Jiyao Liu

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Summary

I am currently a third-year Ph.D. candidate with the Department of Computer and Information Sciences at Temple University. My research mainly focuses on networks and networked systems, including edge intelligence, distributed machine learning, quantum networking, network optimization, etc.

Education

2021 - 2025	**Temple University**, Philadelphia, PA, USA
	PhD, Computer and Information Sciences
	Advisor: Dr. Yu Wang
2016 - 2020	**North China University of Technology**, Beijing, China
	BEng, Information Security

Research Experience

Research Intern (Aug. 2023 - Dec. 2023)

Toyota Motor North America, Mountain View, CA, USA

Rating: **Exceeded**. Two projects delivered in 3.5 months.

Project 1. In-car monitoring via object detection.

- Model. Design, evaluate, and tune models: i) implemented YOLOv8 detect almost from scratch; ii) modify YOLOv8 for customized purposes, e.g., change box scores for unknown object detection.
- Dataset. Collect and pre-process a sample dataset with around 1500 images. Hard samples (wrong predictions) analysis, and add proper training data to improve performance.
- Performance. Achieved around 98% precision and recall on known items, and around 90% precision and recall on unknown items.

Project 2. Battery estimation for electric vehicles.

- Model. Explore model structures. Evaluate various combinations and organizations of MLP, CNN, RNN, attention, transformers, etc.
- Dataset. Feature analysis/selection from massive raw sensor data, and preprocess before training. Change the data from time based to distance based for better prediction.
- Loss Function. Use proper loss functions to facilitate faster convergence and more stable prediction.
- Performance. The average percentage error is within 10%, which is **better than Tesla's**.

Research Assistant (May. 2021 - current)

Temple University, PA, USA

- Large-Scale Federated Learning. Communication compression: model pruning, top-k compression, quantization, etc. Statistical/systematic heterogeneity: non-IID data, fast-slow device scheduling, model personalization, clustered training, etc. Attack and defense: malicious updates detection and defence, adversarial sample generation, etc. Resource allocation within a networked system.

Selected Publications

For full publication list, see my Google Scholar.

[1] **Jiyao Liu**, Xinliang Wei, Xuanzhang Liu, Hongchang Gao, and Yu Wang. "Group Formation and Sampling in Group-based Hierarchical Federated Learning". In: *Transactions on Cloud Computing, under review.* 2024.

[2] Xinliang Wei*, **Jiyao Liu***, Lei Fan, Yuanxiong Guo, Zhu Han, and Yu Wang. "Optimal Entanglement Distribution Problem in Satellite-based Quantum Networks". In: *IEEE Network, in major revision.* 2024.

[3] **Jiyao Liu**, Xinliang Wei, Xuanzhang Liu, Hongchang Gao, and Yu Wang. "Group-based Hierarchical Federated Edge Learning: Convergence, Group Formation and Sampling". In: *52nd International Conference on Parallel Processing (ICPP).* 2023.

[4] Xinliang Wei, **Jiyao Liu**, and Yu Wang. "Joint Participant Selection and Learning Optimization for Federated Learning of Multiple Models in Edge Cloud". In: *Journal of Computer Science and Technology (JCST).* 2023.

[5] Xinliang Wei, **Jiyao Liu**, Xinhua Shi, and Yu Wang. "Participant Selection for Hierarchical Federated Learning in Edge Clouds". In: *16th IEEE International Conference on Networking, Architecture, and Storage (NAS).* 2022.

[6] Xinliang Wei, **Jiyao Liu**, and Yu Wang. "Joint Participant Selection and Learning Scheduling for Multi-Model Federated Edge Learning". In: *19th IEEE International Conference on Mobile Ad-Hoc and Smart Systems (MASS).* 2022.

Methodology and Skills

Programming Languages	C/C++, Python, Java, SQL, x86 Assembly/Disassembly.
Network/Distributed Systems	networkx, Gurobi, Classic/Quantum Linear Solvers.
Machine Learning	Convex Optimization, Differential Privacy, PyTorch, NumPy, matplotlib.
Cryptography	Encryption, Blockchain, Smart Contract, Solidity.
Systems & Tools	Linux (Ubuntu), Raspberry PI, Git, CMake, GCC, ssh, shell.

Teaching

Teaching Assistant for (Department of Computer and Information Sciences, Temple University)

- CIS 1057.003, Computer Programming in C, Spring 2024
- CIS 3319.001/4379.001, Wireless Networks & Security, Spring 2024
- CIS 3319.001, Wireless Networks & Security, Fall 2022
- CIS 3319.002, Wireless Networks & Security, Fall 2022
- CIS 1057.005, Computer Programming in C, Spring 2022
- CIS 1068.002, Program Design & Abstraction, Spring 2022
- CIS 2168.005, Data Structure, Fall 2021
- CIS 2168.007, Data Structure, Fall 2021

Awards

- CIS Outstanding Graduate Research Assistant Award, 2024
- ICPP Student Travel Award, 2023

Services

Reviewer for

- IEEE Transactions on Mobile Computing, 2024
- IEEE Transactions on Cloud Computing, 2023, 2024
- IEEE Internet of Things Journal, 2023
- IEEE MASS, 2023
- Intelligent and Convergence Network, 2023, 2024