Weiyang "Frank" Wang

Ph.D. Candidate, MIT EECS Department

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Education

2022 – 2026 **Massachusetts Institute of Technology**, *Cambridge*, MA
Ph.D. Computer Science
Advisor: Prof. Manya Ghobadi
Tentative Thesis: Workload-Driven Network Optimizations for Distributed Machine Learning
Minor in Quantum Computing and Quantum Information Science

2020 – 2022 **Massachusetts Institute of Technology**, *Cambridge*, MA
M.S. Computer Science
Advisor: Prof. Manya Ghobadi
Thesis: TopoOpt: Co-optimizing Network Topology and Parallelization Strategy for Distributed Machine Learning Training Jobs

2016 – 2020 **University of California, San Diego**, *La Jolla*, CA, *magna cum laude*
B.S. Computer Science, *Honors With Highest Distinction*
Advisor: Prof. Alex C. Snoeren
Thesis: Harnessing Highly Dynamic Datacenter Fabrics with TDTCP
B.S. Physics
Minor in Mathematics

Research Interest

I design and build adaptive network systems that harness structures in machine learning workloads to enable network-application co-optimization.

Publications

2026 **Checkmate: Zero Performance Overhead Model Checkpointing via Network Gradient Replication**, Ankit Bhardwaj*, **Weiyang Wang***, Jeremy Carin, Adam Belay, Manya Ghobadi (*: equal contribution), *Proceedings of the 23rd USENIX Symposium on Networked Systems Design and Implementation (NSDI), Renton, WA, May 2026*

2025 **Spine-Free Networks for LLM Training**, **Weiyang Wang**, Manya Ghobadi, *IEEE Micro, vol. 45, no. 2, pp. 18-25, March-April 2025*

2025 **Efficient Direct-Connect Topologies for Collective Communications**, Liangyu Zhao, Siddharth Pal, Tapan Chugh, **Weiyang Wang**, Prithwish Basu, Joud Khoury, Arvind Krishnamurthy, *Proceedings of the 22nd USENIX Symposium on Networked Systems Design and Implementation (NSDI), Philadelphia, PA, April 2025*

2024 **Rail-only: A Low-Cost High-Performance Network for Training LLMs with Trillion Parameters**, **Weiyang Wang**, Manya Ghobadi, Kayvon Shakeri, Ying Zhang, Naader Hasani, *Proceedings of IEEE Symposium on High-Performance Interconnects (HOTI), Online Conference, August 2024*
Supported by major network device vendors like Juniper and Broadcom

2023 **TopoOpt: Co-optimizing Network Topology and Parallelization Strategy for Distributed Training Jobs**, **Weiyang Wang**, Moein Khazraee, Zhizhen Zhong, Zhijao Jia, Dheevatsa Mudigere, Ying Zhang, Anthony Kewitsch, and Manya Ghobadi, *Proceedings of the 20th USENIX Symposium on Networked Systems Design and Implementation (NSDI), Boston, MA, April 2023*
Being evaluated for deployment at Meta

2022 **Time-division TCP for Reconfigurable Data Center Networks**, Shawn Shuoshuo Chen*, **Weiyang Wang***, Christopher Canel, Srinivasan Seshan, Alex C. Snoeren, Peter Steenkiste (*: equal contribution), *Proceedings of the ACM SIGCOMM 2022, Amsterdam, Netherlands, August 2022*

2021 **IOI: In-network Optical Inference**, Zhizhen Zhong, **Weiyang Wang**, Manya Ghobadi, Alexander Sludds, Ryan Hamerly, Liane Bernstein, Dirk Englund, *Proceedings of the ACM SIGCOMM 2021 Workshop on Optical Systems (OptSys), Online Conference, August 2021*

2020 **Adapting TCP for Reconfigurable Datacenter Networks**, Matthew Mukerjee, Christopher Canel, **Weiyang Wang**, Daehyeok Kim, Srinivasan Seshan, and Alex C. Snoeren, *Proceedings of the 17th USENIX Symposium on Networked Systems Design and Implementation (NSDI), Santa Clara, CA, February 2020*

Press Releases

Aug 2024 **This AI Network Has No Spine – And That's A Good Thing**, *The Next Platform*

Apr 2023 **Meta, MIT, Others Test Robotic Arm in Optical AI Infrastructure**, *HPC Wire*

Apr 2023 **Telescent and MIT CSAIL Collaborate to Accelerate Machine Learning Workflows**, *Business Wire*

Posters

Apr 2025 **Efficient Direct-Connect Topologies for Collective Communications**, Liangyu Zhao, Siddharth Pal, Tapan Chugh, **Weiyang Wang**, Jason Fantl, Prithwish Basu, and Joud Khoury, Arvind Krishnamurthy, *Poster Session at the 22nd USENIX Symposium on Networked Systems Design and Implementation (NSDI), Philadelphia, PA, April 2025*

Apr 2024 **Zero Buffer Optical Packet Switching Data Center Network**, Shawn Shuoshuo Chen, **Weiyang Wang**, Manya Ghobadi, Srinivasan Seshan, Peter Steenkiste, *Poster Session at the 21st USENIX Symposium on Networked Systems Design and Implementation (NSDI), Santa Clara, CA, April 2024*

Patent

Jul 2024 **In-network Optical Inference**, Manya Ghobadi, Zhizhen Zhong, **Weiyang Wang**, Liane Sarah Beland Bernstein, Alexander Sludds, Ryan Hamerly, Dirk Robert Englund, *US Patent Application Number 18561985*

Research Experiences

Mar 2023 – Now **Student Research Scholar**, *Center for Ubiquitous Connectivity (CUbiC), SRC JUMP 2.0 Program*
Center Leader: Prof. Keren Bergman, Columbia University

Sep 2020 – Now **Graduate Research Assistant**, *MIT Computer Science and Artificial Intelligence Lab*
Advisor: Prof. Manya Ghobadi

Jan 2019 – Jun 2020 **Undergraduate Research Assistant**, *UCSD CSE Department*
Advisor: Prof. Alex C. Snoeren

Jun 2018 – Sep 2018 **Undergraduate Researcher**, *UCSD CSE Department*
Mentor: Prof. Yannis Papakonstantinou

Feb 2017 – Jun 2018 **Undergraduate Researcher**, *UCSD Center of Astrophysics and Space Science*
Mentors: Dr. Praween Siritanasak, Alex Zahn, and Prof. Brian Keating

Industry Experiences

May 2024 – Aug 2024 **Research Intern**, *Microsoft Research*, Improving Speed and Robustness of ML Training
Mentor: Dr. Srikanth Kandula

Jun 2023 – Aug 2023 **Research Intern**, *Google Cloud*, Topology Engineering and Traffic Engineering under Demand Uncertainty
Mentor: Dr. Anny Xijia Zheng

Teaching Experiences

Fall 2024 **Guest Lecturer**, *MIT EECS Department*, Computer Networks (6.5820)
Delivered a full lecture on distributed machine learning

Fall 2023 **Guest Lecturer**, *MIT EECS Department*, Computer Networks (6.5820)
Delivered part of a lecture on network for machine learning

Fall 2022 **Teaching Assistant**, *MIT EECS Department*, Computer Networks (6.5820)

Winter 2020 **Tutor**, *UCSD CSE Department*, Introduction to Programming II (CSE8B)

Fall 2018 – Fall 2019 **Tutor**, *UCSD CSE Department*, Database Principles (CSE132A)

Mentoring Experiences

Fall 2024 – Now **Jeremy Carin**, *Ph.D. Student with Prof. Manya Ghobadi, MIT CSAIL*
With Jeremy, we explored the mismatch of increasing functionalities of today's eBPF applications and Linux's existing eBPF implementation. This research led to a submission for HotNets 2025.

Fall 2023 – Now **Anton Zabreyko**, *Ph.D. Student with Prof. Manya Ghobadi, MIT CSAIL*
With Anton, we are investigating network optimization that combines placement, routing, and flow scheduling in multitenant ML training clusters.

Spring 2024 – Now **Om Chabra**, *Ph.D. Student with Prof. Hari Balakrishnan, MIT CSAIL*
I provided project feedback and writing guidance to Om on his projects about training ML models in the space and distributed fallback networks.

Spring 2023 **Natalie Muradyan**, *Undergraduate Research Opportunities Program (UROP), B.S. Computer Science and Engineering, MIT*
Natalie developed a demonstration website of TopoOpt with me. She went on to pursue a M.Eng. with the Microarchitecture ATtacks and CHAllenges (MATCHA) research group at MIT with Prof. Mengjia Yan.

Honors and Awards

Feb 2022 **Finalist**, *Meta PhD Research Fellowship Program in Computer Networks*

Sep 2020 **Awardee**, *MIT Presidential Fellowship Award*

Jun 2020 **Awards of Excellence**, *UCSD Jacobs School of Engineering, Award for Excellence in Computer Science and Engineering*

Dec 2019 **Runners-Up**, *CRA Outstanding Undergraduate Researcher Awards*

Dec 2018 **Winner**, *UCSD CSE Department, Computer Networking Espresso Prize*

Dec 2016 – Jun 2020 **Provost Honors**, *UCSD*

Invited Talks

A Tale of Two Networks: Defining Network Infrastructure for Deep Neural Network Training

Mar 2025 ELEN E9403: Seminar in Photonics, Columbia University, *New York, NY*

Jan 2024 Networking Lecture Series, Microsoft Research, *Online*

Reconfigurable Network Architecture for DNN Training

Jun 2025 Workshop on Reconfigurable Networks, Cornell University, *Ithaca, NY*

May 2024 SRC JUMP 2.0 CUbiC Liaison Presentation, *Online*

Zero-Overhead Model Checkpointing via Network Gradient Replication

Apr 2025 Distributed Systems Laboratory (DSL) Seminar, University of Pennsylvania, *Online*

Rail-only: A Low-Cost High-Performance Network for Training LLMs with Trillion Parameters

Sep 2024 HPC Applications, SW, and HW Sync Seminar, Advanced Micro Devices, Inc. (AMD), *Online*

Aug 2024 MLSys Seminar, University of Washington, *Seattle, WA*

TopoOpt: Co-optimizing Network Topology and Parallelization Strategy for Distributed Training Jobs

Feb 2023 Network Research Group Seminar, Carnegie Mellon University, *Pittsburgh, PA*

Oct 2022 S2Infra Talks, Google Inc., *Online*

Dec 2021 MSR Cambridge, Lecture Series, Microsoft Research, *Online*

Jan 2021 Internal Presentation, Telescent Inc., *Online*

Professional Services

2025 **Reviewer**, *IEEE/ACM Transactions on Networking (ToN)*

2025 **Reviewer**, *IEEE Open Journal of the Solid-State Circuits Society (OJ-SSCS)*

2025 **Reviewer**, *Elsevier Computer Networks (COMNET)*

2025 **External Reviewer**, *IEEE International Conference on Network Protocols (ICNP)*

2025 **External Reviewer**, *ACM Asia-Pacific Workshop on Networking (APNet)*

2025 **External Reviewer**, *IEEE Global Communications Conference (GLOBECOM)*

Other Services

Sep 2022 – Now **Member**, *MIT EECS REFS*
Served as peer mediators to support the graduate community and serve as a first point of contact in dealing with stress

Sep 2022 – Now **Web Chair**, *Sidney-Pacific Student Government, MIT*
Served as Web Chair to maintain and develop the administration system for MIT's Sidney-Pacific graduate housing

Sep 2020 – Now **System Administrator**, *Network and Mobile System Research Group, MIT*
Constructed and managed a 24-node GPU cluster, with electrical and optical networking, from scratch