USC Viterbi
School of Engineering
*Ming Hsieh Department of Electrical and Computer Engineering*

# Seminar

# *Integrated photonic and atomic quantum systems*


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## Wednesday, April 7, 2021
## Via Zoom @ 9:00 am

https://usc.zoom.us/j/97126068362?pwd=OGdjUGF3WExjd1NRTTNQT0NqMkU3Zz09
Meeting ID: 971 2606 8362
Passcode: 465970


**Abstract:** Practical and useful quantum information processing requires significant advances over current systems in error rates and robustness of basic operations, and at the same time in scale. The high coherence and precise control possible with trapped atomic ion qubits are promising for long-term systems, but the optics required pose a major challenge in scaling.
Interfacing low-noise atomic qubits with scalable integrated photonics [1] is a promising route forward, enabling practical extensibility while simultaneously lending robustness to noise.
Foundry-fabricated ion trap devices with integrated waveguide optical delivery have recently allowed us to realize multi-ion entangling quantum logic with fidelities competitive with the highest achieved across qubit platforms [2]. Aside from the stability and scalability afforded by these techniques, I will discuss how they allow generation of optical field profiles enabling new physical operations, new photonics motivated by atomic systems broadly, and additional possibilities for such techniques to advance future experiments in areas including sensing and precision metrology.



[1] K.K. Mehta, C.D. Bruzewicz, R. McConnell, R.J. Ram, J.M. Sage, and J. Chiaverini. "Integrated optical addressing of an ion qubit." *Nature Nanotechnology* **11**, 1066-1070 (2016). [2] K.K. Mehta, C. Zhang, M. Malinowski, T.-L. Nguyen, M. Stadler, and J.P. Home. "Integrated optical multi-ion quantum logic." *Nature* **586**, 533-537 (2020).


**Biography:** Karan Mehta received BS. Degrees from UCLA in Physics and Electrical Engineering in 2010, and completed his PhD in Electrical Engineering and Computer Science at MIT in 2017. Since 2017 he has been an ETH postdoctoral fellow and subsequently senior scientist in the Physics department at ETH Zurich since 2017. His current research interests include trapped- ion techniques, optics and integrated photonics, and quantum information.