CHANGHAO LI

Mobile: (+86) 18911355676 | Email: lichangh20@mails.tsinghua.edu.cn | Home 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 Coursework:** Linear Algebra(A), Calculus(A) , Introduction to Complex Analysis(**A+**), Foundation of Object-Oriented Programming(A), Assembly Language Programming(A), Fundamentals of Computer Graphics(A), Artificial Neural Networks(A)
- ➢ Member of TSAIL (Tsinghua Statistical Artificial Intelligence & Learning), advised by Professor Jianfei Chen and Professor Jun Zhu
- ➢ **Academic Interests**: 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 EXPERIENCE

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-lead the project

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++; utilized its high efficiency on different GPU architectures
- ➢ Second author. Accepted by Main Track of Neurips 2023.
- ➢ Project selected to THU *Challenge Cup Competition*

LEADING PROJECTS

RISC-V CPU   Nov 2022 – Dec 2022
- ➢ Made a 5-stage pipeline RV32I CPU on FPGA from scratch
- ➢ Designed a VGA capable of playing video with multiple accelerating operations on the CPU

Realistic Rendering based on Photon Mapping   Apr 2022 – Jun 2022
- ➢ Implemented a realistic rendering engine using stochastic progressive photon mapping algorithms
- ➢ Improved the engine with bounding boxes, hierarchical KD-Tree and OpenMP

Search Engine   Apr 2022 – Jun 2022
- ➢ Scraped more than 5,000 pieces of data from websites using python crawlers
- ➢ Built a high-performance search engine using these data inputs; the site supported multiple search functions like regular match and word segmentation search

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
- ➢ 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
- ➢ 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