Zeliang Zhang

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Education

- **Huazhong University of Science and Technology** — Wuhan, Hubei, China
  Bachelor, Computer Science; GPA: 3.89 — *Sep 2018 - June 2022*
- **University of Rochester** — Rochester, New York State, US
  Graduate, Computer Science; GPA: 3.55 — *Sep 2022 - Present*

Personal Statement

My research interests fall on high-performance **scientific tensor computations** and applications (quantum neural networks, big data analysis, and quantum circuits), **responsible AI**, and **optimization theory**. I am an expert in **Python and C programming**, and familiar with popular deep learning frameworks, including Pytorch/TensorFlow, and basic **CUDA programming**, including the use of **GPU tensor cores**.

Experience

- **Machine Learning Group, Microsoft Research Asia** — Beijing, China
  Research intern — *Oct. 2021 – Jun. 2022*
  - **HPC for AI4Science**: Work on using GPU to accelerate the DFT computation for the automatic material design.
- **AI4Finance programming team, Columbia University** — Remote
  Research intern — *Apr. 2020 – May. 2022*
  - **Stable RL**: Involved in an open source project, ElegantRL (over 1,500 starts on Github), and developed a Hamitonian regularization term to stable the RL training, https://github.com/AI4Finance-Foundation/ElegantRL.
  - **HPC for tensor network-based methods**: Study on the design of high-performance tensor computations and applications, including tensor networks, DMRG, and the classical simulation of quantum circuits.

Publications

(* indicates the **equal contribution**)

- [Optimization Theory] Jinyang Jiang*, **Zeliang Zhang***, Chenliang Xu, Zhaofei Yu, Yijie Peng. "Breaking the chain rule: learning with only forward using the likelihood ratio method." https://arxiv.org/abs/2305.08960.
- [Quantum computation] Xiao-Yang Liu, **Zeliang Zhang**. "Classical Simulation of Quantum Circuits Using Reinforcement Learning: Parallel Environments and Benchmark." NeurIPS dataset and benchmark track 2023.
- [Trustworthy Computer Vision] Xiaosen Wang, **Zeliang Zhang**, and Jianping Zhang. "Structure Invariant Transformation for better Adversarial Transferability." ICCV 2023.
- [Trustworthy Computer Vision] Zhiyuan Wang*, **Zeliang Zhang***, Siyuan Liang, and Xiaosen Wang. "Diversifying the High-level Features for better Adversarial Transferability." BMVC 2023.
- [HPC for Tensor computation] Xiao-Yang Liu*, **Zeliang Zhang***, Zhiyuan Wang, Han Lu, Xiaodong Wang, and Anwar Walid. "High-Performance Tensor Learning Primitives Using GPU Tensor Cores." IEEE Transactions on Computers 2022.
- [HPC for Tensor computation] **Zeliang Zhang**, Junzhe Zhang, Guoping Lin, Zeyuan Yin, and Kun He. "Parallel TTr1-Tensor: Randomized Compression-based Scheme for Tensor Train Rank-1 Decomposition." NeurIPS 2020 QTNMLW.
- [Trustworthy Computer Vision] Xiaosen Wang, **Zeliang Zhang**, Kangheng Tong, Dihong Gong, Kun He, Zhifeng Li, and Wei Liu. "Triangle attack: A query-efficient decision-based adversarial attack." ECCV 2022.
- [Optimization Theory] Xiao Li, **Zeliang Zhang**, Jinyang Jiang, and Yijie Peng. "Noise optimization in artificial neural networks." CASE 2022.
- [Optimization Theory] **Zeliang Zhang**, Zhuo Liu, Susan Liang, Zhiyuan Wang, Yifan Zhu, Chen Ding, Chenliang Xu. "Scalable CP Decomposition for Tensor Learning using GPU Tensor Cores." https://arxiv.org/pdf/2311.13693.pdf.
- [Reinforcement Learning] **Zeliang Zhang**, Yipeng Wang, Zeqi Liu, and Xiao-Yang Liu, "DHN: Deep Hamiltonian Network for Variational Reinforcement Learning." NeurIPS 2021 QTNMLW.
- [HPC for Tensor computation] **Zeliang Zhang**, Xiao-Yang Liu, and Pan Zhou. "Trillion-Tensor: Trillion-Scale CP Tensor Decomposition." IJCAI 2020 TNRMLW.

Projects

Discover and Mitigate Multiple Biased Subgroups in Image Classifiers
Zeliang Zhang*, Mingqian Feng*, Zhiheng Li, Chenliang Xu

- [Trustworthy/XAI] In this work, we propose Decomposition, Interpretation, and Mitigation (DIM), a novel method to address a more challenging but also more practical problem of discovering multiple biased subgroups in image classifiers.
- Under review.

Are large models always better?: Understanding audio-visual model robustness under common corruptions
Daiki Shimada, **Zeliang Zhang**, Chenliang Xu

- [Trustworthy/Robustness] This paper presents a benchmarking framework to evaluate the robustness of audio-visual models against common corruptions.
- Under review.

Approximated Likelihood Ratio Method for Neural Network Training
Zeliang Zhang*, Jinyang Jiang*, Zhuo Liu*, Yijie Peng, Chenliang Xu

- [Optimization] We propose an approximated likelihood ratio method for gradient estimation without relying on the chain rule.
- Under review.

Bag of tricks to boost the adversarial transferability
Zeliang Zhang, Rongyi Zhu, Wei Yao, Xiaosen Wang, Chenliang Xu

- [Trustworthy AI] We propose a bag of tricks to boost the adversarial transferability among different models.
- Under review.

Random Smooth-based Certified Defense against Text Adversarial Attack
Zeliang Zhang, Wei Yao, Susan Liang, Chenliang Xu

- [Trustworthy AI] We propose to treat the word substitution as a continuous perturbation on the word embedding representation for better robustness.
- Under review.

Revisit Audio-Visual Adversarial Robustness from Temporal and Modality Correlation Perspectives
Zeliang Zhang*,Susan Liang*, Daiki Shimada*, Chenliang Xu

- [Trustworthy AI] We propose a powerful audio-visual adversarial attack to benchmark the robustness performance of audio-visual models and strong defense adversarial defense methods.
- Under review.

High-performance Tensor-Train Primitives Using GPU Tensor Cores
Xiao-Yang Liu, Hao Hong, **Zeliang Zhang**, Weiqing Tong, Xiaodong Wang, Anwar Walid

- [Tensor computation] We present high-performance tensor-train primitives using GPU tensor cores and demonstrate three applications.
- Under review.

Honors and Awards

Individual Scholarship on Arts and Sports Apr. 2019
Recognition for students with good performance in arts and sports activities
Scholarship for Scientific and Technological Innovation Dec. 2020
Recognition for students with good performance in scientific and technological innovation
The SANGFOR scholarship Apr. 2021
Recognition by Sangfor Technologies Inc for students in both study and academics
Excellent graduate Jun. 2022
Recognition for excellent graduate in HUST.