



Integrated Nonlinear and Quantum Photonic Devices

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Via Zoom @ 9:00am

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Abstract: Recent advances in nanofabrication technology have allowed for the realization of ultra-low loss nanophotonic waveguides and is opening up exciting opportunities for next-generation nonlinear photonic circuits with higher integration density, advanced functionalities, and ultralow energy consumption. Those features are critical for advancing photonic technologies in both classical and quantum domains.

In this talk, I will discuss silicon-based and thin-film lithium niobate (LN)-based photonic devices, which leverage the combination of Kerr and second-order nonlinearities, along with electro-optic (EO) and piezoelectric effects to achieve highly efficient and controllable light-matter interactions at extremely compact footprints. I will talk about the first mode-locked Kerr frequency combs in the mid-infrared regime and dual-comb spectroscopy technique for ultrafast molecular sensing, based on silicon microresonators. Furthermore, I will discuss a novel class of silicon-nitride-based optical parametric oscillators and its experimental realization for building a true quantum random number generator and a spatially multiplexed nanophotonic spin glasses system for coherent photonic computing. Thirdly, I will talk about the emerging LN optoelectronic platform and show the developments of several novel EO devices and circuits for femtosecond pulse lasers, frequency shifters, and electro-optic frequency combs. Lastly, I will discuss the potential of nonlinear photonic platform for scaling up and accelerating classical and quantum technologies in molecular sensing, photonic computing, information processing and communication networks.

Biography: Mengjie Yu is a postdoctoral fellow in Professor Marko Loncar's group in the John A. Paulson School of Engineering and Applied Sciences at Harvard University. She received her Ph.D. degree in Electrical Engineering in 2018 from Cornell University in Professor Alexander L. Gaeta's group. Her research focuses on integrated photonics across various platforms of silicon, silicon nitride, and lithium niobate, and her research areas include nonlinear physics, integrated optical frequency comb, mid-infrared molecular spectroscopy, nonlinear frequency conversion and coherent computing based on artificial photonic Ising spins.

Mengjie Yu is the 2020 the Optical Society (OSA) Ambassador. She was the winner of the 2016 Maiman Student Paper Competition and the 2016 Emil Wolf Student Paper Competition, and a finalist of the 2020 Tingye Li Innovation Prize. She was the Caltech 2019 Young Investigator Lecturer. She has published 33 peer-reviewed journal papers and 45 conference papers and is a referee for 15 peer-reviewed journals. Currently, she serves as chair of the OSA Integrated Photonics Technical Group.