Tianyang Liu

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Education

University of California, San Diego — **San Diego, CA, USA**
M.Sc. in Computer Science — 2022–Present
Mentors: Zhiting Hu, Julian McAuley — GPA: 4.00/4.00

Wuhan University — **Wuhan, Hubei, China**
B.Eng. in Software Engineering — 2018–2022
Mentors: Peng Liang, Chong Wang — GPA: 3.85/4.00

Research Interests

My research spans **AI**, **ML**, and **NLP**, with a primary focus on advancing **Large Language Models (LLMs)**. I am dedicated to exploring their full potential, enhancing their reasoning capabilities, and fostering their application across various sectors. Key areas include:

- **Understanding LLM Capabilities and Boundaries:** Conducting in-depth analysis of LLMs to evaluate their strengths, limitations, and ethical considerations, ensuring their effectiveness and responsible use in various contexts.
- **Augmenting LLMs with Symbolic and World-Aware Reasoning:** Integrating symbolic reasoning with LLMs, and enhancing their ability to interact with and interpret multimodal data, aiming to create more comprehensive and world-aware models.
- **Developing Versatile LLM-Based Applications:** Utilizing LLMs to create innovative, intelligent solutions that address diverse challenges and enhance accessibility, benefiting a wide range of users and scenarios.

Publications (* equal contribution)

When Large Language Models Meet Non-linear Reasoning: Unified Formulation, Library, and Benchmark for Multi-step Reasoning
Shibo Hao, Yi Gu, Tianyang Liu, Xinyuan Wang, Haotian Luo, Chenxi Li, Zhen Wang, Zhiting Hu
Manuscript Under Preparation

Rethinking Tabular Data Understanding with Large Language Models
Tianyang Liu, Fei Wang, Muhao Chen
Preprint 2023 [arXiv] [code]

RepoBench: Benchmarking Repository-Level Code Auto-Completion Systems
Tianyang Liu, Canwen Xu, Julian McAuley
ICLR 2024 [arXiv] [code] [OpenReview]

ToolkenGPT: Augmenting Frozen Language Models with Massive Tools via Tool Embeddings
Shibo Hao, Tianyang Liu, Zhen Wang, Zhiting Hu
NeurIPS 2023 (Oral) [arXiv] [code]
Best Paper Award at SoCal NLP 2023

Architecture Decisions in AI-based Systems Development: An Empirical Study
Beiqi Zhang, Tianyang Liu, Peng Liang, Chong Wang, Mojtaba Shahin, Jiaxin Yu
SANER 2023

RoseMatcher: Identifying the Impact of User Reviews on App Updates
Tianyang Liu, Chong Wang, Kun Huang, Peng Liang, Beiqi Zhang, Maya Daneva, Marten van Sinderen
Information and Software Technology 2023

The Role of User Reviews in App Updates: A Preliminary Investigation on App Release Notes
Chong Wang*, Tianyang Liu*, Peng Liang, Maya Daneva, Marten van Sinderen
APSEC 2022

👨‍💻 Research Experience

LLM Reasoners 🦙 June 2023–Present

Advisor: Prof. Zhiting Hu (UC San Diego)

- Developed a library with ~ 600 stars on GitHub for advanced LLM reasoning, incorporating SOTA tree reasoning algorithms like RAP-MCTS and Tree-of-Thoughts, balancing exploration and exploitation with the idea of *World Model* and *Reward*.
- Co-authored *When Large Language Models Meet Non-linear Reasoning: Unified Formulation, Library, and Benchmark for Multi-step Reasoning*, currently manuscript under preparation.

LLM Meets Tabular Data May 2023–Oct 2023

Advisor: Prof. Muhao Chen (UC Davis, formerly University of Southern California)

- Investigated the inherent limitations of LLMs in understand and reasoning over structured tabular data, focusing on the challenges of structural information loss.
- Conducted comparative studies demonstrating the superiority of a hybrid method that synergizes symbolic and textual reasoning for tabular data reasoning performance in a zero-shot setting.
- Authored *Rethinking Tabular Data Understanding with Large Language Models*, currently under review at ARR Octorber (Overall Rating: 4).

Repository-Level Code Completion Mar. 2023–Present

Advisor: Prof. Julian McAuley (UC San Diego)

- Proposed and developed RepoBench, a benchmark for evaluating repository-level code auto-completion.
- Currently contributing to the StarCoder project, enhancing code models at repository level.
- Authored *RepoBench: Benchmarking Repository-Level Code Auto-Completion Systems*, accepted by ICLR 2024.

Language Model Argumentation with Functions/Tools Mar. 2023–Present

Advisor: Prof. Zhiting Hu (UC San Diego)

- Investigated the augmentation of LLMs with external tools to tackle complex problems across various domains.
- Introduced ToolkenGPT, a method for learning function embeddings that can be seamlessly integrated into frozen LLMs with little training costs.
- Authored *ToolkenGPT: Augmenting Frozen Language Models with Massive Tools via Tool Embeddings*, accepted by NeurIPS 2023 as oral presentation, and rewarded Best Paper at Socal NLP 2023.

Crowdsourced Software Requirement Engineering Sep. 2021–Nov. 2022

Advisors: Prof. Peng Liang, Prof. Chong Wang (Wuhan University)

- Explore the influence of user reviews on app updates by analyzing the correlation between user reviews and app release notes.
- Contributed to three publications on Software Requirement Engineering.

🤝 Professional Services

Invited Reviewer: NLPCC

💻 Techinical Skills

🚀 **Programming Languages**: Python, JavaScript, HTML, SQL, LaTeX, Git, VSCode
🧠 **Machine Learning & Deep Learning Libraries**: Pytorch, 🤗 Huggingface Transformers, DeepSpeed
🌐 **Languages**: Chinese (native), English (fluent)