Jin Fang

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Education

University of Science and Technology of China (USTC) Anhui, China

Ph.D. in Computer Science 2020.9-present

- Research focus on Distributed Training and In-network Computing
- Advisors: Prof. Hongli Xu and Prof. Gongming Zhao

Hunan University (HNU) Hunan, China

B.S. in Computer Science 2016.9-2020.6

- Excellent Graduation Thesis of Hunan University

Publications

1. **J. Fang**, G. Zhao, H. Xu, L. Luo, Z. Yao, A. Xie, *Non-Idle Machine-Aware Worker Placement for Efficient Distributed Training in GPU Clusters*, IEEE International Conference on Network Protocols (**ICNP'24**)
2. **J. Fang**, G. Zhao, H. Xu, Z. Yu, B. Shen, L. Xie, *Accelerating Distributed Training with Collaborative In-network Aggregation*, IEEE/ACM Transactions on Networking (**ToN'24**)
3. **J. Fang**, G. Zhao, H. Xu, Z. Yu, B. Shen, L. Xie, *GOAT: Gradient Scheduling with Collaborative In-Network Aggregation for Distributed Training*, IEEE/ACM International Symposium on Quality of Service (**IWQoS'23**)
4. **J. Fang**, G. Zhao, H. Xu, C. Wu, Z. Yu, *GRID: Gradient Routing with In-network Aggregation for Distributed Training*, IEEE/ACM Transactions on Networking (**ToN'23**)
5. **J. Fang**, G. Zhao, H. Xu, H. Tu, H. Wang, *Reveal: Robustness-Aware VNF Placement and Request Scheduling in Edge Clouds*, Computer Networks (**ComNet'23**)
6. J. Liu, Y. Zhai, G. Zhao, H. Xu, **J. Fang**, Z. Zeng, Y. Zhu, InArt: In-Network Aggregation with Route Selection for Accelerating Distributed Training, International World Wide Web Conference (**WWW'24**)

Experience

Communication-Computation Fused GPU Kernel Generation Bytedance AML, Beijing, China

Research Intern 2024.6-Present

- Implement collective communication operations (e.g., AllGather) based on Triton and NVSHMEM
- Design and implement communication-computation fused operations (e.g., AllGather+GEMM), exploring overlaps between GEMM and collective communications
- Optimize GPU memory access cost by organizing thread block layouts
- Achieve near-optimized bandwidth utilization (200GBps) on A100*8 NVlink machines

Optimizing Worker Placement for Distributed Training in OCS Network Huawei 2012 Lab, Hefei, China

Research Intern 2023.12-2024.5

- Investigate existing large model task deployment and resource scheduling works
- Investigate existing gradient compression optimization for sparse model training
- Model physical and logical communication patterns of different all-reduce algorithms, analyze the impact of communication topology on task training time
- Design a task placement algorithm to optimize the cross-rack traffic in the optical circuit switch network

Simulating network faults with programmable dataplane Suzhou, China

Main Developer 2022.12-2023.9

- Build a user-friendly, multi-backend fault injection system in programmable dataplane
- Design a parser generation algorithm to handle flow dependency and load the table entries

- Formulate the fault injection point selection problem
- Implement several network faults with P4 in TNA and PSA architectures

Accelerating distributed training with programmable switches Zhijiang Lab, Hangzhou, China

Research Intern 2022.6-2022.9

- Improve the in-network aggregation throughput by mitigating the influence of asychronous arrived packets
- Design a knapsack-based randomized rounding algorithm for gradient scheduling
- Implement a distributed training prototype with Pytorch
- Implement the in-network aggregation logic in Tofino with P4
- Reduce the communication overhead of distibuted training tasks by 81.2%

Developing and testing Alcor, a cloud native SDN platform Futurewei, *Remotely*

Developer 2021.6-2021.9

- Write an automatic building script for large scale deployment with bash
- Write an end-to-end test of the virtualization control plane (ACA) with C++
- Develop grpc thread for pulsar subscribe information (PR #274) with C++

Robust-awareness VNF placement in the edge cloud Hefei, China

Main Developer 2021.2-2021.6

- Improve the robustness of edge clouds by limiting the influence of malicious users and failed VNFs
- Design a two-phase algorithm to solve the problem of VNF placement and request scheduling
- Implement a prototype containing 6 Nvidia Jetson Tx2s and 20 Raspberry Pis with Python
- Improve the network throughput by 57% under exisitence the malicious user

Implement a LSTM model based on high-level synthesis Hunan, China

Main Developer 2019.6-2020.1

- Train a LSTM model based on Keras to predict the steam pressure in nuclear power plant reactor
- Implement the trained LSTM model with C++ and deploy it into a Pynq-Z2 board
- Reduce the inference time by 90x compared with software implementation
- *Win the award of Excellent Graduation Thesis of Hunan University*

PATENTS

1. G. Zhao, **J. Fang**, H. Xu, C. Wu, *A gradient scheduling method based on programmable switch under PS architecture*, CN114900482B
2. H. Xu, **J. Fang**, G. Zhao, H. Tu, H. Wang, *A VNF placement method in the edge cloud*, CN113961324A

AWARDS

- Guorui scholarship 2023
- Excellent price (25%) in Intel P4 China Hackthon 2022
- Doctoral first-class academic scholarship 2022, 2023
- Master's first-class study scholarship 2020, 2021

SKILLS

- Programming Language: C/C++, Python, P4, C#, Swift
- Developing Framework: Pytorch, p4c, eBPF, Mininet

SERVICES

- External Reviewer: IEEE JSAC, IEEE TNET, COMNET
- Teaching Assistant: COMP6103P Advanced Computer Networking