

## 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 &amp; 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 a ring-assisted MZI-based interleaver for Kerr frequency combs,” *Optics Letters*, vol. 50, no. 2, p. 698, Jan. 2025. doi 10.1364/OL.546772
- 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 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. 041306, 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 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)*, accepted.
- C4 **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.
- C5 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)
- C6 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)
- C7 **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
- C8 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)
- C9 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)
- C10 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)
- C11 **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
- C12 **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)
- C13 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)
- C14 **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)
- C15 **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)

- C16 **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)
- C17 **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](https://doi.org/10.1145/3287624.3287649)
- C18 **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](https://doi.org/10.1109/ICMTS.2019.8730924) invited
- C19 **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](https://doi.org/10.23919/DATE.2018.8342079)
- C20 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/ASP-DAC.2018.8297295](https://doi.org/10.1109/ASP-DAC.2018.8297295)
- C21 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](https://doi.org/10.23919/DATE.2017.7927057)
- C22 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](https://doi.org/10.1145/2934583.2934590)
- C23 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](https://doi.org/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 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.
- P3 **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.
- P4 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

<b>Presentation</b> SRC TECHCON <i>Scalable Kerr-Comb Driven DWDM Silicon Photonics Chip I/O</i>	Austin, TX, USA Sep. 2024
<b>Seminar</b> School of EECS, Pennsylvania State University <i>Co-Designing Photonics for Heterogeneously Integrated Systems</i>	University Park, PA, USA Apr. 2024
<b>Invited Talk</b> SPIE Photonics West <i>Scalable Architecture for Sub-pJ/b Multi-Tbps Comb-Driven DWDM Silicon Photonic Transceiver</i>	San Francisco, CA, USA Jan. 2023
<b>Poster</b> Ph.D. Forum, ACM/IEEE Design Automation Conference (DAC) <i>Design and Optimization of Variation-Aware Runtime-Reconfigurable Optical Interconnects</i>	Online Virtual Event Jun. 2020
<b>Invited Talk</b> Optical/Photonic Interconnects for Computing Systems (OPTICS) Workshop <i>Optimal Pairing and Non-Uniform Channel Alignment of Microring-Based Transceivers for Comb Laser-Driven DWDM Silicon Photonics</i>	Dresden, Germany Mar. 2018
<b>Seminar</b> Department of ECE, Hong Kong University of Science and Technology <i>Variation-Aware Modeling and Design of Silicon Photonic Systems</i>	Hong Kong SAR, China Jan. 2018
<b>Poster</b> Optical/Photonic Interconnects for Computing Systems (OPTICS) Workshop <i>Variation-Aware Modeling and Design of Nanophotonic Interconnects</i>	Lausanne, Switzerland 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): [P2], [P3], [C4], [J1], [C6], [C7], [J2], [C11], [C12]

### 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], [C12], [C13]

### Kaylx Jang G

Ph.D. Student at Columbia University

DWDM dispersion engineering, optically connected memory

Resulting joint publication(s): [P3], [C12]

### Tobias Zypman G

Ph.D. Student at Columbia University

Photonics-Enabled Signal Processing

Resulting joint publication(s): [P4]

### James Robinson G

Ph.D. Student at Columbia University

Variation-aware tuning of microresonator-based DWDM links

Resulting joint publication(s): [C4]

### 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], [P3], [C7], [J2], [C11], [C12]

### Zhenguo Wu G

Ph.D. Student at Columbia University

Reconfigurable architecture for optically connected systems

Resulting joint publication(s): [C8], [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): [P3]

### Max Haimowitz G

Ph.D. Student at Columbia University

Scripted and automated large-scale silicon photonics chip layout

> 80 mm<sup>2</sup>/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, *Systems and Testbeds*, coordinating four research tasks across three teams 2024–Present
- CUBiC Scholar Leadership Council, leading monthly workshops with industry liaisons 2023–Present
- Task Co-Lead, *Socket-to-Socket Distributed AI/ML/HPC Fabric Platform (SoSFab)*, 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