Yucheng Pan

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EDUCATION

B.S. Mathematics and Physics, Tsinghua University Sep. 2021 - Jul. 2025 (expected)
GPA: 3.87/4.00 Beijing, China

RESEARCH INTERESTS

Primary Large Language Model Agents (LLM Agents), Reinforcement Learning
Supplementary AI Safety, Multi-Agent Systems, Lifelong Learning, Bio-Inspired AI

RESEARCH EXPERIENCE

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

· ***LLM Agents Can Deceive and Be Constrained by Social Norms and Payoff Allocations***

Investigate how LLM agents exhibit deceptive behaviors in multi-agent games and design mechanisms to enforce compliance with social norms and fair payoff distributions.

- Literature review and idea development.
- Designed and implemented the overall framework and constraint mechanisms; conducted extensive experiments with comprehensive analysis.
- Submitted to *Nature Computational Science*.

· ***Data Augmentation for Generalized LLM Agents***

Enhance the generalization capabilities of LLM agents through innovative data augmentation techniques.

- Literature review, idea development and preliminary experimentation.
- Proposed novel methods to redesign existing agent environments for fine-tuning pre-trained LLMs.

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

· ***Traceable Neural Audio Watermarking with Multi-Embedding***

Develop a novel audio watermarking model that enables embedding multiple watermarks from different sources into a single audio file to improve robustness and traceability.

- Literature review and idea development.
- Redesigned the architecture and fine-tuning pipeline of a state-of-the-art audio watermarking neural network for multi-embedding support.

Department of Statistics and Data Science, Tsinghua University
Undergraduate Research Assistant Sep. 2023 - Jul. 2024
Mentor: Prof. Ke Deng

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

Improve the precision of isotope nuclear radius estimation using advanced statistical analysis of laser spectroscopy data.

- Literature review, data collection, and data pre-processing.
- Developed statistical models; implemented statistical computing algorithms to enhance the precision and validated the results.

· ***Nucleotide Sequences Prediction and Protein Design Based on Transformers***

Utilize a BERT model to predict nucleotide sequences and explore their applications in artificial protein design.

- Led the implementation and experimentation of the model.

Department of Automation, Tsinghua University
Undergraduate Research Assistant Sep. 2024 - Present
Mentor: Prof. Wenhui Fan

· ***Experimental teaching platform for group cooperative control of intelligent unmanned systems***

- Designed and implemented the interface of interaction between humans, LLMs, and robotic arms.
- Completed the preliminary platform.

SCIENTIFIC TALKS

Enhancing Isotope Charge Radius Measurement Precision with Statistical Analysis Jul. 2024
Topics on Frontiers of Cross-Sciences, Beijing
· Oral presentation, on the advancements and results of my research project.

PLMs as Meta-function: Learning In-context Learning for Named Entity Recognition Dec. 2023
Tsinghua Text Analysis Symposium, Beijing
· Oral presentation, a literature review on this paper.

SCHOLARSHIPS AND AWARDS

Academic Excellence Scholarship — Tsinghua University, 2024
Progress in Academic Performance Scholarship — Tsinghua University, 2022
Outstanding Innovation Scholarship — Philip K.H. Wong Foundation, 2022

SELECTED COURSE PROJECTS

Deep Learning Sep. 2024 - Present
· Investigating the analogs of brain sleep mechanisms in neural networks and their role in improving continual learning capabilities.

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

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.

Machine Learning and Big-data Nov. 2023 - Dec. 2023
· Designed and implemented neural networks (ANN, RNN, CNN) to predict autonomous underwater vehicle health.

TECHNICAL SKILLS

Programming Languages Python, R, LaTeX, C/C++, Mathematica, HTML, CSS, JavaScript