CHANGHAO LI

Mobile: (+86) 18911355676 | Email: lichangh20@mails.tsinghua.edu.cn | Main Page : lichangh20.github.io

EDUCATION

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

- **Cumulative GPA: 3.88 / 4.00, Major GPA: 3.89 / 4.00.**
- Selected Courses of **A & A+**: Linear Algebra, Calculus, Foundation of Object-Oriented Programming, Programing and Training, Introduction to Complex Analysis, Assembly Language Programming, Fundamentals of Computer Graphics, Artificial Neural Networks.
- Member of **TSAIL** (Tsinghua Statistical Artificial Intelligence & Learning), advised by **Professor Jianfei Chen** and **Professor Jun Zhu**.
- **Academic Interest**: High Efficient Machine Learning; Reinforcement learning in NLP; Parameter-efficient tuning of LLM

PUBLICATIONS & PATENTS

Publications:
Haocheng Xi, **Changhao Li**, Jianfei Chen, Jun Zhu. *"Training Transformers with 4-bit Integers"*. *Neurips 2023*

Patents:
Name: Training Deep Neural Networks With 4-bit Integers. Type: Invention. Inventors: Jianfei Chen, Haocheng Xi, **Changhao Li** Application reference: P20238162

RESEARCH EXPERIENCES

Multi-Step Reasoning with Reinforcement Learning Jun 2023 – Present

- Advised by **Prof. Xiang Ren**, USC INK Lab.
- Investigated systematically how to improve the multi-step reasoning quality with small language model(Llama2-7B); Propose a first Distillation then Reinforcement-Learning framework to improve the generation quality;
- Co-First author. (expected)

Training Transformers with 4-bit Integers Dec 2022 – May 2023

- Advised by **Prof. Jianfei Chen** & **Prof. Jun Zhu**, TSAIL.
- Proposed a 4-bit quantization method to train the Transformer models; Use Hadamard Matrix to filter out out-of-distribution data and use leverage sampling to quantize the gradient;
- Hardware optimization using Cuda C++ and demonstrate its high efficiency on different GPU architectures
- Second author. Accepted by Main Track of Neurips 2023.
- Project selected to THU *Challenge Cup Competition* and entered the finals.

LEADING PROJECTS

RISC-V CPU Nov 2022 – Dec 2022

- Outstanding Course Project
- Implemented a 5-stage pipeline RV32I CPU on FPGA from scratch.
- Implemented a VGA that can play video with many accelerating operations on the CPU, and got a high-performance video player.

Realistic Rendering based on Photon Mapping Apr 2022 – Jun 2022

- Outstanding Course Project

- Implemented a realistic rendering engine using stochastic progressive photon mapping algorithms.
- Boosted the engine with bounding boxes, hierarchical KD-Tree and OpenMP.

Search Engine Apr 2022 – Jun 2022

- Outstanding Course Project
- Got more than 5,000 pieces of data from website using python crawlers.
- Built a high-performance search engine using these data, and supported multiple search functions.

SELECTED AWARDS & HONORS

1. Comprehensive Excellence Scholarship, **highest** scholarship in Dept. of CST, Tsinghua University 2023
2. Academic Excellence Scholarship, Tsinghua University. 2022
3. Social Worker Excellence Scholarship, Tsinghua University. 2022
4. Second Prize in National Undergraduate Physics Competition, Beijing Physics Society. 2021
5. First Prize in Chinese Mathematics Olympiad 2020

EXTRACURRICULAR ACTIVITIES

1. Member of Table Tennis Team in Dept.of CST. 2021-2023
2. Member of Student Union in Dept.of CST. 2021-2023
3. Member of Tsinghua Orienteering Team. 2021-2023
4. Mentor of Tsinghua Summer School(Beijing). 2022

SKILLS

English Skills

- TOEFL 108/120 (Reading 28, Listening 29, Speaking 23, Writing 28).
- GRE Verbal Reasoning 155/170, Quantitative Reasoning 170/170, Analytical Writing 4/6.

Technical Skills

- Proficient in C/C++(Cuda C++), Python(PyTorch), LaTeX, Linux, Java, Rust.
- Familiar with various neural networks and state-of-the-art deep learning techniques.
- Familiar with high-efficient machine learning and parallel computing