PURDUE UNIVERSITY | Elmore Family School of Electrical and Computer Engineering

Tailoring Integrated Photonics for Scalable Quantum Technologies

Ryota Katsumi
Toyohashi University of Technology

Wednesday, March 11, 2026
10:30 AM • WANG 1004

Zoom: https://purdue-edu.zoom.us/j/94995688744
Meeting ID: 949 9568 8744

Abstract
Abstract: Quantum technologies are poised to revolutionize information processing and sensing by overcoming classical limits. My research focuses on engineering integrated photonics to realize scalable, practical, and chip-scale quantum technologies.
In this talk, I will first present approaches for deterministic single-photon generation essential for quantum computing architectures. By coupling semiconductor quantum dots to nanophotonic cavities, I demonstrate substantially enhanced light–matter coupling. I will also highlight strategies for hybrid integration of such high-performance materials with cutting-edge photonic platforms.
Next, I will address quantum sensing and interconnects. I will demonstrate diamond nitrogen-vacancy (NV) center–based quantum sensors that combine high-sensitivity magnetometry with nanoscale spatial resolution. Finally, I will show how nonlinear photonics on thin-film lithium niobate (TFLN) platforms can bridge different material systems on a single chip.
Together, these results illustrate how integrated photonics serves as a versatile platform for next-generation quantum technologies, opening new pathways toward practical, chip-scale quantum computing, sensing, and networking.

Bio
Dr. Ryota Katsumi is a researcher specializing in quantum photonics and nanoscale device engineering. He received his B.S. (2016) and Ph.D. (2021) in Physics from The University of Tokyo. He currently holds a dual appointment as a Research Scientist in the group of Prof. Alexander L. Gaeta at Columbia University and as an Associate Professor at Toyohashi University of Technology. His work aims to bridge the gap between solid-state quantum emitters and cutting-edge integrated photonics to realize scalable hardware for quantum computing, sensing, and networking. To this end, his research encompasses a wide range of fields, including cavity quantum electrodynamics, nonlinear photonics, and topological photonics. He also serves as the Group Leader for Optica's Quantum Optical Science and Technology Technical Group and as the Principal Investigator of a JST PRESTO project.

Host
Associate Professor Joseph M. Lukens, jlukens@purdue.edu