Scalable Information Processing with Quantum Nano-Photonics (SIPQNP)

TECHNICAL PROGRAM COMMITTEE:

Ryan Camacho
Matt Shaw
Zheshen Zhang
Daniel Soh
Kanu Sinha
Brian Smith
Mohammad Hafezi
Saikat Guha

Co-Sponsored By:

Fairlead Building, Massachusetts Institute of Technology (MIT)
Research Laboratory of Electronics (RLE) Building
Cambridge, Massachusetts, USA
50 Vassar Street

Coordination:

Brianna Moreno

Diandrea Campbell

February 18-20, 2026

https://www.sipqnp.org

Workshop Agenda

Wednesday, February 18

6pm-8pm Welcome dinner – Featuring Nicole Yunger Halpern

Located at Catalyst Restaurant - 300 Technology Square, Cambridge, MA 02139

Day 1 - Thursday, February 19

Located at MIT building 36 at 50 Vassar Street (4th floor in rooms Haus 36-428 & Allen 36-462)

8:00am-8:45am Breakfast and Registration

8:45am Opening Remarks with Saikat Guha

9:00am Session 1 – Machine learning with quantum and photonic systems [Chairs: Zheshen Zhang & Daniel Soh]

<u>Goal of the session:</u> This session aims at discussing the Use of AI techniques in the photonic domain for classical and/or quantum light for better sensitivity, energy consumption or speed of operation, development of associated ML algorithms in the optical domain and device needs to realize them; and applications.

9:00am-9:45am Flash talks on machine learning with quantum and photonic systems

- Qingyi Zhou, University of Wisconsin-Madison
  - Quantum nonlinearity for optical neural computing
- Liang Jiang, University of Chicago
  - Entanglement enhanced learning
- Zheshen Zhang, University of Michigan
  - Quantum state readout

9:45am-10:00am Break

10:00am-11:00am Flash talks continued

- Tianyu Wang, Boston University
  - Deep neural network
- Hakan Tureci, Princeton University
  - Reservoir computing
- Daniel Soh, University of Arizona,
  - Minimalistic low-energy-consuming quantum machine learning

11:00am-11:15am Break

11:15am-12:00pm Moderated Discussion [Moderator: Daniel Soh]

- Nick Harris/Darius Bunandar, Lightmatter
- Quntao Zhuang, USC
- Jungsang Kim, Duke University
- Bo-Han Wu, University of Hawaiʻi at Mānoa
- Zheshen Zhang, University of Michigan
- Zach Vernon, Quantinuum

12:00-1:00pm Lunch

1:00pm Session 2 – Scalable quantum interconnects [Chairs: Brian & Kanu]

Goal of the session: This session seeks to address different approaches, devices and systems for interconnecting heterogenous and homogenous quantum memories and processors, such as Waveguide QED, ZALM-based photon-pair source, non-linear quantum frequency conversion, time lensing, pump engineering for nonlinear pulse compression, and more; and applications. The session will consist of two primary sets of speakers, each of whom will give short "flash" talks:

1:00pm-2:00pm Flash talks on Architectures and approaches for scalable interconnects

- Chris Monroe, Duke University and IonQ
    - Trapped-ion modular architectures
- Emily Van Milligen, Virginia Tech
    - Spin-photon interfaces and photonic cluster states
- Dirk Englund, MIT
    - Architectures for repeaters, memories, buffers
- Prajit Dhara, RTX BBN Technologies
    - Distributed quantum information processing with waveguide coupled emitters
- Hadiseh Alaeian, Purdue University
    - Integrated photonic quantum technologies

2:00-2:10pm Break

2:10pm-3:00pm Flash talks continued – Hard level issues: Platform specific challenges in quantum interconnects, and the role of photonics

- Aziza Suleymanzade, UC Berkeley
    - Neutral atom quantum processors
- Sara Mouradian, University of Washington
    - Trapped ions
- Aziza Almanakly, New York University
    - Superconducting qubits
- Francesca Sansavini, University of Oregon

- Programmable temporal mode conversion for connecting hybrid optically-active memories
- Edo Waks, University of Maryland (UMD)
  - Quantum dots

3:00pm-3:15pm Break

3:15pm-4:00pm Moderated discussion [Co-moderators - Kanu Sinha & Brian Smith]

- Sherry Zhang, Columbia University
  - Hybrid quantum systems: Circuit QED, solid-state spins and silicon photonics
- Joyce Jiang, University of Pittsburgh
  - Hybrid quantum systems/quantum interconnects: Cold atoms and Circuit QED
- Robert Niffinegger, University of Massachusetts Amherst (UMASS Amherst)
  - Ion trap processors and cavity-coupled ions
- Don Towsley, UMASS Amherst
  - Quantum network architectures
- Norbert Linke, UMD
  - Trapped ion architectures
- Chao Li, MIT
  - Multiplexed color center processors

Day 2 - Friday, February 20

7:30am-8:00am Breakfast

8:00am Session 3 – Spatial and temporal mode transformations [Chairs: Saikat & Mohammad]

Goal of the session: Discuss the fundamental idea of Linear, nonlinear and quantum multi-mode processing across spatial and/or temporal / spectral modes of quantum and/or classical light; and applications. The session will begin with two overview talks, followed by flash talks and a moderated discussion at the end.

8:00am-9:00am Flash talks on use cases for scalable mode transformations

- Saikat Guha, UMD
  - Super resolution imaging
- Quntao Zhuang, USC
  - Photonic sensing and AI
- Olivier Pfister, University of Virginia
  - Cluster state preparation
- Jungsang Kim, Duke University
  - Trapped ion quantum register

- Dal Wilson, University of Arizona
  - Opto-mechanical imaging
- Aziza Suleymanzade, UC Berkeley
  - Neutral atom excitation

9:00am-9:15am Open Mic – impromptu talks

9:15am-9:30am Break

9:30am-10:20am Flash talks [hardware platforms and enabling technologies] ~8 minutes per talk

- Chaohan Cui, UMD
  - Time-delayed interferometry
- Siddharth Ramachandran, Boston University
  - OAM fibers for high-dimensional entanglement generation
- Christine Wang, Diffraqtion
  - Spatial Multi-plane light conversion
- Mahmoud Jalali, MIT
  - Meta material
- Linran Fan, University of Texas at Austin
  - Temporal-mode MPLC

10:20am-10:30am Open Mic – impromptu talks

10:30am-10:45am Break

10:45am-11:30am Moderated discussion [Co-moderators - Saikat Guha & Mohammad Hafezi]

- Sergey Polyakov, National Institute of Standards and Technology (NIST)
  - Imaging use cases
- Alexey Gorshkov, NIST and UMD
  - Entanglement assisted sensing use cases
- Avik Dutt, UMD
  - Manipulating squeezed light
- Sherry Zhang, Columbia University
  - Topological photonics use cases
- Irina Novikova, William & Mary
  - EIT and precision metrology use cases

11:30am-12:00pm Lunch

12:00pm Session 4 – Cryogenic platforms and packaging [Chairs: Ryan & Matt]

12:00pm-12:10pm Introduce session and challenge topic: Heterogeneous temperature cryogenics [Ryan Camacho]

12:10pm-12:40pm Overview Talk - Field of SNSPDs, perspectives on cryogenics and challenge [Matt Shaw]

12:40pm-1:10pm Overview Talk - Cryogenic packaging for quantum memories [Kamil Gradkowski]

1:10pm-1:25pm Break

1:25-2:25pm Flash talks

- Ben Dixon, MIT LL
  - Photonic Packaging of Cryogenic Interconnects
- Zach Vernon, Quantinuum
  - Quantinuum Perspective
- Mike Dipirro, NASA/Goddard Space Flight Center
  - Space Cryogenics
- Karl Berggren, MIT
  - Superconducting Electronics

2:25pm-2:40pm Break

2:40pm-3:30pm Moderated discussion [Co-moderators: Ryan Camacho and Matt Shaw]

3:30pm Closing remarks & meeting adjourned [Saikat Guha]

Poster Presentations

Continuous-variable quantum photonics using frequency-domain encoding and strongly squeezed combs || Avik Dutt

We develop scalable photonic platforms built on frequency synthetic dimensions. This concept encodes lattice degrees of freedom into frequency modes to realize reconfigurable, high-dimensional Hamiltonians for analog quantum simulation, including those with nontrivial topological behavior. In photonic integrated circuits (PICs), low-loss silicon-nitride (Si_3N_4) microring resonators provide dense spectral-mode encoding where we generate squeezed states along the frequency lattice, achieving strong directly detected squeezing (>5.5 dB) with frequency agility and broadband (~11 THz) coverage around the telecom C-band. We further demonstrate near-term applications in quantum-enhanced absorption spectroscopy, showing a larger SNR than classical counterparts, and continuous-variable entanglement important for quantum information processing.

Visible Spectral-Domain Optical Coherence Tomography for Photonic Integrated Circuit Characterization || Chao Li

Visible photonic integrated circuits (PICs) find applications ranging from AR/VR to quantum control, yet lack a high-resolution, nondestructive diagnostic comparable to optical frequency-domain reflectometry, which has matured for infrared silicon photonics. We adapt spectral-domain optical coherence tomography (SD-OCT) to measure guided-mode back-reflections for visible PICs. A broadband visible source is injected; back-reflections interfere with a local oscillator and are read out on a spectrometer. We validate the method by resolving multiple round-trip echoes in a waveguide-coupled ring resonator via a single port, then apply it to circuits with integrated diamond quantum micro-chiplets (QMCs), clearly resolving input/output facets and PIC–QMC transition zones. The system achieves shot-noise-limited sensitivity, 50 dB dynamic range, 16 um axial resolution, and 2 mm (6 dB) imaging depth. SD-OCT thus provides a practical, high-resolution diagnostic for visible PICs, enabling rapid characterization—such as propagation loss, backscattering, and dispersion of PICs—and supporting higher design and packaging yield.

Distributed sensing with waveguide-coupled quantum emitters || Isack Padilla

We propose a setup for sensing field gradients via waveguide-coupled quantum emitters. We demonstrate that delayed (non-Markovian) interactions between such macroscopically separated emitters enhance the quantum Fisher information associated with estimating field gradients.

Machine Learning for efficient generation of universal hybrid Quantum Computing resources || Olivier Pfister

We showcase numerical simulations executed on the UVA Rivanna supercomputer demonstrating the effectiveness of deep reinforcement learning techniques applied to a measurement-based quantum processor. The simulated quantum processor is constituted of a time-multiplexed optical circuit sampled with photon-number-resolving detection. Our simulation successfully mitigated the inherent probabilistic nature of photon number detection, achieving a success rate of 98%. This performance surpasses that of previous other proposals.

Fully Integrated Trapped Ion System on a Chip || Robert Niffenegger

Trapped Ions are a leading platform for quantum computing, networking and sensing, however, conventional bulk optical and laser systems present challenges to scaling. Here we present high fidelity single qubit gates (> 99.7% fidelity) with trapped ions using integrated photonic laser sources and photonic laser stabilization cavities compatible with monolithic integration into the ion trap chip. We also share progress towards monolithic integration with optical addressing using photonic grating couplers. This progress lights the way to scaling up quantum networks with quantum repeaters based on compact trapped ion systems.

Quantum limit of superresolution with entanglement based telescopes || Saikat Guha

Long-baseline interferometry will be possible using pre-shared entanglement between two telescope sites to mimic the standard phase-scanning interferometer, but without physical beam combination. We show that spatial-mode sorting at each telescope, along with pre-shared entanglement, can be used to realize the most general multimode interferometry on light collected by any number of telescopes, enabling achieving quantitative-imaging performance at the ultimate limit pursuant to the baseline as afforded by quantum theory. We work out an explicit example involving two telescopes imaging two point sources.

Hybrid repeater chains with encoding for long distance entanglement distribution || Stav Haldar

Long-distance entanglement distribution will require error correction/distillation in order to compensate for the loss of coherence in quantum memories and noise addition during entanglement swapping. In this work, we argue why repeaters with error correction abilities should utilize more than one physical platform. Hybrid repeaters introduced in this work, utilize the best features of different platforms, such as high entanglement generation rates of one type and the low two qubit-gate errors and high coherence times offered by another type. At the same time, taking the resource-intensive nature of hybrid repeaters (financial or difficulty of deployment) into account, we propose a repeater chain where only some repeaters need to be hybrid, whereas the others can be simpler with no error correction abilities. We show through detailed simulations that these hybrid repeater architectures can outperform architectures that rely only on a single kind of quantum memory platform in terms of end-to-end fidelity and entanglement distribution rates/secret key rates. The advantage is greater in more resource constrained scenarios, making hybrid architectures relevant for current implementations.

Exponential entanglement advantage in sensing correlated noise || Yuxin Wang

In this work, we propose a new form of exponential quantum advantage in the context of sensing correlated noise. Specifically, we focus on the problem of estimating parameters associated with Lindblad dephasing dynamics, and show that entanglement can lead to an exponential enhancement in the sensitivity (as quantified via quantum Fisher information of the sensor state) for estimating a small parameter characterizing the deviation of system Lindbladians from a class of maximally correlated dephasing dynamics. This result stands in stark contrast with previously studied scenarios of sensing uncorrelated dephasing noise, where one can prove that entanglement does not lead to an advantage in the signal-to-noise ratio. Our work thus opens a novel pathway towards achieving entanglement-based sensing advantage, which may find applications in characterizing decoherence dynamics of near-term quantum devices. Further, our approach provides a potential quantum-enhanced probe of many-body correlated phases by measuring noise generated by a sensing target. We also discuss realization of our protocol using near-term quantum hardware.

List of Participants

Alexey Gorshkov	**NIST and UMD**
Anthony Munson	**UMD**
Avik Dutt	**UMD**
Aziza Almanakly	**New York University**
Aziza Suleymanzade	**UC Berkeley**
Ben Dixon	**MIT LL**
Bo-Han Wu	**University of Hawai‘i at Mānoa**
Brian Smith	**University of Oregon**
Chao Li	**MIT**
Chaohan Cui	**UMD**
Chris Monroe	**Duke University and IonQ**
Christian Arenz	**Arizona State University**
Christine Wang	**Diffraqtion**
Dalziel Wilson	**University of Arizona**
Dan Kilper	**Trinity College Dublin**
Daniel Blumenthal	**UC Santa Barbara**
Daniel Soh	**University of Arizona**
Darius Bunandar	**Lightmatter**
Dirk Englund	**MIT**
Don Boroson	**MIT Lincoln Laboratory**
Don Towsley	**UMASS Amherst**
Emily Van Milligen	**Virginia Tech**
Evan Anderson	**UMD/University of Arizona**
Filip Rozpedek	**UMASS Amherst**
Francesca Sansavini	**University of Oregon**
Franco Wong	**Qunett**
Gabe Richardson	**UMD**
Gayane Vardoyan	**UMASS Amherst**

Hadiseh Alaeian	**Purdue University**
Hakan Tureci	**Princeton University**
Irina Novikova	**William&Mary**
Isack Padilla	**University of Arizona**
Jack Postlewaite	**UMD**
John Jarman	**Nu Quantum**
Joohyung Song	**UMD**
Joyce Jiang	**University of Pittsburgh**
Jungsang Kim	**Duke University**
Junyu Liu	**The University of Pittsburgh**
Kamil Gradkowski	**Tyndall National Institute**
Kanu Sinha	**University of Arizona**
Karl K. Berggren	**MIT**
Kerolos Yousef	**Harvard University**
Laura Andre	**Qunett**
Liang Jiang	**University of Chicago**
Linran Fan	**University of Texas at Austin**
Lorcan Conlon	**UMD**
Mahmoud Jalali Mehrabad	**MIT**
Matt Shaw	**Jet Propulsion Laboratory**
Mehdi Namazi	**Qunnect Inc.**
Michael DiPirro	**NASA/Goddard Space Flight Center**
Mo Soltani	**RTX BBN Technologies**
Mohammad Hafezi	**UMD**
Nicole Yunger Halpern	**NIST, QuICS, & UMD**
Norbert Linke	**UMD**
Oliver Slattery	**NIST**
Olivier Pfister	**University of Virginia**
Prajit Dhara	**RTX BBN Technologies**

Prithwish Basu	**RTX BBN Technologies**
Qingyi Zhou	**University of Wisconsin-Madison**
Quntao Zhuang	**USC**
Rajveer Nehra	**UMASS Amherst**
Robert Niffenegger	**UMASS Amherst**
Ryan Camacho	**Brigham Young University**
Saikat Guha	**UMD**
Sara Mouradian	**University of Washington**
Sergey Polyakov	**NIST**
Shenggao Li	**TSMC**
Siddharth Ramachandran	**Boston University**
Stav Haldar	**UMASS Amherst**
Stefan Krastanov	**UMASS Amherst**
Tianyu Wang	**Boston University**
Wenhua He	**UMD**
Xueyue (Sherry) Zhang	**Columbia University**
Yuxin Wang	**UMD**
Zac Dutton	**RTX**
Zachary Vernon	**Quantinuum**
Zheshen Zhang	**University of Michigan**
Zhujun Shi	**University of Pittsburgh**

Biographies (Alphabetically)

Hadiseh Alaeian, Purdue University

Hadiseh Alaeian is an Assistant Professor of Electrical and Computer Engineering and of Physics and Astronomy at Purdue University in West Lafayette. She earned her BS and MS degrees from the University of Tehran and her PhD in 2015. Her research focuses on hybrid, scalable, and integrated photonic quantum technologies, with an emphasis on theoretical and experimental quantum optics and photonics. In particular, she investigates interacting and correlated open quantum optical systems, engineering strong light–matter interactions using highly excited Rydberg states to generate large optical nonlinearities and exotic states of light for photon-based quantum technologies.

Aziza Almanakly, New York University

Aziza Almanakly is an Assistant Professor of Electrical and Computer Engineering at the NYU Tandon School of Engineering. Her research focuses on quantum engineering with superconducting circuits, particularly waveguide quantum electrodynamics and microwave quantum optics for scalable quantum networks. She earned her Ph.D. from the MIT in 2025 and previously developed a chiral quantum interconnect enabling deterministic remote entanglement, published in Nature Physics.

Laura Andre, Qunett

Laura Andre is the CEO of Qunett, a quantum research startup building scalable hardware for quantum device connectivity and deployable quantum networks. Trained as a physicist and engineer, she studied mathematics and applied physics at St. Mary's College of Maryland and earned a PhD in Electrical Engineering with a focus on optics and photonics from the University of Michigan. Known for her hands-on, methodical approach, Laura blends deep technical work with operational and strategic leadership, having grown from Research Engineer to COO and then CEO in under a year.

Christian Arenz, Arizona State University

Christian joined Arizona State University as an assistant professor in the School of Electrical, Computer and Energy Engineering in January 2022. Previously, he completed his PhD in applied mathematics at Aberystwyth University in 2016, where he focused on the control of open and noisy quantum systems. Christian's current research centers on using tools from control theory to advance quantum information science. His work targets applications such as the design of robust and efficient controls for quantum computing, and the development of quantum algorithms for optimization and machine learning tasks.

Prithwish Basu, RTX BBN Technologies

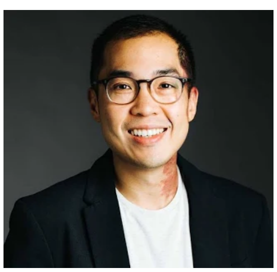
Prithwish Basu is Principal Scientist in Network & Cyber Technologies at Raytheon BBN Technologies. He has a Ph.D. in Computer Engineering from Boston University. He has written numerous articles focusing on various topic such as routing entanglements in the quantum internet and artificial intelligence in urban planning and design.

Dan Blumenthal, UC Santa Barbara

Daniel J. Blumenthal is currently a Distinguished Professor in the Department of ECE at UCSB, Director of the Terabit Optical Ethernet Center (TOEC) and heads the Optical Communications and Photonics Integration (OCPI) group (ocpi.ece.ucsb.edu). Dr. Blumenthal is Co-Founder of Packet Photonics Inc. and Calient Networks, manufacturers of optical communications and network equipment. He holds 23 patents and has published over 500 papers in the areas of optical communications, optical packet switching, ultra-narrow linewidth integrated lasers, and ultra-low loss silicon nitride waveguides.

Don Boroson, MIT Lincoln Laboratory

Dr. Don M. Boroson is a Lincoln Laboratory Fellow in the Communication Systems Division, where he has played a leading role in the development of advanced satellite and free-space laser communication systems. His work includes digital beamforming, efficient receiver architectures, and novel modulation formats, as well as leadership in major space laser communications programs. He coordinated integration and test planning for the Laser Intersatellite Transmission Experiment and served as lead engineer and associate manager for the GeoLITE program, which became the world's first successful space-based high-rate laser communications system in 2001. Dr. Boroson has also led and contributed to NASA-sponsored Mars and Lunar Laser Communications Demonstration efforts and continues to oversee programs advancing the state of the art in laser communications. He holds BSE, MSE, MA, and PhD degrees in electrical engineering from Princeton University.



Darius Bunundar

As chief scientist at Lightmatter, Bunandar is leading the charge to create a greener future for AI by developing more powerful processors that harness the power of light. The company, backed by Google Ventures, reached unicorn status in 2023, clinching a $1.2 billion valuation.

Ryan Camacho, Brigham Young University

Ryan Camacho joined the BYU ECEn faculty in July of 2017 after spending 7 years as a scientist at Sandia National Labs. He obtained a Ph.D. in Physics from the University of Rochester (2008) and worked as a postdoc at Caltech (2008-2010). His main research interests are in micro and nano optical structures, quantum engineering, and optofluidic resonators.

Lorcan Conlon, UMD

Lorcan is a Theoretical Quantum Optics Postdoctoral Fellow. He is primarily interested in quantum metrology, determining fundamental limits on how accurately we can measure any physical quantity. Lorcan obtained his PhD at the Australian National University, and held a joint position between the Agency for Science Technology and Research Singapore, and the Centre for Quantum Technologies at the National University of Singapore before joining QuICS.

Chaohan Cui, UMD

Chaohan received his Ph. D. degree from the University of Arizona. His research focuses on integrated quantum photonics, temporal-spectral quantum optics, and quantum feedback control. He is interested in novel optical applications with practical quantum advantages and AI-infused experimental platforms.

Prajit Dhara, RTX BBN

Prajit, Quantum Information Theorist at RTX BBN Technologies completed his B.E. (Electronics and Instrumentation Engineering) from BITS Pilani, India. He joined the University of Arizona as a Ph.D. student in 2020. His current research is geared towards quantum communications, quantum information theory and quantum optics.

Michael DiPirro, NASA

Mike DiPirro received a Ph.D. in Low Temperature Physics from the State University of New York at Buffalo in 1979. One year later he joined NASA's Goddard Space Flight Center in 1980, where he has worked until the present. He has written more than 80 journal articles in low temperature physics and cryogenic technology. He is one of the Technical Editors of the Advances in Cryogenic Engineering, and has served in this role since 1999.

Ben Dixon, MIT LL

Dr. P. Benjamin Dixon is a senior staff member in the Optical and Quantum Communications group at MIT Lincoln Laboratory. He has overseen the development of several key quantum networking technologies including high-rate entanglement sources, and high-fidelity quantum frequency-conversion systems. Dr. Dixon has over 50 peer-reviewed journal publications and conference papers, and has won three R&D 100 awards. He received his B.A. in Mechanical Engineering in 2005, his Ph.D. in Physics in 2012, and completed a postdoctoral appointment in 2014.

Avik Dutt, UMD

Dr. Avik Dutt joined UMD as an Assistant Professor in 2022. He is currently building the FloQuET lab to pursue interdisciplinary research on FearLess Optics, Quantum Engineering & Technology, by innovating on ideas from nanophotonics, quantum science and nonlinear optics, across the whole spectrum from fundamental science to applied technologies.

Zac Dutton, RTX BBN Technologies

Dr. Zachary Dutton received his B.S. in physics at UC Berkeley (1996) and PhD in theoretical physics at Harvard (2002) in the group of Prof. Lene Hau. Following that he did a National Research Council post-doctoral fellowship at NIST-Gaithersburg with Dr. Charles Clark and was then a staff physicist at the Naval Research Lab. Dr. Dutton joined Raytheon BBN Technologies in 2007 and is currently VP of Defense Technology.

Dirk Englund, MIT

Dirk Englund is a Professor of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology and a leading researcher in quantum information science, machine learning, and artificial intelligence. His work bridges quantum photonics, optical and RF hardware, and in-physics computing, with contributions ranging from scalable diamond quantum devices to photonic processors for machine learning. Englund's research spans fundamental theory and practical systems, including quantum networking, superconducting qubit readout, and energy-efficient optical computation. He is widely published and holds multiple patents advancing quantum and photonic technologies.

Linran Fan, University of Texas at Austin

Linran Fan is an Assistant Professor in the Chandra Family Department of Electrical and Computer Engineering at The University of Texas at Austin. His research interests focus on nonlinear interactions between optical photons, superconducting circuits, electron spins, and acoustic waves at the quantum level in a hybrid system of novel integrated devices and materials. Target applications include photonic information processing, communication, and precision measurement enhanced by quantum information science.

Alexey Gorshkov, NIST and UMD

Alexey Gorshkov is a theoretical physicist and researcher bridging quantum information science, atomic physics, and condensed matter at NIST and UMD. As a JQI and QuICS Fellow, he specializes in controlling large quantum systems, photon interactions, and quantum sensing. His work supports advancements in quantum computing and communication.

Kamil Gradkowski, Tyndall National Institute

Kamil Gradkowski is a senior researcher at Tyndall National Institute in Cork, Ireland specializing in photonic packaging and integrated photonics. His work focuses on coupling strategies, fiber-to-chip interfaces, and advanced packaging solutions that enable silicon photonic integrated circuits to operate as scalable, real-world photonic devices. He has contributed extensively to high-impact journals including Photonics Research, ACS Photonics, Applied Sciences, and Journal of Lightwave Technology. His research bridges fundamental device physics and practical photonic system assembly.

Saikat Guha, UMD

Saikat Guha is a Professor at UMD, Department of Electrical and Computer Engineering. He is also the Director of the NSF Engineering Research Center for Quantum Networks (CQN). Saikat received his Bachelor of Technology degree in Electrical Engineering from Indian Institute of Technology, Kanpur in 1998, and his S.M. and Ph.D. degrees in Electrical Engineering and Computer Science from Massachusetts Institute of Technology in 2004 and 2008, respectively. He now leads the Photonic Quantum Systems Group at the UMD.

Mohammad Hafezi, UMD

Minta Martin Professor of Electrical and Computer Engineering and Physics, leads the Joint Quantum Institute's Hafezi Group. They aim to theoretically and experimentally investigate various quantum properties of light-matter interaction for applications in future optoelectronic devices, quantum information processing, and sensing.

Stav Haldar, UMASS Amherst

Postdoctoral researcher, Stav Haldar, is a Postdoctoral Researcher at UMASS Amherst working in quantum science and technology. His research focuses on quantum networks, entanglement distribution, and quantum repeaters, with particular emphasis on improving long-distance quantum communication using hardware-aware protocols and machine-learning–assisted optimization. He has authored many publications and his work also explores topics like satellite-based quantum links and contributing to the development of scalable global quantum communication infrastructures.

Wenhua He, UMD

Wenhua He received her Bachelor of Engineering degree from Tianjin University in 2015. From there she completed her Masters degree at the University of Rochester in 2018. She is currently a PhD student at the James C. Wyant College of Optical Sciences at UMD.

Mahmoud Jalali Mehrabad, MIT

Mahmoud Jalali Mehrabad, Research Scientist at MIT, works with Prof. Dirk Englund. He is a member of the Quantum Photonic & AI Group and earned his PhD in Quantum Optics 2021. His research spans quantum photonics, topological photonic circuits, optical frequency combs, on-chip quantum synchronization, chiral quantum optics with solid-state quantum emitters, and 2D-materials-integrated plasmonics.

John Jarman, Nu Quantum

John Jarman, International Tech Lead at Nu Quantum supports their mission in building the Entanglement Fabric to unlock commercial quantum computing scale-out. John has over 30 publications focusing on Nanomaterials, Materials, Thin Films and Nanotechnology, Nanostructured Materials and Nanofabrication.

Joyce Jiang, University of Pittsburgh

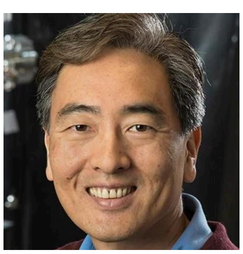
Yue (Joyce) Jiang earned her Ph.D. in Physics from the Hong Kong University of Science and Technology in 2020, where her research focused on studying the nonlinear interactions between photons and laser-cooled atomic ensemble. Following her Ph.D., she completed a postdoctoral fellowship at JILA, developing quantum-enhanced sensing techniques for axion dark matter searches using superconducting quantum circuits.

Liang Jiang, University of Chicago

Liang Jiang theoretically investigates quantum systems and explores various quantum applications, such as quantum sensing, quantum transduction, quantum communication, and quantum computation. His research focuses on using quantum control and error correction to protect quantum information from decoherence to realize robust quantum information processing. He has worked on modular quantum computation, global-scale quantum networks, error-correction-assisted quantum sensing and simulation, and more.

Daniel Kilper, Trinity College Dublin

Prof. Kilper received his PhD in physics from the University of Michigan in 1996. From 2000 to 2013, he was a member of the technical staff at Bell Labs. He is a senior member of IEEE, a topical area editor for the IEEE Transactions on Green Communications and Networking (TGCN) and chairs the optics working group in the IEEE International Network Generations Roadmap. He is the Director of the CONNECT Centre, and Principal Investigator.



Jungsang Kim, Duke University

Jungsang Kim leads the Multifunctional Integrated Systems Technology group at Duke University. His main area of current research is quantum information sciences, where his group uses trapped atomic ions and a range of photonics technologies in an effort to construct scalable quantum information processors and quantum communication networks. His research focuses on the introduction of new technologies, such as micro fabricated ion traps, optical micro-electromechanical systems, advanced single photon detectors, compact cryogenics and vacuum technologies, towards a functional integration of quantum information processing systems.

Stefan Krastanov, UMASS Amherst

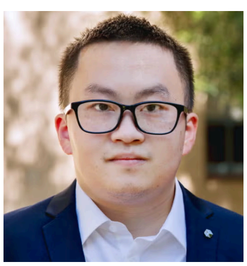
Stefan joined UMASS Amherst in 2022 as an assistant professor. Stefan works on the design, control, and optimization of quantum hardware for computation and networking, from its analog physical description up to the compilation of error-corrected logical circuitry running on it. His research centers around leaky abstraction boundaries between the many layers of technologies making up the field of quantum computing and quantum information science.

Chao Li, MIT

Dr. Li is a Postdoctoral Associate at the Massachusetts Institute of Technology, where they have conducted full-time research since 2022. They earned a PhD in Physics from the Georgia Institute of Technology and a BS in Physics from Jilin University. Their work has been recognized by the American Physical Society and by IOP Publishing, including an Outstanding Reviewer Award (2024), reflecting contributions to both research and scholarly peer review.

Norbert Linke, UMD

Norbert Linke is a quantum scientist working on different applications of individual trapped atomic ions. He earned his doctoral degree (D.Phil.) in Atomic & Laser Physics in 2013 from the University of Oxford, U.K., under David Lucas. After post-doctoral work at Oxford, he joined the University of Maryland and its Joint Quantum Institute. He is the director of the National Quantum Laboratory at Maryland, QLab.



Junyu Liu, The University of Pittsburgh

Coming from University of Chicago & Caltech, Junyu Liu joined the Department of Computer Science as an Assistant Professor in the tenure stream in the quantum computing area. Dr. Liu is interested in finding useful quantum information science and technologies for real-world applications, including quantum computing, quantum algorithms, quantum network and quantum sensing. His research focuses on quantum computer systems, quantum algorithms, quantum network, quantum sensing, AI for quantum and quantum for AI.

Chris Monroe, Duke University and IonQ

Christopher Monroe is a pioneering researcher in quantum computing and quantum information science. He is the Gilhuly Family Presidential Distinguished Professor at Duke University, with appointments in Electrical and Computer Engineering and Physics, and serves as Director of the Duke Quantum Center. Monroe leads the Monroe Lab, where his research focuses on quantum physics and the development of programmable quantum simulators and trapped-ion quantum computers. He earned his B.Sc. in 1987 and his Ph.D. in 1992. A member of the National Academy of Sciences since 2016, Monroe is widely recognized for foundational contributions that have shaped modern quantum computing and quantum networking.

Sara Mouradian, University of Washington

Sara Mouradian received her BS, MEng, and PhD degrees from the Massachusetts Institute of Technology. As an Intelligence Community Postdoctoral Fellow at the University of California, Berkeley she worked to build useful quantum sensors based on trapped ions. Her research focuses on building robust and scalable quantum systems for the next generation of computing, communication, and sensing.

Mehdi Namazi, Qunnect Inc.

Mehdi Namazi, Co-founder and Chief Science Officer at Qunnect Inc., Mehdi received his M.Sc. in Nanophysics working on designing nanostructure solar cells. During his Ph.D., Mehdi worked on several aspects of room temperature quantum communication and computation technologies. In 2018, Mehdi was awarded the Yale Joint Quantum Institute Postdoctoral Fellowship to work on novel quantum opto-mechanical systems. As Qunnect's CSO, he currently leads a team of scientists and engineers with a focus on developing the product suite necessary for long-distance quantum communication embedded in telecom fiber networks. between them.

Rajveer Nehra, UMASS Amherst

Dr. Nehra is an Assistant Professor in the Department of Electrical and Computer Engineering at UMass Amherst, with adjunct positions in the Department of Physics and Manning College of Information and Computer Sciences. Dr. Nehra completed his doctoral studies in AMO physics on developing and efficiently characterizing non-Gaussian resources for photonic quantum information science and technology. Recognizing his dissertation work, he was honored with the Outstanding Graduate Research Award and the Allan Talbott Gwathmey Memorial Award. Before UMass-Amherst, Dr. Nehra held a visiting research scientist position at the University of Tokyo and a postdoctoral position at Caltech.

Robert Niffenegger, UMASS Amherst

Professor Robert Niffenegger leads the UMass+ Trapped Ion Quantum Computing and Photonics which develops integrated technologies like photonics for trapped ion quantum processor units (QPUs). He has also previously received a coveted National Science Foundation CAREER Award for research on developing integrated technologies for trapped ion qubits.

Irina Novikova, William & Mary

Irina Novikova is a Professor of Physics specializing in Atomic, Molecular, and Optical (AMO) physics experiments. Her research explores light–matter interactions, nonlinear and quantum optics, and precision optical probing of complex media. She received her early training at the Moscow State Engineering Physics Institute and earned her Ph.D. from Texas A&M University. Her work has been published in leading journals such as Optics Letters, Advanced Optical Materials, and Optical Engineering, contributing to advances in squeezed light propagation, nonlinear optics, and optical studies of phase transitions.

Isack Padilla, University of Arizona

Isack received a Bachelor's degree in Physics at the University of Sonora in Mexico. He is now pursuing a PhD in Optical Sciences. His research interests are in the fields of quantum information science, photonics and computational physics.

Olivier Pfister, University of Virginia

Olivier Pfister received the B.S. in Physics, M.S. and the Ph.D. in Physics. Olivier Pfister is a fellow of the American Physical Society and a member of Optica, IEEE, and SPIE. His general research area is atomic, molecular, and optical physics, ultrahigh resolution laser spectroscopy, symmetry effects in small molecules, nonlinear optics for optical frequency chains, and two-photon lasers. His current research interest is quantum computing with light. He is a co-founder and CTO of quantum computing startup QC82, Inc.

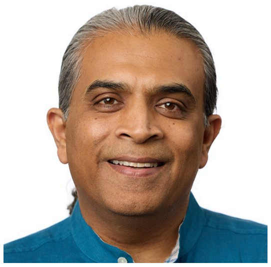
Sergey Polyakov, NIST

Dr. Sergey V. Polyakov is a physicist in the Quantum Optics group in the Quantum Measurement Division of the Physical Measurement Laboratory. Before becoming a staff member at NIST in 2013, Dr. Polyakov served as a guest researcher at NIST and JQI since 2005 and held a post-doctoral position at Caltech with H. Jeff Kimble, where he built and characterized an atomic ensemble-based quantum memory.

Jack Postlewaite, UMD

Jack Postlewaite is currently pursuing a PhD in the Department of Electrical and Computer Engineering at the University of Maryland, College of Engineering. Jack's research focuses on quantum communications, quantum information theory, and quantum computing. His current research focuses on experimental efforts to realize generalized temporal unitary control of single photon and squeezed coherent light. T Jack's interests continue to involve quantum enhanced optical communication and sensing.

Siddharth Ramachandran, Boston University



Siddharth Ramachandran, PhD is a Distinguished Professor of Engineering with appointments in Electrical and Computer Engineering, Physics, and Materials Science & Engineering. He received his PhD from the University of Illinois at Urbana–Champaign and leads research in nonlinear, ultrafast, and quantum photonics, focusing on light–matter interactions, optical fibers and guided-wave devices, super-resolution and brain imaging, and classical and quantum networks. A Fellow of AAAS, IEEE, APS, OSA, and SPIE, he is the recipient of numerous honors, including the SPIE G.G. Stokes Award and the Vannevar Bush Faculty Fellowship.

Gabe Richardson, UMD

Gabe Richardson studied Physics at Brigham Young University as an undergraduate and participated in the Pathways Program at NASA Goddard Space Flight Center. This led him to pursue graduate studies at the University of Arizona. His research interests focus on the fundamental extraction and processing of information from light. His current work includes entanglement generation and distribution, atomic and atom-like quantum memory design, and quantum long-baseline interferometry.

Filip Rozpedek, UMass Amherst

Filip Rozpedek's research focuses on designing novel quantum communication, quantum repeater, and quantum network architectures. In his research he combines various techniques from quantum information theory, mathematical optimization, quantum optics, as well as physics of quantum devices in order to bring closer the realization of practical quantum networks. One such strategy that has been a focus of Rozpedek's recent research is the use of bosonic quantum error correcting codes for quantum repeaters. He has been also actively involved in modeling proof-of-principle quantum repeater experiments and optimizing entanglement distillation schemes.

Francesca Sansavini, University of Oregon

Francesca Sansavini is a Postdoctoral Researcher at the University of Oregon and an experimental quantum physicist specializing in photonic quantum technologies. Her work focuses on single-photon quantum communication and quantum sensing, with complementary theoretical contributions to quantum information protocols. She earned her PhD in Experimental Quantum Optics through a cotutelle program between Sorbonne Université and the University of Helsinki, where her research addressed time- and frequency-multiplexed continuous-variable quantum networks. Francesca has led and contributed to experiments in femtosecond quantum optics, multimode squeezing, and multiplexed quantum networks, and is actively involved in teaching, mentoring, and science outreach.

Matt Shaw, Jet Propulsion Laboratory

Matt Shaw leads the development of superconducting nanowire single photon detector arrays for optical communication, quantum information, and fundamental science at JPL. Group supervisor for 15 full-time staff members performing technology development in superconducting detectors for astronomy and other applications, from the UV to the far-infrared. Principal Investigator for technology R&D projects funded by NASA, DARPA, DOE, JPL, other government agencies, and private industry. Scientific interests include superconducting detectors, optical communication, quantum information science, dark matter detection and astronomy.

Zhujun Shi, University of Pittsburgh

Zhujun Shi is an Assistant Professor in the Department of Physics and Astronomy at the University of Pittsburgh. Her research focuses on developing nanophotonic systems for advanced imaging, sensing, and computation. She investigates new physical mechanisms of nanoscale light–matter interaction and uses them to design devices that can control light in new and extreme ways.

Kanu Sinha, Arizona State University

Kanu Sinha is an Assistant Professor at the School of Electrical, Energy and Computer Engineering at Arizona State University. Prior to joining ASU, she was an Associate Research Scholar at the Department of Electrical and Computer Engineering at Princeton University. She earned her Bachelors of Technology in Engineering Physics, followed by her Ph.D. in Physics at UMD. She has since been a Postdoctoral Fellow at the Institute of Quantum Optics and Quantum Information (IQOQI) in Innsbruck, Austria and at the US Army Research Laboratory (ARL) in Maryland.

Oliver Slattery, NIST

Oliver Slattery has worked as a physicist at NIST since 1998. He holds B.Sc. (Hons), M.Sc. and Ph.D. degrees in Physics from the University of Limerick (UL) in Ireland and a M.Sc. degree in Electrical Engineering from the Johns Hopkins University in Maryland. Upon arriving at NIST, he worked primarily on the NIST Rotating Wheel Braille Display and Tactile Display project and was part of the team that won a 2001 R&D 100 award and 2003 Department of Commerce (DoC) bronze medal for that project. The DoC bronze medal is the highest award NIST offers to its staff.

Brian Smith, University of Oregon

Brian Smith is a professor at the University of Oregon. He is also the director of the Oregon Center for Optical Molecular and Quantum Science. His areas of interest include quantum optics, quantum information science and technology, and optics.

Daniel Soh, University of Arizona

Daniel Soh is an Associate Professor of Optical Sciences at the University of Arizona's Wyant College of Optical Sciences, with an additional appointment in Electrical and Computer Engineering, where he leads the Theory and Experiment of Scalable Quantum Systems Lab. His research spans scalable quantum computation, qubit transduction, and quantum information processing with squeezed light, with interests extending to non-conventional quantum computing paradigms and light–matter interactions in topological quantum materials. Prior to joining the University of Arizona, he spent over a decade at Sandia National Laboratories as a Principal Member of Technical Staff, following earlier roles in industry and academia. His work integrates theory and experiment to develop scalable quantum information processing networks based on open quantum systems.

Mo Soltani, RTX BBN Technologies

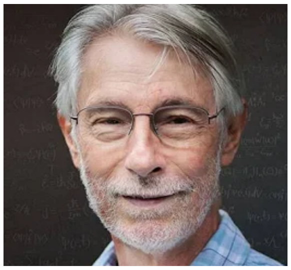
Mo Soltani, principal investigator at RTX BBN, is leading a DARPA-backed project to develop compact, chip-scale quantum photonic sensors that surpass standard light-fluctuation limits by 10x+ in precision. This technology uses "squeezed light" for advanced LiDAR, navigation, and defense. BBN Technologies, an RTX company, is renowned for pioneering ARPANET and continues to push boundaries in quantum computing and photonics.

Joohyung Song, UMD

Joohyung earned B.S. and M.S. in Electrical and Computer Engineering from Ajou University, South Korea. He is pursuing his PhD in the Department of Electrical and Computer Engineering at the University of Maryland, starting in 2022. His research focuses on quantum photonics, quantum networks, and quantum communications. Outside of research, he enjoys playing tennis, swimming, and cooking.

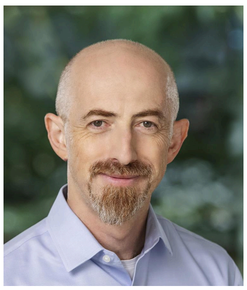
Aziza Suleymanzade, UC Berkeley

Aziza Suleymanzade is an Assistant Professor of Physics at UC Berkeley. Her group explores hybrid quantum systems that combine Rydberg atoms, superconducting circuits, and nanophotonics. Her research focuses on creating novel quantum interfaces and generating entanglement resources that link these platforms for quantum information processing, communication, and sensing.



Don Towsley, UMASS Amherst

Don Towsley's research spans a wide range of activities, from quantum and classical networking and secure communications to distributed learning and inference. He pioneered the area of network tomography and the use of fluid models for the analysis and control of large networks. More recently, he pioneered the theoretical study of covert communications and is one of the leading researchers in the area of quantum networking. He is one of the highly cited computer scientists with over 250 articles in leading journals.

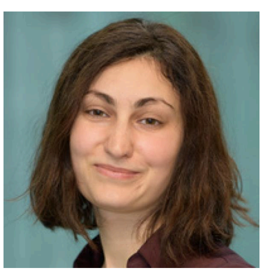


Hakan Türeci, Princeton University

Prof. Türeci is a professor of electrical and computer engineering at Princeton University. His group focuses on quantum optical phenomena in complex media. Traditionally, quantum optics studies the interactions between emitters and electromagnetic fields. Their research aims at a realistic description of the physics of state-of-the art photonic media as well as novel emitter systems. Research projects in my group have a well-balanced applied and fundamental physics component.

Emily Van Milligen, Virginia Tech

Emily Van Milligen, Postdoctoral student at Virginia Tech's Center for Quantum Information Science and Engineering under Ed Barnes, focuses on Quantum Networks with an emphasis on entanglement assisted sensor networks and entanglement routing in a Quantum Network. Emily did her PhD in Physics under Dr. Guha at the University of Arizona.



Gayane Vardoyan, UMASS Amherst

Gayane Vardoyan is an Assistant Professor in the Manning College of Information and Computer Sciences. Prior to coming to UMass, Vardoyan was an Assistant Professor at the QuTech Advanced Research Centre and the faculty of Electrical Engineering, Mathematics, and Computer Science at TU Delft. Vardoyan was a postdoctoral researcher at QuTech, where she was advised by Prof. Stephanie Wehner. Vardoyan holds a B.S. in Electrical Engineering and Computer Sciences and a Ph.D. from the University of Massachusetts, Amherst, where she was advised by Prof. Don Towsley.

Zachary Vernon, Quantinuum

Dr. Zachary Vernon is the Director of Photonics at Quantinuum, a leader in trapped-ion and hybrid quantum computing. Formerly the hardware CTO at Xanadu, he brings extensive expertise in integrated photonics and quantum hardware development to advance Quantinuum's scalable, fault-tolerant roadmap.

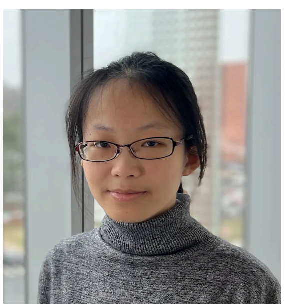
Christine Wang, Diffraqtion

Christine Wang is the Officer and Co-Founder of Diffraqtion and an xperienced R&D leader in the field of optics and photonics. Proven track records in technology innovation, technical leadership, program management and communication skills. PhD in Experimental Physics from Harvard University. Passionate about bringing innovation with global impact to the real world.

Tianyu Wang, Boston University

Tianyu Wang is a fifth-year PhD student in Industrial Engineering and Operations Research at Columbia University, co-advised by Garud Iyengar and Henry Lam, and working closely with Hongseok Namkoong. He holds a B.E. in Information Systems and a B.S. in Mathematics from Tsinghua University. His research studies the statistical and computational foundations of data-driven decision-making, with applications in trustworthy machine learning, supply chains, and pharmaceutical manufacturing.

Yuxin Wang, UMD

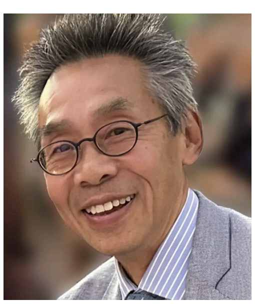


Yuxin Wang is a postdoctoral fellow at the University of Maryland Institute for Advanced Computer Studies (UMIACS) working with Alexey Gorshkov. She focuses on the intersection of quantum information science and condensed matter physics. Wang investigates noise and dissipation in quantum systems and their implications for quantum information processing, particularly in characterizing dissipative environments and utilizing these dynamics for practical applications. Additionally, she aims to gain experience with various experimental quantum platforms.

Dal Wilson, University of Arizona

Dalziel Wilson is an associate professor of physics and optical sciences at the University of Arizona. His work in cavity optomechanics, spanning a decade, includes seminal demonstrations of radiation pressure feedback cooling, quantum-limited position measurement, optomechanical light squeezing, membrane-based cavity optomechanics, and ultra-high-Q nanomechanics. Previously, he was a scientist at IBM Research–Zurich, a Marie Curie Postdoctoral Fellow at EPFL, and a Ph.D. student at Caltech.

Franco Wong, Qunett



Franco Wong, Principal Research Scientist at Qunett, after a postdoctoral appointment at JILA with Jan Hall, he joined MIT in 1983, where his research has centered on the quantum nature of light. In collaboration with Jeff Shapiro, he made key contributions to efficient, high-flux sources of polarization-entangled photons, including interferometric designs that are now widely used. One such source served as the basis for the first photonic entanglement experiment flown in space in 2017.

Kerolos Yousef, Harvard University

Kerolos Yousef, PhD Candidate in Applied Physics at Harvard University, co-designed metasurfaces – ultrathin nanostructured materials that control light – to generate photon entanglement, enabling complex quantum operations on a single device instead of a bulky optical network. This approach can accelerate the development of photonic quantum computers, sensors, and networks, potentially enabling room-temperature quantum processors and portable lab-on-a-chip systems. His work has been published in Science Magazine and could transform precision sensing in medicine, and environmental monitoring. He has also authored seven journal papers.

Nicole Younger Halpern, NIST, QuICS, and UMD

Nicole Yunger Halpern is an American author and theoretical physicist specializing in quantum thermodynamics. She is also a a Fellow of the Joint Center for Quantum Information and Computer Science, and an adjunct assistant professor at the UMD. Nicole completed her PhD at Caltech, winning the international Ilya Prigogine Prize for a thermodynamics thesis. While an ITAMP Postdoctoral Fellow at Harvard University, she won the International Quantum Technology Emerging Researcher Award. Other scientific accolades include the US ASPIRE Prize, the Mary Somerville Medal, the Hermann Weyl Prize, the Katharine B. Gebbie Young Scientist Award, and inclusion in the Science News "Ten to Watch" list of early- and mid-career scientists. Nicole re-envisions 19th-century thermodynamics for the 21st century, using quantum information theory. She has dubbed this research "quantum steampunk," after the steampunk genre of art and literature that juxtaposes Victorian settings with futuristic technologies.

Xueyue "Sherry" Zhang, Columbia University

Xueyue (Sherry) Zhang and her lab leverage the unique advantages of qubit-photon interactions to advance the frontiers of quantum science and technology. They focus on introducing new capabilities, such as high levels of connectivity, into superconducting circuits and solid-state spin platforms by integrating these qubits with microwave waveguides and silicon photonics. This foundation enables the Zhang lab to explore novel possibilities in basic science, such as many-body quantum simulation and quantum topological photonics, as well as pushing the boundaries of quantum computing and networking technologies.

Quntao Zhuang, USC

Quntao Zhuang joined the USC Ming Hsieh Department of Electrical and Computer Engineering in August 2022. He received his B.A. in physics from Peking University in 2013 and Ph.D. in physics in 2018 from Massachusetts Institute of Technology. Before coming to USC, he was an Assistant Professor in Electrical and Computer Engineering and Optical Sciences at University of Arizona. Dr. Zhuang received the Google Academic Research Award in 2024, NSF CAREER award in 2022 and DARPA Young Faculty Award in 2020, which is selected as DARPA Director's award in 2022.

Presenters with slides should join Zoom to share their screen. Do not connect to audio.

Online notes to be taken by assigned scribes:

Topic 1: Artificial intelligence in quantum photonics

Topic 2: Scalable quantum interconnects

Topic 3: Spatial and temporal mode transformations

Topic 4: Cryogenic platforms and packaging

Thank you for joining us for the 8th SIPQNP Workshop!

We would be grateful if you could leave us some feedback on the quality and the organization of this workshop, and how we can improve it in the future.

https://uarizona.co1.qualtrics.com/jfe/form/SV_0HD4y6tV85ezIGi