Xiaomin Liu

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👤 Google Scholar
👤 PhD Supervisor: Prof. Qunbi Zhuge

Education

2020 – 2025   🔖 **Ph.D., Shanghai Jiao Tong University**
Information and communication engineering

2016 – 2020   🔖 **B.Sc., Shanghai Jiao Tong University**
Information engineering
Thesis title: *The next-generation intelligent optical networks: modeling, monitoring, and optimization.*

Research interest

My research focus on the construction of **next-generation dynamic, reliable, and autonomous optical networks**. The research covers **digital twin modeling and autonomous management for optical networks** with the assistance of optics physics and data-driven machine learning techniques. I am also working on the architecture for the future multi-band optical networks.

- **Digital twin**: Quality of transmission, Fiber nonlinearity, Optical amplifiers, etc.

- **Network telemetry**: Fiber nonlinearity, Soft failures, Filtering effect, etc.

- **Network automation**: Service provisioning, Power optimization in C and C&L band, etc.

In the future, my research will focus on designing autonomous computation optical networks to serve both inter- and intra- data center communications for AI applications such as large language models.

Awards and Achievements

2024   🔖 **Corning Woman Scholar in Optical Communication**, 3 in worldwide each year, awarded in OFC 2024. **[link]**

2023   🔖 **SPIE Optics and Photonics Education Scholarship**, 6 in China and 72 around the world

2022   🔖 **Intel Scholarship**, 5 in Shanghai Jiao Tong University and 65 in China

       🔖 **First Prize** of the Outstanding Ph.D. Student of State Key Laboratory of Advanced Optical Communication Systems and Networks

2021   🔖 **Best Student Paper Award of Asia Communications and Photonics Conference**

2020, 2021   🔖 **National PhD Scholarship**, 2 Times, Top 2%

2020   🔖 **Excellent Bachelor Thesis of Shanghai Jiao Tong University**, Top 1%

       🔖 **Shanghai Outstanding Graduates**, Top 5%

2017, 2018, 2019   🔖 **The Academic Scholarship of Shanghai Jiao Tong University**

Research Publications

As the first author, I have published 7 journal papers and 7 conference papers. Additionally, I collaborated with colleagues and guided junior students in publishing 20+ second-authored papers. For my full

publication list, please to my `Google scholar`.

Journal Articles

1. **X. Liu**, Y. Zhang, M. Cai, *et al.*, "Smof: Simultaneous modeling and optimization framework for raman amplifiers in c+ l-band optical networks," *Journal of Lightwave Technology*, 2024.

2. **X. Liu**, Y. Zhang, Y. Chen, *et al.*, "Digital twin modeling and controlling of optical power evolution enabling autonomous-driving optical networks: A bayesian approach," *Advanced Photonics*, vol. 6, no. 2, pp. 026 006–026 006, 2024.

3. Q. Zhuge, **X. Liu**, Y. Zhang, *et al.*, "Building a digital twin for intelligent optical networks [invited tutorial]," *Journal of Optical Communications and Networking*, vol. 15, no. 8, pp. C242–C262, 2023.

4. **X. Liu**, Y. Fan, Y. Zhang, *et al.*, "Fusing physics to fiber nonlinearity model for optical networks based on physics-guided neural networks," *Journal of Lightwave Technology*, vol. 40, no. 17, pp. 5793–5802, 2022.

5. **X. Liu**, H. Lun, L. Liu, *et al.*, "A meta-learning-assisted training framework for physical layer modeling in optical networks," *Journal of Lightwave Technology*, vol. 40, no. 9, pp. 2684–2695, 2022.

6. **X. Liu**, H. Lun, R. Gao, *et al.*, "A data-fusion-assisted telemetry layer for autonomous optical networks," *Journal of Lightwave Technology*, vol. 39, no. 11, pp. 3400–3411, 2021.

7. **X. Liu**, H. Lun, M. Fu, *et al.*, "Ai-based modeling and monitoring techniques for future intelligent elastic optical networks," *Applied Sciences*, vol. 10, no. 1, p. 363, 2020.

Conference Proceedings

1. **X. Liu**, Q. Qiu, Y. Zhang, *et al.*, "Auto-dtwave: Digital twin-aided autonomous optical network operation with continuous wavelength loading," in *2024 Optical Fiber Communications Conference and Exhibition (OFC)*, IEEE, 2024, pp. 1–3.

2. **X. Liu**, Y. Zhang, Y. Liu, *et al.*, "Online simultaneous modeling and gain profile optimization for multi-pump raman amplifiers in c+ l-band optical systems," in *2023 European Conference on Optical Communications (ECOC)*, IET, 2023, pp. 448–451.

3. **X. Liu**, Y. Zhang, M. Cai, L. Yi, W. Hu, and Q. Zhuge, "Fusion of physics and ai for building self-driving optical networks," in *Photonic Networks and Devices*, Optica Publishing Group, 2022, NeW2D–1.

4. **X. Liu**, L. Liu, H. Lun, *et al.*, "A grey-box model for estimating nonlinear snr in optical networks based on physics-guided neural networks," in *2021 Asia Communications and Photonics Conference (ACP)*, IEEE, 2021, pp. 1–3.

5. **X. Liu**, H. Lun, M. Fu, L. Yi, W. Hu, and Q. Zhuge, "Machine learning based fiber nonlinear noise monitoring for subcarrier-multiplexing systems," in *2020 Optical Fiber Communications Conference and Exhibition (OFC)*, IEEE, 2020, pp. 1–3.

6. **X. Liu**, H. Lun, M. Fu, *et al.*, "A meta-learning-assisted training framework for ai deployment in optical networks," in *2020 European Conference on Optical Communications (ECOC)*, IEEE, 2020, pp. 1–4.

7. **X. Liu**, H. Lun, M. Fu, *et al.*, "A three-stage training framework for customizing link models for optical networks," in *2020 Optical Fiber Communications Conference and Exhibition (OFC)*, IEEE, 2020, pp. 1–3.

Academic Activities and Projects

Invited talks

2022   ▉ **"Fusion of physics and AI for building self-driving optical networks"** , Advanced Photonics Congress (APC), Photonic Networks and Devices Conference (NETWORKS), Maastricht, The Netherlands.

▉ **"Combining AI and physics for digital-twin optical networks"** , Optoelectronics Global Conference (OGC), Shenzhen, China.

2021   ▉ **"Design and deployment of the data-driven fiber nonlinearity estimation for dynamics optical networks"**, Optoelectronics Global Conference (OGC), Shenzhen, China.

Journal reviewer

2021-2024   ▉ Journal of Lightwave Technology,
Journal of Optical Communications and Networking,
Optics Express

Collaborated projects

2020-2021   ▉ **Tencent: Quality of transmission (QoT) estimation tool for data center optical networks**.
I developed a QoT tool for Tencent's data center optical networks to provide adjustable precision and computation speed.
This tool has already developed in Tencent's network controller.

Lab hardware experiments experience

2021-2022   ▉ **Experiments with a 700km transmission link for fiber nonlinearity modeling**.
Conducted an experiment in a offline coherent transmission system over 700km and successfully estimate the fiber nonlinear SNR using the digital twin model in journal 4 within 0.5 dB deviation.

2022-2023   ▉ **Real-time testbed with EDFAs and multi-pump Raman amplifiers**.
Constructed a real-time testbed with EDFAs and Raman amplifiers. This test bed includes multi-vendor amplifiers, WSS, Waveshaper, and OSA. It can be automatically controlled for optical spectrum measurement, OA modeling, and optical power optimization.

2023-2024   ▉ **Real-time lab testbed with 400G commercial transponders in 480km link**.
Constructed a real-time testbed with commercial 400Gbps transponders. This test bed includes multi-vendor amplifiers, WSS, Waveshaper. It can be automatically controlled through for service provisioning, OA modeling, and optical power optimization.

Skills

Languages   ▉ Strong reading, writing and speaking competencies for English, Mandarin Chinese.
Coding   ▉ Python, C++, MATLAB, LaTeX, …