Yang Xu

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Education

University of Rochester, Rochester, NY

Ph.D. in Physics — December 2025 (expected)

Advisor: Robert W. Boyd

Columbia University, New York City, NY

B.A. in Physics; Minor in Computer Science; GPA: 3.97/4.00 (Magna Cum Laude) — May 2019

Research Interests

quantum and nonlinear optics with ultrafast lasers, quantum frequency conversion, quantum imaging

Awards and Scholarships

- Silver Award, Edmund Optics Ultrafast Educational Award, Edmund Optics, 2024
- Finalist, Emil Wolf Outstanding Paper Award, OPTICA FiO, 2024
- Tamor Fund, Department of Physics and Astronomy, University of Rochester, 2023
- Professional Development Fund, University of Rochester, 2023
- APS DAMOP Student Travel Grant, APS, 2023
- Phi Beta Kappa, Columbia University, 2019
- 5^{th} at International Theoretical Physics Olympiad for Undergraduate Students, 2019
- Undergraduate Summer Research Fund, Columbia University, 2017

Research Experience

1. **Efficient and Tunable Quantum Frequency Conversion in Ridge PPLN Waveguide** — June 2024 - present
   - Design and lead the experiment work which aims to convert polarization-entangled photons at 780 nm to the telecom L-band with high conversion efficiency and tunability.
   - Simulate and characterize Raman noise in ridge PPLN waveguide the using FDTD method.
2. **High Harmonics Generation with Bright Squeezed Vacuum on ITO** — May 2024 - present
   - Generate the bright squeezed vacuum and characterize the photon statistics using intense ultrafast lasers
   - Generate high-harmonics with coherent pump and bright squeezed vacuum on ITO and measure the $g^{(2)}$ function of the HHG signal
   - Characterize photon statistics of the high-harmonic signals experimentally and help to build a phenomenological model for HHG with quantum light on ITO
3. **MicroBooNE, Fermilab, Batavia, IL** — June 2019 - May 2020
   - Implemented Convolutional Neural Network to identify quasielastic scattering processes in PyTorch using neutrino interactions images
   - Analyzed MicroBooNE data that controls systematic errors using the deep learning reconstruction chain in Janet Conrad's research group at MIT
   - Studied the time dependence of the liquid argon detector response with cosmic background samples

Publications

[1] Hao Zhang*, **Yang Xu***, Wenwen Zhang, Saumya Choudhary, Robert W. Boyd, and Sergio Carbajo. Hybrid-supervised deep reconstruction from ENZ time-gated optical scattering-free for sensing applications. *In preparation*, 2025.

[2] Jiaqi Wang, **Yang Xu**, Saumya Choudhary, Omid Mozafar, and Robert W. Boyd. Suppressed self-focusing effect of scalar beams with grid structures. *In preparation*, 2025.

[3] Luchang Niu, **Yang Xu**, Saleem Iqbal, and Robert W. Boyd. Distance-dependence of photon entanglement through turbulence. *In preparation*, 2025.

[4] **Yang Xu**, Luchang Niu, Girish Kulkarni, and Robert W. Boyd. The effect of phase-matching condition on transverse spatial entanglement in high-gain SPDC. *In preparation*, 2025.

[5] Jiapeng Zhao, **Yang Xu**, Hassan Shapourian, Robert W. Boyd, and Reza Nejabati. Scalable MHz rate quantum entanglement distribution network with reduced latency. *arXiv:2504.05567*, 2025.

[6] **Yang Xu***, Saumya Choudhary*, Long D Nguyen, Matthew Klein, Shivashankar Vangala, J Keith Miller, Eric G Johnson, Joshua R Hendrickson, M Zahirul Alam, and Robert W. Boyd. High-fidelity spatial information transfer through dynamic scattering media by an epsilon-near-zero time-gate. *Nature Photonics (in review)*, 2025.

[7] Alexander Mavian, **Yang Xu**, Cheng Li, and Robert W. Boyd. Fast quantum ghost imaging with a single-photon-sensitive time-stamping camera. *Optics Letters*, 50(2):594–597, 2025.

[8] **Yang Xu**, Saumya Choudhary, and Robert W. Boyd. Stimulated emission tomography for efficient characterization of spatial entanglement. *Physical Review Research*, 6:L042047, 2024.

[9] Saleem Iqbal, **Yang Xu**, and Robert W. Boyd. Limitations in quantum metrology approaches to imaging resolution. *Philosophical Transactions A*, 382(2287):20230332, 2024.

[10] **Yang Xu**, Sirui Tang, A. Nicholas Black, and Robert W. Boyd. Orthogonal spatial coding with stimulated parametric downconversion. *Optics Express*, 31(25):42723–42729, 2023.

[11] Arie Bodek, Un Ki Yang, and **Yang Xu**. Inelastic axial and vector structure functions for lepton-nucleon scattering 2021 update. In *Proceedings of the 41st International Conference on High Energy Physics (ICHEP2022)*, Bologna, Italy, 2022.

Talks and Presentations

*(presenter name in **bold**)*

1. **Yang Xu**, "Imaging with ultrafast nonlinear optical modulation and quantum light," Applied Physics Research Seminar, Cornell University, Ithaca, NY, February 18, 2025 **(invited)**.
2. **Yang Xu**, "The quantum realm of ultrafast optics: from ultrafast time gating to ultrabright non-classical light," Special Condensed Matter Seminar, Stanford University, Stanford, CA, October 30, 2024 **(invited)**.
3. **Yang Xu**, Saumya Choudhary, M. Zahirul Alam and Robert W. Boyd, "Imaging through scattering media with ultrafast spatiotemporal gating on epsilon-near-zero materials," FTu6E.4, Frontiers in Optics, Denver, CO, September 23–26, 2024.
4. **Yang Xu**, "The quantum future of ultrafast pulses: from SPDC to ultrafast nonlinear optics on epsilon-near-zero materials," Joint Attosecond Science Laboratory Seminars, University of Ottawa, Ottawa, ON, August 20, 2024 **(invited)**.
5. **Yang Xu**, Saumya Choudhary, M. Zahirul Alam and Robert W. Boyd, "Imaging tiny objects hidden in scattering media: an application of the nonlinear ultrafast gating effect of ENZ materials," UR SPIE Summer Talk Series, Rochester, NY, July 31, 2024 **(invited)**.
6. **Yang Xu**, Saumya Choudhary, M. Zahirul Alam and Robert W. Boyd, "Imaging through scattering media with ultrafast spatiotemporal gating on epsilon-near-zero materials," JTu5A.3, Optica Imaging Congress, Paris, France, July 15–19, 2024 **(postdeadline paper)**.
7. Yang Xu, **Luchang Niu**, Girish Kulkarni and Robert W. Boyd, "The effect of phase-matching condition on high-dimensional OAM entanglement in high-gain spdc," 12869-46, SPIE Photonics for Quantum, Waterloo, ON, Canada, June 17-20, 2024.

8. Yang Xu, **Sirui Tang** and Robert W. Boyd, "Spatial Hadamard encoding with difference frequency generation," 12869-46, SPIE Photonics West, San Francisco, CA, USA, January 27 – February 2, 2024.
9. **Yang Xu**, Saumya Choudhary and Robert W. Boyd, "Efficient measurement of bi-photon OAM spectrum with stimulated emission tomography," FM6B.6, Frontiers in Optics, Tacoma, WA, October 9–12, 2023.
10. **Yang Xu**, Sirui Tang, A. Nicholas Black and Robert W. Boyd, "Two-color aberration cancellation with stimulated parametric down-conversion," Th2A.4, Optica Nonlinear Optics Topical Meeting, Honolulu, HI, July 10–13, 2023.
11. **Yang Xu**, Zahirul Alam and Robert W. Boyd, "Detecting large rotational Doppler shift with time-varying two-beam coupling interference patterns," Waves in Time-varying Media, New York, NY, May 3-5, 2023.

Teaching Experience

1. **Instructor, General Physics II, University of Rochester** Summer 2023
   - Gave weekly lectures on introductory E&M to undergraduate students during the summer session
   - Designed the course structure and prepared syllabus, all homework problems and exams
   - Made full solutions to all homework problems and graded students' exams
2. **Teaching Assistant, Nonlinear Optics, University of Rochester** Fall 2022
   - Gave lectures to students and helped the instructor to make homework problems and exam problems
   - Held Weekly office hours and answered students' questions on course material
   - Made full solutions to all homework problems and graded students' solutions
3. **Teaching Assistant, General Physics I&II, Columbia University** Spring 2017 - Fall 2018
   - Graded weekly quizzes and answered students' questions
   - Helped students with homework problems and quiz problems during office hours

Advising and Mentoring

1. Luchang Niu, undergraduate student, University of Rochester
2. Alexander Mavian, REU student, Rensselaer Polytechnic Institute, now Ph.D. student at Yale
3. Jiaqi Wang, post-bac student, Peking University, now Ph.D. student at CREOL
4. Sirui Tang, undergraduate student, University of Rochester, now Ph.D. student at UC Berkeley

Professional Services and Activities

- Referee for APL, Optics Letters, JOSA A
- Student Member of the Optica (OSA), APS, and SPIE

Technical Skills

Programming: Python, C, C++, MATLAB, LaTeX, LABView.