

Tianyang Liu

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 Personal Profile  GitHub  LinkedIn  Google Scholar  /  Twitter/X

Education

University of California, San Diego

San Diego, CA, USA

Computer Science M.Sc. 4.00 GPA

2022–Present

Mentors: Zhiting Hu, Julian McAuley

Wuhan University

Wuhan, Hubei, China





Software Engineering B.Eng. 3.85 GPA

2018–2022

Mentors: Peng Liang, Chong Wang

Research Interests

My primary research interests pivot around **Artificial Intelligence (AI)**, **Machine Learning (ML)**, and **Natural Language Processing (NLP)**. A keen focal point of my endeavors lies in the capabilities and potential of **Large Language Models (LLMs)**. My primary research areas include:

-  **Commonsense/Symbolic Reasoning in LLMs:** Investigating methods to improve the commonsense knowledge and symbolic reasoning abilities of LLMs to enhance their decision-making capabilities.
-  **Autonomous Tool Usage by LLMs:** Innovating mechanisms allowing LLMs to autonomously use tools, thereby broadening their problem-solving capabilities.
-  **LLMs as Intelligent Agents:** Harnessing the potential of LLMs to act as intelligent agents, facilitating user interaction and providing assistance across a plethora of domains.
-  **Evaluation of LLMs:** Rigorously assessing the capabilities, limitations, and practical applications of LLMs to ensure their efficacy and reliability in real-world scenarios.

Publications (* equal contribution)

-  **RepoBench: Benchmarking Repository-Level Code Auto-Completion Systems**
Tianyang Liu, Canwen Xu, Julian McAuley
Preprint, 2023
[\[arXiv\]](#) [\[code\]](#)
-  **ToolkenGPT: Augmenting Frozen Language Models with Massive Tools via Tool Embeddings**
Shibo Hao, *Tianyang Liu*, Zhen Wang, Zhiting Hu
Preprint, 2023
[\[arXiv\]](#) [\[code\]](#)
-  **Architecture Decisions in AI-based Systems Development: An Empirical Study**
Beiqi Zhang, *Tianyang Liu*, Peng Liang, Chong Wang, Mojtaba Shahin, Jiaxin Yu
SANER, 2023
[\[arXiv\]](#)
-  **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
IST, 2023
[\[paper\]](#)
-  **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
[\[paper\]](#)


Note: Icons denote subject areas:  for Large Language Models (LLMs),  for Software Engineering (SE).

Research Experience

LLM Reasoners

June 2023–Present

Advisor: [Prof. Zhiting Hu](#) (UC San Diego)

- Developed a library ([GitHub](#), ~400 stars) for advanced Large Language Model reasoning, incorporating state-of-the-art reasoning algorithms like RAP-MCTS and Tree-of-Thoughts, balancing exploration and exploitation with the idea of “World Model” and “Reward”.
- Provided intuitive visualization tools that allow users to easily comprehend complex reasoning algorithms with a single line of Python code.
- Integrated compatibility with multiple LLM frameworks, including  Huggingface, OpenAI API, LLaMA (fairscale backend), LLaMA.cpp, etc.
- Publication coming soon.

LLM Meets Tabular Data

May 2023–Present

Advisor: [Prof. Muhao Chen](#) (University of Southern California)

- Explored challenges in integrating tabular data comprehension with Large Language Models (LLMs), addressing the inherent disparities between structured tables and unstructured text.
- Formulated guidelines to enable LLMs to effectively utilize tabular data for informed decision-making.
- Proposed strategies for unifying structured tabular data within LLM processing paradigms.
- Balanced semantic reasoning (CoT reasoning) and symbolic reasoning (PoT reasoning) to enhance LLM decision-making.
- Publication coming soon.

Repository-Level Code Completion

Mar. 2023–Present

Advisor: [Prof. Julian McAuley](#) (UC San Diego)

- Proposed and developed REPOBENCH, a benchmark featuring three interconnected evaluation tasks: retrieval, completion, and end-to-end tasks, for evaluating the efficacy of repository-level code auto-completion systems.
- Performed exhaustive experiments on multiple state-of-the-art code auto-completion models to assess their performance.
- Publication: *RepoBench: Benchmarking Repository-Level Code Auto-Completion Systems*.

Language Model Argumentation with Functions/Tools

Mar. 2023–Present

Advisor: [Prof. Zhiting Hu](#) (UC San Diego)

- Investigated the augmentation of large language models with external tools to tackle complex problems across various domains.
- Introduced TOOLKENGPT, an innovative methodology for learning function embeddings that can be seamlessly integrated into language models.
- Publication: *ToolkenGPT: Augmenting Frozen Language Models with Massive Tools via Tool Embeddings*.

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 in the App Store.
- 3 publications on Software Requirement Engineering.


Professional Services

Invited Reviewer: NLPCC

Technical Skills

 **Programming Languages:** Python, JavaScript, HTML, SQL, \LaTeX , Git, VSCode

 **Machine Learning & Deep Learning Libraries:** Pytorch,  Huggingface Transformers, DeepSpeed

 **Languages:** Chinese (native), English (fluent)