CHANGHAO LI

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EDUCATION

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

- **GPA: 3.88 / 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 Assistant Professor Jianfei Chen and Professor Jun Zhu.

PUBLICATIONS

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

RESEARCH EXPERIENCES

Multi-Step Reasoning with Reinforcement Learning Jun 2023 – Present

- Directed by Prof. Xiang Ren, USC INK Lab.
- Investigated systematically how to improve the multi-step reasoning quality with small language model(GPT2-Large & Llama2-7B); Propose a first fine-tuning then reinforcement-learning framework to improve the generation quality;
- Co-First author.

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

- Directed 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-boundary data and use leverage sampling to quantize the gradient;
- Hardware implementation using Cuda C++ and show its comparable higher 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

- Academic Excellence Award, Tsinghua University. 2022
- Social Worker Excellence Award, Tsinghua University. 2022
- Second Prize in National Undergraduate Physics Competition, Beijing Physics Society. 2021
- First Prize in Chinese Mathematics Olympiad 2020

SKILLS

English Skills

- TOEFL 108/120 (Reading 28, Listening 29, Speaking 23, Writing 28).
- GRE Coming Soon.

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.