CHENG QIAN

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EDUCATION

Tsinghua University, *Undergraduate* Sep 2020 – Present
B.Eng. in Computer Science and Technology

- **GPA: 3.90 / 4.00.**
- Selected Courses of **A & A+**: Linear Algebra, Introduction to Complex Analysis, Foundation of Object-Oriented Programming, Software Engineering, Introduction to Artificial Intelligence, Introduction to Modern Cryptogrophy, Fundamentals of Computer Graphics, A General Introduction to Economics, Writing and Communication.
- Member of **THUNLP** (THU Natural Language Processing Group), advised by Associate Professor Zhiyuan Liu.

PUBLICATIONS

- **Cheng Qian**, Xinran Zhao, Sherry Tongshuang Wu. *"Merge Conflicts!" Exploring the Impacts of External Distractors to Parametric Knowledge Graphs*.
- **Cheng Qian**, Chenyan Xiong, Zhenghao Liu, Zhiyuan Liu. *Toolink: Linking Toolkit Creation and Using through Chain-of-Solving on Open-Source Model*.
- **Cheng Qian**, Chi Han, Yi R. Fung, Yujia Qin, Zhiyuan Liu, Heng Ji. *CREATOR: Disentangling Abstract and Concrete Reasonings of Large Language Models through Tool Creation*.
- Yujia Qin, Shengding Hu, Yankai Lin, Weize Chen, Ning Ding, Ganqu Cui, Zheni Zeng, Yufei Huang, Chaojun Xiao, Chi Han, Yi Ren Fung, Yusheng Su, Huadong Wang, **Cheng Qian**, Runchu Tian, Kunlun Zhu, Shihao Liang, Xingyu Shen, Bokai Xu, Zhen Zhang, Yining Ye, Bowen Li, Ziwei Tang, Jing Yi, Yuzhang Zhu, Zhenning Dai, Lan Yan, Xin Cong, Yaxi Lu, Weilin Zhao, Yuxiang Huang, Junxi Yan, Xu Han, Xian Sun, Dahai Li, Jason Phang, Cheng Yang, Tongshuang Wu, Heng Ji, Zhiyuan Liu, Maosong Sun. *Tool Learning with Foundation Models*.
- **Cheng Qian***, Yujia Qin*, Xu Han, Yankai Lin, Huadong Wang, Ruobing Xie, Zhiyuan Liu, Maosong Sun, Jie Zhou. *Recyclable Tuning for Continual Pre-training*. Findings of ACL 2023.
- **Cheng Qian***, Yujia Qin*, Jing Yi*, Weize Chen, Yankai Lin, Xu Han, Zhiyuan Liu, Maosong Sun, Jie Zhou. *Exploring Mode Connectivity for Pretrained Language Models*. EMNLP 2022.

RESEARCH EXPERIENCES

Exploring the Impacts of External and Internal Knowledge Conflicts Jul 2023 – Sep 2023

- Directed by Prof. Sherry Tongshuang Wu, CMU HCII & LTI.
- Investigated systematically how the Large Language Models (LLMs) respond to knowledge conflicts; Proposed parametric knowledge graph to model LLM's internal knowledge and distractors to introduce external knowledge;
- First author. Submitted to ACL 2024.

Investigation of LLM's Tool Using & Tool Creation Potential Mar 2023 – Jun 2023

- Collaborate with Prof. Heng Ji, UIUC Blender Lab and Prof. Chenyan Xiong, CMU LTI.
- Investigated into LLM's ability to create useful tools for problem-solving; Devised the CREATOR framework, which leverages the model's tool creation ability through four stages including creation, decision, execution, and rectification.
- Proved the generalizability of toolkits created by LLMs; Explored whether LLM's tool-using ability could be transferred to smaller, open-sourced models to raise performance on challenging tasks.

- First author of two papers. Both submitted to EMNLP 2023.

Tool Learning with Foundational Models Jan 2023 - Apr 2023

- Survey paper project. Collaborated with CMU, UIUC and NYU.
- Explored LLM's ability to utilize external tools in various scenarios; Formulated a general tool learning framework, in which the foundational model understands human instructions, adjusts its tool-using plan through reasoning, and effectively conquer the target tasks.
- Contributor to the paper and experiments. Submitted to Nature Machine Intelligence, under review.

Recyclable Tuning for Continual Pre-training Aug 2022 – Jan 2023

- Directed by Prof. Zhiyuan Liu, THUNLP.
- Formulated the task of recyclable tuning as LLM continually acquire fresh knowledge from emerging data; Explored how to make earlier adapted weights compatible with the upgraded LLMs.
- Explored the parametric connections and functional similarity among continually pre-trained models; Proposed distillation-based and initialization-based tuning methods, which enables recyclable tuning in data-efficient and training efficient ways.
- Co-first author. Applying for an invention patent. Accepted as Findings of ACL 2023.
- Project selected to THU *Undergraduate Academic Advancement program* and won ￥30K support.

Exploring Mode Connectivity for Pre-trained Language Models Mar 2022 – Jul 2022

- Directed by Prof. Zhiyuan Liu, THUNLP.
- Analyzed the geometric connections of different minima in loss landscape through the lens of mode connectivity, which measures whether two minima can be connected with a low loss path.
- Discovered the role of pre-training in facilitating mode connectivity and pulling task boundaries closer; Investigated into how PLMs task knowledge change along the connected path quantitatively.
- Co-first author. Accepted by Main Conference of EMNLP 2022.
- Project established in THU *Student Research Training Program*.

THUPat: A Convenient Campus Helper Mar 2022 – Jun 2022

- Directed by Prof. Chun Yu, *Theory and Practice of Human Computer Interaction* course project.
- Proposed "pat" for the first time as the medium in human-phone interaction; Built an open source software THUPat that can help with various kinds of campus events via simply patting the phone.
- Collaborator. Software released in THU and benefited the campus community.

SELECTED AWARDS & HONORS

- December-9th Scholarship, highest scholarship in Dept. of CST, **1 / 180**. 2021
- Volunteering & Social Survey Excellence Scholarship, Dept. of CST, **1 / 180**. 2022
- Awards of Excellent Student Cadre, Tsinghua University. 2021
- Second Prize in National Undergraduate Physics Competition, Beijing Physics Society. 2021
- Third Prize in THU Challenge Cup Academic Competition, Tsinghua University. 2022
- Honorable Mention in 2023 Mathematical Contest in Modeling 2023

SKILLS

English Skills

- TOEFL 115/120 (Reading 30, Listening 30, Speaking 26, Writing 29).
- GRE Verbal Reasoning 162/170, Quantitative Reasoning 170/170, Analytical Writing 4/6.

Technical Skills

- Proficient in C/C++, Python(PyTorch), LaTeX, Linux, Java, React.
- Familiar with various neural networks and state-of-the-art deep learning techniques.