun. 2023
· Designed a spectral fitting pipeline for observational data; earned an A+ for the project.

TECHNICAL SKILLS

Programming Languages Python, R, LaTeX, C/C++, Mathematica, HTML, CSS, JavaScript
Operating Systems Windows, Linux

SCHOLARSHIPS AND AWARDS

Scholarship for Outstanding Technological Innovation 2022
Friends of Tsinghua - Qianheng Huang Scholarship 2022
Scholarship for Academic Progress 2022
First Prize in Public Welfare and Social Innovation Track of Creative Competition for Freshmen of Tsinghua 2021

Second Prize in Healthcare and Medical Track of Creative Competition for Freshmen of Tsinghua 2021

EXTRA-CURRICULAR

- Implementing Object Detection Applications Using Ascend Elastic Cloud Servers Aug. 2023