

RESEARCH

I design large-scale integrated photonic systems to transform future computing paradigms. Addressing communication bottlenecks in AI/machine learning applications through embedded photonic I/O and heterogeneous integration, I aim to redefine chip-to-chip connectivity with unparalleled density and novel functionalities beyond data communication.

APPOINTMENT

Columbia University in the City of New York

Postdoctoral Research Scientist, Columbia Nano Initiative

New York, NY, USA

2021–Present

- Mentored by Prof. Keren Bergman
- Photonics design and integration, *DARPA PIPES program*, led the Phase 2 development and the successful transition to Phase 3

EDUCATION

University of California, Santa Barbara

Ph.D. in Electrical and Computer Engineering

Santa Barbara, CA, USA

2018–2021

- Co-advised by Prof. Kwang-Ting Cheng and Prof. John E. Bowers

University of California, Santa Barbara

M.S. in Electrical and Computer Engineering

Santa Barbara, CA, USA

2015–2018

Tsinghua University

B.Eng. in Electronic Engineering

Beijing, China

2011–2015

EXPERIENCE

Semiconductor Research Corporation (SRC) Research Scholars Program

Research Scholar, Center for Ubiquitous Connectivity (CUBiC) under SRC JUMP 2.0

2023–Present

- Contributed to the writing and visualization of the proposal that led to the award of \$35M JUMP 2.0 grant for the CUBiC Center
- Co-led the *CUBiC Scholar Leadership Council* and the *Systems and Testbeds* subgroup; organized monthly workshops with industry liaisons

Hong Kong University of Science and Technology

Postgraduate Visiting Intern, Department of Electrical and Computer Engineering

Hong Kong SAR, China

Aug. 2019–Dec. 2019

Cadence Design Systems, Inc.

Design Engineering Intern - Photonics, Custom IC & PCB Group

San Jose, CA, USA

Jun. 2018–Sep. 2018

Rice University

Student Intern, Department of Electrical and Computer Engineering

Houston, TX, USA

Jul. 2014–Sep. 2014

PUBLICATION

Journal Articles

- J1 S. Wang, **Y. Wang**, S. Sanyal, R. Parsons, X. Ji, Y. Okawachi, X. Meng, M. Lipson, A. Gaeta, and K. Bergman, “Automated tuning of ring-assisted MZI based interleaver for Kerr frequency combs,” *Optics Letters*, 2024, in press.
- J2 **Y. Wang**, S. Wang, R. Parsons, S. Sanyal, V. Gopal, A. Novick, A. Rizzo, M. Lipson, A. L. Gaeta, and K. Bergman, “Co-designed silicon photonics chip I/O for energy-efficient petascale connectivity,” *IEEE Transactions on Components, Packaging and Manufacturing Technology*, 2024, in press.
[doi 10.1109/TCPMT.2024.3492189](https://doi.org/10.1109/TCPMT.2024.3492189) invited

- J3 Z. Wu, L. Yuan Dai, **Y. Wang**, S. Wang, and K. Bergman, "Flexible silicon photonic architecture for accelerating distributed deep learning," *Journal of Optical Communications and Networking*, vol. 16, no. 2, A157, Feb. 1, 2024. doi [10.1364/JOCN.497372](https://doi.org/10.1364/JOCN.497372) invited
- J4 A. James, A. Rizzo, **Y. Wang**, A. Novick, S. Wang, R. Parsons, K. Jang, M. Hattink, and K. Bergman, "Process Variation-Aware Compact Model of Strip Waveguides for Photonic Circuit Simulation," *Journal of Lightwave Technology*, pp. 1–14, 2023. doi [10.1109/JLT.2023.3238847](https://doi.org/10.1109/JLT.2023.3238847)
- J5 A. Novick, A. James, L. Y. Dai, Z. Wu, A. Rizzo, S. Wang, **Y. Wang**, M. Hattink, V. Gopal, K. Jang, R. Parsons, and K. Bergman, "High-bandwidth density silicon photonic resonators for energy-efficient optical interconnects," *Applied Physics Reviews*, vol. 10, no. 4, p. 041 306, Nov. 2023. doi [10.1063/5.0160441](https://doi.org/10.1063/5.0160441) invited
- J6 **Y. Wang**, P. Sun, J. Hulme, M. A. Seyedi, M. Fiorentino, R. G. Beausoleil, and K.-T. Cheng, "Energy Efficiency and Yield Optimization for Optical Interconnects via Transceiver Grouping," *Journal of Lightwave Technology*, vol. 39, no. 6, pp. 1567–1578, Mar. 2021. doi [10.1109/JLT.2020.3039489](https://doi.org/10.1109/JLT.2020.3039489)
- J7 Z. Zhang, R. Wu, **Y. Wang**, C. Zhang, E. J. Stanton, C. L. Schow, K.-T. Cheng, and J. E. Bowers, "Compact Modeling for Silicon Photonic Heterogeneously Integrated Circuits," *Journal of Lightwave Technology*, vol. 35, no. 14, pp. 2973–2980, Jul. 2017. doi [10.1109/JLT.2017.2706721](https://doi.org/10.1109/JLT.2017.2706721)

Conference Proceedings

- C1 N. Nauman, J. Robinson, **Y. Wang**, K. Jang, X. Meng, and K. Bergman, "Photonic analog-to-digital architecture for accelerating multiply-accumulate operations," in *Optical Fiber Communication Conference (OFC) 2025*, accepted.
- C2 R. Parsons, S. Sanyal, M. Cullen, **Y. Wang**, A. Novick, X. Ji, Y. Okawachi, X. Meng, M. Lipson, A. Gaeta, and K. Bergman, "Dispersion-engineered resonator-based interleaver co-designed with Kerr comb source," in *Optical Fiber Communication Conference (OFC) 2025*, accepted.
- C3 **Y. Wang**, S. Wang, S. Swarnava, N. Nauman, R. Parsons, J. Robinson, M. Hattink, K. Jang, A. Novick, K. J. McNulty, X. Meng, M. Lipson, A. L. Gaeta, and K. Bergman, "Order-preserving channel calibration of Kerr comb-driven microresonator-based DWDM link," in *Optical Fiber Communication Conference (OFC) 2025*, accepted.
- C4 A. Novick, M. Hattink, A. Rizzo, **Y. Wang**, V. Gopal, S. Wang, R. Parsons, and K. Bergman, "Integrated Photonic Resonant Modulator-Based Equalization and Optimization for DWDM," in *Optical Fiber Communication Conference (OFC) 2024*, San Diego California: Optica Publishing Group, 2024, W1K.5. doi [10.1364/OFC.2024.W1K.5](https://doi.org/10.1364/OFC.2024.W1K.5)
- C5 S. Wang, **Y. Wang**, X. Meng, K. Hosseini, T. T. Hoang, and K. Bergman, "Automated Tuning of Ring-Assisted MZI-Based Interleaver for DWDM Systems," in *Optical Fiber Communication Conference (OFC) 2024*, San Diego California: Optica Publishing Group, 2024, Th1A.3. doi [10.1364/OFC.2024.Th1A.3](https://doi.org/10.1364/OFC.2024.Th1A.3)
- C6 **Y. Wang**, S. Wang, R. Parsons, A. Novick, V. Gopal, K. Jang, A. Rizzo, C.-P. Chiu, K. Hosseini, T. T. Hoang, S. Shumarayev, and K. Bergman, "Silicon Photonics Chip I/O for Ultra High-Bandwidth and Energy-Efficient Die-to-Die Connectivity," in *2024 IEEE Custom Integrated Circuits Conference (CICC)*, Denver, CO, USA: IEEE, Apr. 21, 2024, pp. 1–8. doi [10.1109/CICC60959.2024.10529018](https://doi.org/10.1109/CICC60959.2024.10529018) invited
- C7 Z. Wu, R. Parsons, S. Wang, **Y. Wang**, and K. Bergman, "Wavelength Reconfigurable Transceiver For Multi-Interface Compute Accelerator Networks," in *Optical Fiber Communication Conference (OFC) 2024*, San Diego California: Optica Publishing Group, 2024, W4F.2. doi [10.1364/OFC.2024.W4F.2](https://doi.org/10.1364/OFC.2024.W4F.2)
- C8 G. Michelogiannakis, Y. Arafa, B. Cook, L. Y. Dai, A.-H. Hameed Badawy, M. Glick, **Y. Wang**, K. Bergman, and J. Shalf, "Efficient Intra-Rack Resource Disaggregation for HPC Using Co-Packaged DWDM Photonics," in *2023 IEEE International Conference on Cluster Computing (CLUSTER)*, Santa Fe, NM, USA: IEEE, Oct. 2023, pp. 158–172. doi [10.1109/CLUSTER52292.2023.00021](https://doi.org/10.1109/CLUSTER52292.2023.00021)
- C9 S. Wang, A. Novick, A. Rizzo, R. Parsons, S. Sanyal, K. J. McNulty, B. Y. Kim, Y. Okawachi, **Y. Wang**, A. Gaeta, M. Lipson, A. Gaeta, M. Lipson, and K. Bergman, "Integrated, Compact, and Tunable Band-Interleaving of a Kerr Comb Source," in *CLEO 2023*, San Jose, CA: Optica Publishing Group, 2023, STh3J.6. doi [10.1364/CLEO_SI.2023.STh3J.6](https://doi.org/10.1364/CLEO_SI.2023.STh3J.6)
- C10 **Y. Wang**, A. Novick, R. Parsons, S. Wang, K. Jang, A. James, M. Hattink, V. Gopal, A. Rizzo, C.-P. Chiu, K. Hosseini, T. T. Hoang, and K. Bergman, "Scalable architecture for sub-pJ/b multi-Tbps comb-driven DWDM silicon photonic transceiver," in *Next-Generation Optical Communication: Components, Sub-Systems, and Systems XII*, G. Li, K. Nakajima, and A. K. Srivastava, Eds., San Francisco, United States: SPIE, Mar. 2023, p. 55. doi [10.1117/12.2649506](https://doi.org/10.1117/12.2649506) invited
- C11 **Y. Wang**, S. Wang, A. Novick, A. James, R. Parsons, A. Rizzo, and K. Bergman, "Dispersion-Engineered and Fabrication-Robust SOI Waveguides for Ultra-Broadband DWDM," in *Optical Fiber Communication Conference (OFC) 2023*, San Diego California: Optica Publishing Group, 2023, Th3A.4. doi [10.1364/OFC.2023.Th3A.4](https://doi.org/10.1364/OFC.2023.Th3A.4)
- C12 A. James, **Y. Wang**, A. Rizzo, and K. Bergman, "Flexible, Process-Aware Compact Model of Effective Index in Silicon Waveguides for Commercial Foundries," in *2022 International Conference on Numerical Simulation of Optoelectronic Devices (NUSOD)*, Turin, Italy: IEEE, Sep. 2022, pp. 173–174. doi [10.1109/NUSOD54938.2022.9894784](https://doi.org/10.1109/NUSOD54938.2022.9894784)
- C13 **Y. Wang** and K.-T. Cheng, "Traffic-Adaptive Power Reconfiguration for Energy-Efficient and Energy-Proportional Optical Interconnects," in *2021 IEEE/ACM International Conference On Computer Aided Design (ICCAD)*, Munich, Germany: IEEE, Nov. 2021, pp. 1–9. doi [10.1109/ICCAD51958.2021.9643475](https://doi.org/10.1109/ICCAD51958.2021.9643475)
- C14 **Y. Wang**, J. Hulme, P. Sun, M. Jain, M. A. Seyedi, M. Fiorentino, R. G. Beausoleil, and K.-T. Cheng, "Characterization and Applications of Spatial Variation Models for Silicon Microring-Based Optical Transceivers," in *2020 57th ACM/IEEE Design Automation Conference (DAC)*, San Francisco, CA, USA: IEEE, Jul. 2020, pp. 1–6. doi [10.1109/DAC18072.2020.9218608](https://doi.org/10.1109/DAC18072.2020.9218608)
- C15 **Y. Wang** and K.-T. Cheng, "Task Mapping-Assisted Laser Power Scaling for Optical Network-on-Chips," in *2019 IEEE/ACM International Conference on Computer-Aided Design (ICCAD)*, Westminster, CO, USA: IEEE, Nov. 2019, pp. 1–6. doi [10.1109/ICCAD45719.2019.8942146](https://doi.org/10.1109/ICCAD45719.2019.8942146)

- C16 **Y. Wang**, M. A. Seyedi, J. Hulme, M. Fiorentino, R. G. Beausoleil, and K.-T. Cheng, "Bidirectional tuning of microring-based silicon photonic transceivers for optimal energy efficiency," in *Proceedings of the 24th Asia and South Pacific Design Automation Conference*, Tokyo Japan: ACM, Jan. 2019, pp. 370–375. doi:10.1145/3287624.3287649
- C17 **Y. Wang**, L. Shao, M. A. Lastras-Montano, and K.-T. Cheng, "Taming Emerging Devices' Variation and Reliability Challenges with Architectural and System Solutions [Invited]," in *2019 IEEE 32nd International Conference on Microelectronic Test Structures (ICMTS)*, Kita-Kyushu City, Fukuoka, Japan: IEEE, Mar. 2019, pp. 90–95. doi:10.1109/ICMTS.2019.8730924 invited
- C18 **Y. Wang**, M. A. Seyedi, R. Wu, J. Hulme, M. Fiorentino, R. G. Beausoleil, and K.-T. Cheng, "Energy-efficient channel alignment of DWDM silicon photonic transceivers," in *2018 Design, Automation & Test in Europe Conference & Exhibition (DATE)*, Dresden, Germany: IEEE, Mar. 2018, pp. 601–604. doi:10.23919/DATE.2018.8342079
- C19 R. Wu, M. A. Seyedi, **Y. Wang**, J. Hulme, M. Fiorentino, R. G. Beausoleil, and K.-T. Cheng, "Pairing of microring-based silicon photonic transceivers for tuning power optimization," in *2018 23rd Asia and South Pacific Design Automation Conference (ASP-DAC)*, Jeju: IEEE, Jan. 2018, pp. 135–140. doi:10.1109/ASPDAC.2018.8297295
- C20 R. Wu, **Y. Wang**, Z. Zhang, C. Zhang, C. L. Schow, J. E. Bowers, and K.-T. Cheng, "Compact modeling and circuit-level simulation of silicon nanophotonic interconnects," in *Design, Automation & Test in Europe Conference & Exhibition (DATE), 2017*, Lausanne, Switzerland: IEEE, Mar. 2017, pp. 602–605. doi:10.23919/DATE.2017.7927057
- C21 A. Ghofrani, M. A. Lastras-Montano, **Y. Wang**, and K.-T. Cheng, "In-place Repair for Resistive Memories Utilizing Complementary Resistive Switches," in *Proceedings of the 2016 International Symposium on Low Power Electronics and Design*, San Francisco Airport CA USA: ACM, Aug. 2016, pp. 350–355. doi:10.1145/2934583.2934590
- C22 C. Xu, F. X. Lin, **Y. Wang**, and L. Zhong, "Automated OS-level Device Runtime Power Management," in *Proceedings of the Twentieth International Conference on Architectural Support for Programming Languages and Operating Systems*, Istanbul Turkey: ACM, Mar. 2015, pp. 239–252. doi:10.1145/2694344.2694360

Under Review and In Preparation

- P1 V. Gopal, A. Novick, M. Hattink, S. Sanyal, S. Wang, M. Cullen, A. Rizzo, A. E. James, **Y. Wang**, X. Meng, M. Lipson, A. L. Gaeta, and K. Bergman, "Resonant modulator-based equalization for frequency comb-driven dense wavelength division multiplexing interconnects," *Journal of Lightwave Technology*, under review.
- P2 A. Rovinski, Y. Ou, C. Ou, D. Khilwani, **Y. Wang**, S. Wang, S. Lee, K. Bergman, A. Molnar, and C. Batten, "Scaling co-packaged optical interconnects using hybrid 2.5D/3D integration," in *2025 IEEE International Symposium on Circuits and Systems (ISCAS)*, under review.
- P3 S. Wang, R. Parsons, A. Novick, V. Gopal, M. Cullen, A. Rizzo, **Y. Wang**, X. Meng, and K. Bergman, "Compact and efficient 32Gbps PAM4 segmented vertical junction silicon microdisk modulator," in preparation.
- P4 **Y. Wang**, S. Wang, P. Dilip, R. Parsons, K. Jang, M. Haimowitz, V. Gopal, A. Novick, A. Rizzo, and K. Bergman, "128-channel DWDM silicon photonic transmitter for > 10 Tbps/mm optical I/O," in preparation.
- P5 T. Zypman, X. Meng, R. Parsons, **Y. Wang**, S. Wang, K. Jang, and K. Bergman, "Silicon photonic MIMO DSP for mode-division multiplexing and multi-dimensional data transmission," *Journal of Lightwave Technology*, under review.

PRESENTATION

Presentation SRC TECHCON	Austin, TX, USA
Scalable Kerr-Comb Driven DWDM Silicon Photonics Chip I/O	Sep. 2024
Seminar School of EECS, Pennsylvania State University	University Park, PA, USA
Co-Designing Photonics for Heterogeneously Integrated Systems	Apr. 2024
Invited Talk SPIE Photonics West	San Francisco, CA, USA
Scalable Architecture for Sub-pJ/b Multi-Tbps Comb-Driven DWDM Silicon Photonic Transceiver	Jan. 2023
Poster Ph.D. Forum, ACM/IEEE Design Automation Conference (DAC)	Online Virtual Event
Design and Optimization of Variation-Aware Runtime-Reconfigurable Optical Interconnects	Jun. 2020
Invited Talk Optical/Photonic Interconnects for Computing Systems (OPTICS) Workshop	Dresden, Germany
Optimal Pairing and Non-Uniform Channel Alignment of Microring-Based Transceivers for Comb Laser-Driven DWDM Silicon Photonics	Mar. 2018
Seminar Department of ECE, Hong Kong University of Science and Technology	Hong Kong SAR, China
Variation-Aware Modeling and Design of Silicon Photonic Systems	Jan. 2018
Poster Optical/Photonic Interconnects for Computing Systems (OPTICS) Workshop	Lausanne, Switzerland
Variation-Aware Modeling and Design of Nanophotonic Interconnects	Mar. 2017

MENTORING

U : undergraduate; G : graduate

Songli Wang G
Ph.D. Student at Columbia University
Scalable link architectures, automated post-fabrication tuning
Resulting joint publication(s): [P3], [P4], [C3], [C5], [J1], [C6], [J2], [C10], [C11]

Aneek E. James G
Ph.D. Student at Columbia University, now with Draper Laboratory
Wafer-scale process variation extraction and characterization
Resulting joint publication(s): [J4], [C11], [C12]

Kaylx Jang G
Ph.D. Student at Columbia University
DWDM dispersion engineering, optically connected memory
Resulting joint publication(s): [P4], [C11]

Tobias Zypman G
Ph.D. Student at Columbia University
Photonics-Enabled Signal Processing
Resulting joint publication(s): [P5]

James Robinson G
Ph.D. Student at Columbia University
Variation-aware tuning of microresonator-based DWDM links
Resulting joint publication(s): [C3]

Abidur Rahman U
Undergraduate Student at University of Michigan, Ann Arbor
SURE Program of Columbia Engineering for under-represented students
Design space exploration of optically connected compute systems

Robert Parsons G
Ph.D. Student at Columbia University
Variation-aware modeling and uncertainty quantification
Resulting joint publication(s): [C2], [P4], [C6], [J2], [C10], [C11]

Zhenguo Wu G
Ph.D. Student at Columbia University
Reconfigurable architecture for optically connected systems
Resulting joint publication(s): [C7], [J3]

Nathaniel Nauman G
Ph.D. Student at Columbia University
Photonics-Enabled Compute for AI
Resulting joint publication(s): [C1]

Priyanka Dilip G
Ph.D. Student at Columbia University
Photonics design for testing and design for packaging
Resulting joint publication(s): [P4]

Max Haimowitz G
Ph.D. Student at Columbia University
Scripted and automated large-scale silicon photonics chip layout
> 80 mm²/reticle fully-scripted layout on a 300 mm full-wafer run

TEACHING

U : undergraduate; G : graduate

Columbia University in the City of New York		New York, NY, USA
- Guest Lecturer	ELEN 9404: Seminar in Lightwave Communications G	Spring 2024
- Guest Lecturer	ELEN 9403: Seminar in Photonics G	Spring 2023
University of California, Santa Barbara		Santa Barbara, CA, USA
- Teaching Assistant	ECE 153B: Sensor & Peripheral Interface Design U	Winter 2019

LEADERSHIP

Center for Ubiquitous Connectivity (CUBiC)		SRC JUMP 2.0
- Subgroup Leader, <i>Systems and Testbeds</i> , coordinating four research tasks across three teams		2024–Present
- CUBiC Scholar Leadership Council, leading monthly workshops with industry liaisons		2023–Present
- Task Co-Lead, <i>Socket-to-Socket Distributed AI/ML/HPC Fabric Platform (SoSFab)</i> , photonics system testbed development		2023–Present

- Photonics Lead, *DARPA PIPES*, in collaboration with Intel, Cornell Univ. (Phase 2) and Orora Design Technologies (Phase 3) 2021–Present
- Design and Aggregation Co-Lead, custom 300 mm wafer run with AIM Photonics involving multiple internal/external riders 2023

SERVICE

Under-Represented Student Mentor

- Summer Undergraduate Research Experience (SURE) Program, *Columbia Engineering* 2024

Journal Reviewer

- *Nature Nanotechnology*, Nature Publishing Group
- *Communications Engineering*, Nature Publishing Group
- *APL Photonics*, American Institute of Physics
- *Journal of Lightwave Technology*, IEEE/Optica
- *Journal of Selected Areas in Communications*, IEEE
- *IEEE Transactions on Computers*, IEEE
- *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, IEEE
- *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, IEEE
- *IEEE Access*, IEEE

Conference Reviewer

- *Optical Fiber Communication Conference (OFC)* 2024
- *IEEE International Symposium on High-Performance Computer Architecture (HPCA)* 2020

Textbook Translation

- T1 C. Hawkins, J. Segura, and P. Zarkesh-Ha, *CMOS Digital Integrated Circuits: A First Course (Chinese Edition)*, trans. by **Y. Wang** and Y. Yin. China Machine Press, 2016, original work published by the Institution of Engineering and Technology (IET) in 2013.
- T2 S. Kundu and A. Sreedhar, *Nanoscale CMOS VLSI Circuits: Design for Manufacturability (Chinese Edition)*, trans. by **Y. Wang** and W. Xie. China Science Publishing, 2014, original work published by McGraw-Hill Education in 2010.

AWARD AND HONOR

- Scholar Leadership Award**, Center for Ubiquitous Connectivity (CUBiC) Annual Review 2024
- Best Poster Award**, voted by liaisons at the Center for Ubiquitous Connectivity (CUBiC) Annual Review 2024
- Graduate Fellowship**, Department of Electrical and Computer Engineering, University of California, Santa Barbara, CA, USA 2015
- Outstanding Thesis Award**, Department of Electronic Engineering, Tsinghua University, Beijing, China 2015
- Scholarship for Sports Excellence**, Department of Electronic Engineering, Tsinghua University, Beijing, China 2014