CHENG QIAN

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EDUCATION

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

➢ **Cumulative GPA: 3.90 / 4.00, Major GPA: 3.90 / 4.00.**
➢ Selected Courses of **A & A+**: Linear Algebra, Discrete Mathematics, Foundation of Object-Oriented Programming, Software Engineering, Computer Architecture, Introduction to Artificial Intelligence, Artificial Neural Networks, Writing and Communication.
➢ Member of **THU Natural Language Processing Group**, advised by **Prof. Zhiyuan Liu**.
➢ **Academic Interest:** Tool learning and tool creation of LLM; LLM-driven AI agent, embodied AI; Elicitation and Interpretability of LLM Knowledge.

PUBLICATIONS & PATENTS & TALKS

Publications:

[1] **Toolink: Linking Toolkit Creation and Using through Chain-of-Solving on Open-Source Model** (*https://arxiv.org/pdf/2310.05155*)
Cheng Qian, Chenyan Xiong, Zhenghao Liu, Zhiyuan Liu. *ArXiv 2023.10*.

[2] **"Merge Conflicts!" Exploring the Impacts of External Distractors to Parametric Knowledge Graphs** (*https://arxiv.org/pdf/2309.08594v1*)
Cheng Qian, Xinran Zhao, Sherry Tongshuang Wu. *ArXiv 2023.9*.

[3] **CREATOR: Tool Creation for Disentangling Abstract and Concrete Reasonings of Large Language Models** (*https://arxiv.org/pdf/2305.14318*)
Cheng Qian, Chi Han, Yi R. Fung, Yujia Qin, Zhiyuan Liu, Heng Ji. *Findings of EMNLP 2023*.

[4] **Tool Learning with Foundation Models** (*https://arxiv.org/pdf/2304.08354*)
Yujia Qin, Shengding Hu, Yankai Lin, … **Cheng Qian**, …, Maosong Sun. *ArXiv 2023.4*.

[5] **Recyclable Tuning for Continual Pre-training** (*https://arxiv.org/pdf/2305.08702*)
Cheng Qian*, Yujia Qin*, Xu Han, Yankai Lin, Huadong Wang, Ruobing Xie, Zhiyuan Liu, Maosong Sun, Jie Zhou. *Findings of ACL 2023*.

[6] **Exploring Mode Connectivity for Pretrained Language Models** (*https://arxiv.org/pdf/2210.14102*)
Cheng Qian*, Yujia Qin*, Jing Yi*, Weize Chen, Yankai Lin, Xu Han, Zhiyuan Liu, Maosong Sun, Jie Zhou. *EMNLP 2022 Main Conference*.

* indicates equal contributions.

Patents:

1. Name: Training Method, Device, Medium, and Program Product for Predictive Model. Type: Invention. Inventors: Zhiyuan Liu, Maosong Sun, **Cheng Qian (Technical Lead)**, Yujia Qin, Yankai Lin, Ruobing Xie, Jie Zhou, Tsinghua University & Tencent Inc. Internal Ref. Num: 2022090418.

Talks:

1. Tool Learning and Tool Creation of LLM, invited talk at SenseTime Smart City Group, 2023.6.

RESEARCH & PROJECTS

1. Undergraduate Research Assistant, THUNLP, THU. **Advisor: Prof. Zhiyuan Liu** *2021 – Present*

➢ **LLM-driven AI agent (XAgent):** Released XAgent, an autonomous agent for complex task solving; Enhanced consistency, stability, and human-agent interaction; Beat GPT-4 and current pioneering projects (e.g. AutoGPT) on various math, code, QA benchmarks.

- ➢ **Tool learning with foundation models:** Formulated a tool learning framework: from understanding user instructions, foundation models learn to decompose complex tasks, adjust plans through reasoning, and conquer sub-tasks applying appropriate tools.
- ➢ **LLM lifelong pre-training:** Formulated the task compatible tuning: how to make earlier adapted weights compatible with upgraded LLMs as the continuously acquire fresh knowledge.
- ➢ **LLM knowledge interpretability:** Analyzed the geometric connections of different minima in loss landscape through the lens of mode connectivity (minima connected with a low loss path).

2. Visiting Student, WInE Lab, CMU. **Advisor: Prof. Sherry Tongshuang Wu**   *2023*
- ➢ **External and parametric knowledge conflicts:** Investigated how LLMs respond to knowledge conflicts systematically; Proposed parametric knowledge graph (PKG) to model LLM's internal knowledge.

3. Visiting Student, BLENDER Lab, UIUC. **Advisor: Prof. Heng Ji**   *2023*
- ➢ **LLM tool creation:** Investigated LLM's ability to create tools to solve the queries; Devised CREATOR framework, which enables tool creation through 4 stages: creation, decision, execution, and rectification.

4. Visiting Student, Chenyan's Group, CMU. **Advisor: Prof. Chenyan Xiong**   *2023*
- ➢ **Open-source adaptation of tool-use ability:** Proposed Toolink, a framework that transfers LLM tool-use ability to smaller, open-sourced LLaMA models to help solve BIG-bench tasks and raise performance.

SELECTED AWARDS & HONORS

1. Comprehensive Excellence Scholarship, highest scholarship in Dept. of CST, **1 / 180**.   *2021, 2023*
2. Volunteering & Social Survey Excellence Scholarship, Dept. of CST, **1 / 180**.   *2022*
3. SenseTime Scholarship for Innovative AI Talent, **top 30 in China.**   *2023*
4. Awards of Excellent Student Cadre, Tsinghua University.   *2021*
5. Five-Star (Highest Honor) Volunteer, Tsinghua University.   *2022*
6. Second Prize in National Undergraduate Physics Competition, Beijing Physics Society.   *2022*
7. Third Prize in THU Challenge Cup Academic Competition, Tsinghua University.   *2022*
8. Honorable Mention in 2023 Mathematical Contest in Modeling   *2023*

EXTRA-CURRICULUM SERVICES & EXPERIENCES

1. Reviewer, COLING 2022.   *2022*
2. Olympic Family Assistant of IBSF President Ivo Ferriano and HRH Prince Jigyel Ugyen Wangchuck (Bhutan), 2022 Beijing Winter Olympics.   *2022*
3. Member of Student Union and Student Association of Science and Technology.   *2021-2023*
4. Member of Tsinghua Orienteering Team (Sport, Professional).   *2020-2023*
5. Mentor of Tsinghua Summer School (Beijing).   *2022*
6. Leader of Summer Education-Aiding Program in NingXia, China. Tsinghua Gold Prize.   *2021*

SKILLS

English Skills
- ➢ TOEFL (Best) 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.