Yuqi Fu

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Research Interests

My research interests include the operating system and cloud computing. Specifically, Serverless computing enables a new way of building and scaling cloud applications by allowing developers to write fine-grained cloud functions. My current research focuses on designing effective scheduling algorithms on both per server's operating system and distributed serverless cluster levels. The goal is to accelerate the overall performance of serverless clusters and minimize contention costs among users' tasks.

Education

Aug 2022 - Ongoing **Ph.D. in Computer Science**,
Computer Science Department, University of Virginia, Charlottesville, VA, US.

Aug 2020 - Aug 2022 **Ph.D. in Computer Science**,
Computer Science Department, George Mason University, Fairfax, VA, US.
Transfer to University of Virginia

Jan 2019 - May 2020 **M.S. in Data Science**,
Computer & Information Science Department, Fordham University, NewYork, NY, US.

Aug 2013 - May 2017 **B.S in Financial Mathematics**,
Department of Mathematics, Xi'an Jiaotong-Liverpool University, Suzhou, China.

Experience

May 2022 – Aug 2022 **Software Engineer Intern**, Bytedance.
○ Analyze real production workloads data.
○ Implement new functionalities and advanced features on the large-scale cluster scheduling system.

Projects

2021 **Building a distributed cache system for higher throughput in deep learning applications**.
We build a new distributed, multi-tier, elastic, and low-latency system that can effectively eliminate the storage bottleneck. As a result, the system ensures higher throughput and low mini-batch load time while significantly reducing the overall memory and storage-level cost for deep learning training. By incorporating importance sampling and the new sampling-aware caching algorithm, we achieve a high hit ratio compared with the default random policy.

2021 **Designing a User-level scheduler accelerating overall performance of serverless workloads**.
Supervised by Prof. Yue Cheng and Prof. Songqing Chen, we propose Smarter Function Scheduler (SFS), which works entirely in the user space and carefully orchestrates existing Linux FIFO and CFS schedulers on each serverless task. The FILTER algorithm guides SFS behaviors that significantly improve short functions' duration with a small impact on relatively longer functions.

2020 **Rebalancing a Kubernetes cluster based on progress estimation**.
We develop a novel scheduler for Kubernetes clusters. It monitors the progress of each container, calculates the resource efficiency, and conducts container migrations in real time. It rebalances the allocation according to the convergence of containers and boosts the overall system performance.

2019 **Orchestrating Distributed Systems of Virtualized Containers**.
We develop a new container placement scheme for Kubernetes. The proposed approach has been implemented as a plugin of the Kubernetes system, an industrial-level container orchestration toolkit, and evaluated through intensive experiments.

Publication

[FAST'23]
Under Review
☆ **SHADE: Enable Fundamental Cacheability for Distributed Deep Learning Training**,
USENIX Conference on File and Storage Technologies (FAST'23), Under Review.
Redwan Ibne Seraj Khan, Ahmad Hossein Yazdani, **Yuqi Fu**, Arnab K. Paul, Yue Cheng, Bo Ji, Ali Butt

[SC '22]
☆ **SFS: Smart OS Scheduling for Serverless Functions**,
The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC'22).
Yuqi Fu, Li Liu, Haoliang Wang, Yue Cheng, Songqing Chen
🏆 Best Student Paper Finalist

[ISJ '21]
☆ **Speculative Container Scheduling for Deep Learning Applications in a Kubernetes Cluster**,
IEEE Systems Journal (ISJ'21).
Yuqi Fu, Wenjia Zheng, Ying Mao, Dingwen Tao, Long Cheng

[BigData '19]
☆ **Progress Based Load Balancing for Containerized Deep Learning Applications**,
2019 IEEE International Conference on Big Data (BigData'19), (AR:19.7%).
Yuqi Fu, Shaolun Zhang, Jose Terrero, Ying Mao, and Guangya Liu.

Professional Services

External Reviewer

2022 **NAS (storage track)**, *IEEE International Conference on Networking, Architecture, and Storage*.

2022 **HPDC**, *ACM International Symposium on High-Performance Parallel and Distributed Computing*.

2022 **SEC**, *ACM/IEEE Symposium on Edge Computing*.

2021 **ICDCS**, *41st IEEE International Conference on Distributed Computing Systems*.

2021 **HPDC**, *ACM International Symposium on High-Performance Parallel and Distributed Computing*.

Student Volunteer

2021 **ICDCS**, *41st IEEE International Conference on Distributed Computing Systems*.