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Google Scholar Page

Ying Mao

Academic Appointments

09/2023— **Associate Chair for Undergraduate Studies**, *Department of Computer and Information Science*, Fordham University, New York, NY.

09/2023— **Associate Professor (Tenured)**, *Department of Computer and Information Science*, Fordham University, New York, NY.

Fall 2021 **Visiting Scholar (Pre-tenure Sabbatical)**, *Pacific Northwest National Laboratory (PNNL)*, Richland, WA.

2018–2023 **Assistant Professor**, *Department of Computer and Information Science*, Fordham University, New York, NY.

2016–2018 **Assistant Professor**, *Department of Computer Science*, The College of New Jersey, Ewing, NJ.

Education

2012-2016 **Ph.D., Computer Science**, *University of Massachusetts Boston*, Boston, MA.

2010–2011 **M.S., Electrical Engineering**, *State University of New York at Buffalo*, Buffalo, NY.

2005–2009 **B.S., Telecommunication**, *Commanding Communication Academy*, Wuhan, China.

Selected Awards and Grants

2024-2026 **XTRIPODS: Advancing Quantum Data Science Research and Education: Resilient Quantum Learning in NISQ era**, *National Science Foundation*, $200K, Role: Lead PI.
This project develops a quantum learning system using a data-driven approach that integrates static-dynamic combined circuit analysis. It combines static metrics with the inherent dynamic noises of quantum systems. A topology-aware resilient circuit transpilation mechanism tailored to quantum learning will be developed to optimize the execution on noisy intermediate-scale quantum (NISQ) era hardware under quantum noise.

2023-2026 **ExpandQISE: Track 1: Collaborative Optimization and Management for Iterative and Parallel Quantum Computing**, *National Science Foundation*, $690K, Role: Lead PI.
This project investigates a collaborative optimization and management pipeline for quantum-classical systems focusing on iterative and parallel applications. It aims to build an application-specific circuit analyst with a set of composable optimizers. The hardware-specific information will be efficiently collected to guide application optimization and system management.

2023-2025 **ERI: Harnessing Quantum-Classical Computing with a Cloud-Edge Framework for Cyber-Physical Systems**, *National Science Foundation*, $200K, Role: Single PI.
This project develops a quantum-equipped cloud-edge collaborative computing framework to effectively manage heterogeneous participants in cyber physical systems. It bridges the gap between quantum computing and classical edge computing related research domains.

2023-2025 **Education DCL: EAGER: Experiential Learning Platform and Curricular Modules for Quantum Computing Security and Privacy Education**, *National Science Foundation*, $300K, Role: co-PI.

This project aims to develop a comprehensive set of curricular modules, hands-on labs, and an online experimental platform with quantum system's visualization functionality to support quantum computing systems security and privacy (QuanSP) education and workforce development at scale. The project also includes an implementation and evaluation phase to ensure the effectiveness and sustainability of the developed QuanSP education materials for training the quantum cybersecurity workforce.

2022 **Iterative Qubits Management in a Quantum-Classic System**, *IonQ Research Program*, $10K, Role: PI.

2021 **Google Explore Computer Science Research in Tri-State Area**, *Google Research*, $18K, Role: PI.

2021 **Quantum based Machine Learning for Image Classifications**, *Google Cloud Platform for Research*, $5K, Role: PI.

2021 **Improving Deep Learning Architectures with IBM-Q Quantum Computing**, *Fordham-IBM Research Fellow Program*, $7K + 1 IBM Research Intern, Role: PI.

Pending Grants

LOI Submitted **ExpandQISE: Track 2: QuantumCS: Expanding Quantum Research and Education in Computer Science across the Tri-State Region** , *National Science Foundation*, $5.0M, Role: Lead PI, with collaborators from Rutgers University and University of Connecticut.

Submitted **KuberQu: An Efficient and Configurable Quantum Emulator through Containerization**, *Department of Energy*, $350K, Role: Single PI.

Submitted **Collaborative Research: CCF: Medium: Physics-Driven, Qubit-Level Quantum Resource Management with Hardware Co-design**, *National Science Foundation*, $1.2M, Role: Lead PI.

Submitted **Equipment: MRI: Track 1 Acquisition of a High-Performance GPU Cluster for Multi-disciplinary Research and Education at Fordham University**, *National Science Foundation*, $400K, Role: Lead PI.

Research Experiences and Interests

- **High-performance Quantum Computing Systems**

  - Quantum Machine Learning
  - Quantum-Classical Systems Optimization
  - Quantum Hardware-Software co-designed Systems
  - Quantum Cloud Computing and Distributed Quantum Systems
  - Fault-tolerant and Noise-resilient Quantum Algorithms on NISQ devices

  In parallel with the breakthrough of deep learning in the past years, remarkable progress has been achieved in the field of quantum computing systems. My latest research portfolio include high-performance quantum computing systems. In this field, we explore quantum state fidelities based deep learning architectures, quantum resource management, noise characterization and visualization. For example, we proposed QuGan and QuClassi that which equipped fully quantum-based evaluation functions. They are trained on quantum computers iteratively and optimized in classical parts to achieve similar performance with 95% fewer parameters.

- **Large-scale and Data-intensive Computing Systems** :

  - Systems for Deep Learning Applications
  - Distributed Systems and Applications

- Heterogeneous computing systems and Management
- Hardware-Software co-design for Scalable Systems

Novel algorithms, growing computational power, and modern designs have enabled a wide spectrum of usage scenarios ranging from scientific data processing to commercial image and speech recognition. My research projects have been focused on High-Performance Computing Systems (classical), where we proposed novel architectures to manage a diverse workloads and accelerate the training process of a deep learning system. We analyze the growth efficiency of the workload at runtime and allocate more resources, such as CPU/GPU shares and memory spaces, to fast-moving tasks. We proposed algorithms to predict the completion time of a deep learning application in order to update the resource allocation plan dynamically and boost the overall system performance.

Selected Publications (Google Scholar)

*Underlined names are my students

2024 L'Abbate, Ryan, D'Onofrio, Anthony, Stein, Samuel, Samuel Yen-Chi Chen, Ang Li, Pin-Yu Chen, Juntao Chen, and **Mao, Ying**. A quantum-classical collaborative training architecture based on quantum state fidelity. *IEEE Transactions on Quantum Engineering (TQE)*, pages 1–13, 2024.

2024 Qingzhi Liu, Yuchen Huang, Chenglu Jin, Xiaohan Zhou, **Ying Mao**, Cagatay Catal, and Long Cheng. Privacy and integrity protection for iot multimodal data using machine learning and blockchain. *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, 2024.

2023 Jingwei Zhang, Long Cheng, Cong Liu, Zhiming Zhao, and **Ying Mao**. Cost-aware scheduling systems for real-time workflows in cloud: An approach based on genetic algorithm and deep reinforcement learning. *Expert Systems with Applications*, volume 234. Pergamon, 2023.

2023 Anthony D'Onofrio Jr., Amir Hossain, Lesther Santana, Naseem Machlovi, Samuel Stein, Jinwei Liu, Ang Li, , and **Ying Mao**. Distributed quantum learning with co-management in a multi-tenant quantum system. In *2023 IEEE International Conference on Big Data (BigData)*, 2023.

2023 Shaolun Ruan, Ribo Yuan, Qiang Guan, Yanna Lin, **Ying Mao**, Weiwen Jiang, Zhepeng Wang, Wei Xu, and Yong Wang. Venus: A geometrical representation for quantum state visualization. In *Computer Graphics Forum (EuroVis 2023)*, volume 42, pages 247–258, 2023.

2023 Shaolun Ruan, Yong Wang, Weiwen Jiang, **Ying Mao**, and Qiang Guan. Vacsen: A visualization approach for noise awareness in quantum computing. *IEEE Transactions on Visualization and Computer Graphics (TVCG, IEEE Visualization 2022)*. IEEE, 2023.

2023 Shaolun Ruan, Qiang Guan, Paul Griffin, **Ying Mao**, and Yong Wang. Quantumeyes: Towards better interpretability of quantum circuits. *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, 2023.

2023 Jinwei Liu, Yingjie Lao, **Ying Mao**, , and Rajkumar Buyya. Sailfish: A dependency-aware and resource efficient scheduling for low latency in clouds. In *2023 IEEE International Conference on Big Data (BigData)*, 2023.

2023 Jinwei Liu, Rui Gong, Wei Dai, Wei Zheng, **Ying Mao**, and Wei Zhou. Hcoop: A cooperative and hybrid resource scheduling for heterogeneous jobs in clouds. In *The 14th IEEE International Conference on Cloud Computing Technology and Science (CloudCom)*, 2023.

2023 Long Cheng, Ying Wang, Rutvij H Jhaveri, Qingle Wang, and **Ying Mao**. Towards network-aware query execution systems in large datacenters. *IEEE Transactions on Network and Service Management (TNSM)*. IEEE, 2023.

2022 Wenrui Mu, **Ying Mao**, Long Cheng, Qingle Wang, Weiwen Jiang, and Pin-Yu Chen. Iterative qubits management for quantum index searching in a hybrid system. In *The 41th IEEE International Performance Computing and Communications Conference (IPCCC)*, pages 1–7. IEEE, 2022.

2022 Samuel Stein, **Ying Mao**, James Ang, and Ang Li. Qucnn: A quantum convolutional neural network with entanglement based backpropagation. In *2022 IEEE/ACM 7th Symposium on Edge Computing (SEC)*, pages 368–374. IEEE, 2022.

2022 Samuel Stein, Betis Baheri, Daniel Chen, **Ying Mao**, Qiang Guan, Ang Li, Shuai Xu, and Caiwen Ding. Quclassi: A hybrid deep neural network architecture based on quantum state fidelity. *Proceedings of Machine Learning and Systems (MLSys)*, volume 4, 2022.

2022 **Ying Mao**, Weifeng Yan, Yun Song, Yue Zeng, Ming Chen, Long Cheng, and Qingzhi Liu. Differentiate quality of experience scheduling for deep learning inferences with docker containers in the cloud. *IEEE Transactions on Cloud Computing (TCC)*. IEEE, 2022.

2022 **Ying Mao**, Vaishali Sharma, Wenjiang Zheng, Long Cheng, Qiang Guan, and Ang Li. Elastic resource management for deep learning applications in a container cluster. *IEEE Transactions on Cloud Computing (TCC)*. IEEE, 2022.

2022 Guan Qiang, Betis Baheri, Xu, Zixuan, **Ying Mao**, Vipin Chaudhary, Shuai Xu, and Bo Fang. Pinpointing the system reliability degradation in nisq machines. In *2022 IEEE International Conference on Quantum Computing and Engineering (QCE)*. IEEE, 2022.

2021 Allen Yang, Jiayin Wang, **Ying Mao**, Yi Yao, Ningfang Mi, and Bo Sheng. Optimizing internal overlaps by self-adjusting resource allocation in multi-stage computing systems. *IEEE Access*, volume 9, pages 88805–88819. IEEE, 2021.

2021 Lianting Xue, Long Cheng, Yuancheng Li, and **Ying Mao**. Quantum machine learning for electricity theft detection: an initial investigation. In *2021 IEEE International Conferences on Internet of Things (iThings) and IEEE Green Computing & Communications (GreenCom) and IEEE Cyber Physical & Social Computing (CPSCom) and IEEE Smart Data (SmartData) and IEEE Congress on Cybermatics (Cybermatics)*, pages 204–208. IEEE, 2021.

2021 Samuel Stein, Ryan L'Abbate, Wenrui Mu, Yue Liu, Betis Baheri, **Ying Mao**, Guan Qiang, Ang Li, and Bo Fang. A hybrid system for learning classical data in quantum states. In *2021 IEEE International Performance Computing and Communications Conference (IPCCC)*, pages 1–7. IEEE, 2021.

2021 Samuel Stein, Betis Baheri, Daniel Chen, **Ying Mao**, Qiang Guan, Ang Li, Bo Fang, and Shuai Xu. Qugan: A quantum state fidelity based generative adversarial network. In *2021 IEEE International Conference on Quantum Computing and Engineering (QCE)*, pages 71–81. IEEE, 2021.

2021 **Ying Mao**, Yuqi Fu, Wenjiang Zheng, Long Cheng, Qingzhi Liu, and Dingwen Tao. Speculative container scheduling for deep learning applications in a kubernetes cluster. *IEEE Systems Journal (SysJ)*. IEEE, 2021.

2021 Qingzhi Liu, Tiancong Xia, Long Cheng, Merijn Van Eijk, Tanir Ozcelebi, and **Ying Mao**. Deep reinforcement learning for load-balancing aware network control in iot edge systems. *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, volume 33, pages 1491–1502. IEEE, 2021.

2021 Long Cheng, Ying Wang, Qingzhi Liu, Dick HJ Epema, Cheng Liu, **Ying Mao**, and John Murphy. Network-aware locality scheduling for distributed data operators in data centers. *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, volume 32, pages 1494–1510. IEEE, 2021.

2021 Xuan Chen, Feng Cheng, Cong Liu, Long Cheng, and **Ying Mao**. An improved wolf pack algorithm for optimization problems: Design and evaluation. *Plos one*, volume 16, page e0254239. Public Library of Science San Francisco CA USA, 2021.

2021 Betis Baheri, Daniel Chen, Bo Fang, Samuel Stein, Vipin Chaudhary, **Ying Mao**, Shuai Xu, Ang Li, and Qiang Guan. Tqea: Temporal quantum error analysis. In *2021 51st Annual IEEE/IFIP International Conference on Dependable Systems and Networks-Supplemental Volume (DSN-S)*. IEEE, 2021.

2020 Wei Yin, Peizhao Hu, Jadwiga Indulska, Marius Portmann, and **Ying Mao**. Mac-layer rate control for 802.11 networks: A survey. *Wireless Networks*, volume 26, pages 3793–3830. Springer US, 2020.

2020 Xuan Chen, Long Cheng, Cong Liu, Qingzhi Liu, Jinwei Liu, **Ying Mao**, and John Murphy. A woa-based optimization approach for task scheduling in cloud computing systems. *IEEE Systems journal (SysJ)*, volume 14, pages 3117–3128. IEEE, 2020.

2020 Daniel Chen, Yekun Xu, Betis Baheri, Chuan Bi, **Ying Mao**, Qiang Quan, and Shuai Xu. Quantum-inspired classical algorithm for principal component regression. In *The 2020 International Conference on Quantum Techniques in Machine Learning (QTML)*, 2020.

2019 Yuqi Fu, Shaolun Zhang, Jose Terrero, **Ying Mao**, Guangya Liu, Sheng Li, and Dingwen Tao. Progress-based container scheduling for short-lived applications in a kubernetes cluster. In *2019 IEEE International Conference on Big Data (BigData)*, 2019.

2019 Wenjiang Zheng, Yun Song, Zihao Guo, Yongchen Cui, Suwen Gu, **Ying Mao**, and Long Cheng. Target-based resource allocation for deep learning applications in a multi-tenancy system. In *2019 IEEE High Performance Extreme Computing Conference(HPEC)*, 2019.

2019 Wenjiang Zheng, Michael Tynes, Henry Gorelick, **Ying Mao**, Long Cheng, and Yantian Hou. Flowcon: Elastic flow configuration for containerized deep learning applications. In *ACM the 48th International Conference on Parallel Processing (ICPP)*, 2019.

2019 Anil Acharya, Yantian Hou, **Ying Mao**, and Jiawei Yuan. Edge-assisted image processing with joint optimization of responding and placement strategy. In *2019 International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData)*, pages 1241–1248. IEEE, 2019.

2019 Anil Acharya, Yantian Hou, **Ying Mao**, Min Xian, and Jiawei Yuan. Workload-aware task placement in edge-assisted human re-identification. In *2019 16th Annual IEEE International Conference on Sensing Communication and Networking (SECON)*, pages 1–9. IEEE, 2019.

2018 **Ying Mao**, Victoria Green, Jiayin Wang, Haoyi Xiong, and Zhishan Guo. Dress: Dynamic resource-reservation scheme for congested data-intensive computing platforms. In *2018 IEEE 11th International Conference on Cloud Computing (CLOUD)*, pages 694–701. IEEE, 2018.

2017 Jiayin Wang, Teng Wang, Zhengyu Yang, **Ying Mao**, Ningfang Mi, and Bo Sheng. Seina: A stealthy and effective internal attack in hadoop systems. In *International Conference on Computing Networking and Communications (ICNC)*, 2017.

2017 Hank Harvey, **Ying Mao**, Yantian Hou, and Bo Sheng. Edos: Edge assisted offloading system for mobile devices. In *The 26th International Conference on Computer Communications and Networks (ICCCN)*, 2017.

2017 **Ying Mao**, Jenna Oak, Anthony Pompili, Daniel Beer, Tao Han, and Peizhao Hu. Draps: Dynamic and resource-aware placement scheme for docker containers in a heterogeneous cluster. In *2017 IEEE 36th International Performance Computing and Communications Conference (IPCCC)*, pages 1–8. IEEE, 2017.

2016 **Ying Mao**, Jiayin Wang, and Bo Sheng. Mobile message board: Location-based message dissemination in wireless ad-hoc networks. In *2016 international conference on computing networking and communications (ICNC)*, pages 1–5. IEEE, 2016.

2015 Jiayin Wang, Yi Yao, **Ying Mao**, Bo Sheng, and Ningfang Mi. Omo: Optimize mapreduce overlap with a good start (reduce) and a good finish (map). In *2015 IEEE 34th International Performance Computing and Communications Conference (IPCCC)*, pages 1–8. IEEE, 2015.

2015 **Ying Mao**, Jiayin Wang, Bo Sheng, and Fan Wu. Building smartphone ad-hoc networks with long-range radios. In *2015 IEEE 34th International Performance Computing and Communications Conference (IPCCC)*, pages 1–8. IEEE, 2015.

2014 Jiayin Wang, Yi Yao, **Ying Mao**, Bo Sheng, and Ningfang Mi. Fresh: Fair and efficient slot configuration and scheduling for hadoop clusters. In *2014 IEEE 7th International Conference on Cloud Computing (Cloud)*, pages 761–768. IEEE, 2014.

2014 **Ying Mao**, Jiayin Wang, Bo Sheng, and Mooi Choo Chuah. Laar: Long-range radio assisted ad-hoc routing in manets. In *2014 IEEE 22nd International Conference on Network Protocols (ICNP)*, pages 350–355. IEEE, 2014.

2014 **Ying Mao**, Jiayin Wang, and Bo Sheng. Skyfiles: Efficient and secure cloud-assisted file management for mobile devices. In *2014 IEEE International Conference on Communications (ICC)*, pages 4202–4207. IEEE, 2014.

2014 **Ying Mao**, Jiayin Wang, and Bo Sheng. Dab: Dynamic and agile buffer-control for streaming videos on mobile devices. *Procedia Computer Science*, volume 34, pages 384–391. Elsevier, 2014.

2014 **Ying Mao**, Jiayin Wang, Cohen, Joseph Paul, and Bo Sheng. Pasa: Passive broadcast for smartphone ad-hoc networks. In *2014 23rd International Conference on Computer Communication and Networks (ICCCN)*, pages 1–8. IEEE, 2014.

2012 **Ying Mao**, Bo Sheng, and Mooi Choo Chuah. Scalable keyword-based data retrievals in future content-centric networks. In *2012 8th International Conference on Mobile Ad-hoc and Sensor Networks (MSN)*, pages 116–123. IEEE, 2012.

Selected Professional Services

Internal Services

University Research Council

Undergraduate Advising Task Force

Clare Boothe Luce Program

Ph.D. Admission Committee

MSDS Admission Committee

MSCS Admission Committee

Department Systems Committee

Department Colloquium Committee

Math-Computer Science Program Coordinator

Freshman Core Advisor

External Services

General Chair **2021 Google Research Tri-State ExploreCSR**, *April, 2021*.
With the support from Google Research, we successfully organized the first Tri-State ExploreCSR. It attracted more than 250 applicants from 13 institutions in the Tri-State area (NY, NJ, and CT). Collaborated with the Stevens Institute of Technology and the University of Connecticut, we provide mentored research experiences to 61 students from underrepresented groups, e.g., first-generation college students, women, racially/ethnically minoritized students.

Organizing Committee
The Second International Workshop on Quantum Classical Cooperative Computing (QCCC'23)

Special Session: Quantum Machine Learning Algorithms and Applications on NISQ Devices at International Joint Conference on Neural Networks (IJCNN'24)

TPC Member
Association for the Advancement of Artificial Intelligence

IEEE International Performance Computing and Communications Conference

IEEE International Conference on Cloud Computing

International Conference on Parallel Processing

International Conference on Big Data

International Conference on Computer Communications and Networks

Frequent Reviewer	Association for the Advancement of Artificial Intelligence
	IEEE Transactions on Cloud Computing
	The IEEE Transactions on Network and Services Management
	IEEE Transactions on Parallel and Distributed Systems
	IEEE Communications Magazine
	IEEE Systems Journal
	ACM Transactions on Quantum Computing
	IEEE Transactions on Quantum Computing and Engineering