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

# Munushian Visiting Seminar Series
## Distinguished Lecture

**Unlocking the power of photonics through inverse design and heterogeneous integration**

**Jelena Vuckovic**

Stanford University

Date: Friday, November 10, 2023
Time: 10:00am – 11:30am
In-person: EEB 132 & Zoom
https://usc.zoom.us/j/98662068700?pwd=YzB0MnhpZGZtb0lZS0ZDUnBIS2FOdz09
Meeting ID: 986 6206 8700
Passcode: 538109

**Abstract:** Novel computational techniques such as photonics inverse design, along with new nanofabrication approaches, play a crucial role in building scalable integrated photonics. While initial inverse design demonstrations focused on individual small footprint devices, recent developments enable rapid optimization of large 3-dimensional structures, with linear dimensions over 100 microns, and fully compatible with foundry fabrication. We illustrate this with recent demonstrations of powerful integrated photonic systems for applications such as optical interconnects. To enable all necessary functionalities, future photonic systems also require integration of traditional and non-traditional photonic materials, including silicon, silicon-carbide, diamond, sapphire, and strong electro-optic materials such as lithium niobate, strontium titanate, and barium titanate. We show that compact and efficient lasers, isolators, electro-optic modulators, and detectors can all be integrated on silicon compatible platform. We also show that a broadly tunable Ti:sapphire laser, the workhorse of optics laboratories, can be miniaturized into sub-cubic centimeter volume together with its pump, and without any loss of performance. Finally, we will discuss how silicon carbide and diamond can be employed to build scalable quantum technologies.

**Biography:** Jelena Vuckovic (PhD Caltech 2002) is the Jensen Huang Professor in Global Leadership in the School of Engineering, and Professor of Electrical Engineering and by courtesy of Applied Physics at Stanford, where she leads the Nanoscale and Quantum Photonics Lab. She was the inaugural director of Q-FARM, the Stanford-SLAC Quantum Science and Engineering Initiative, and the Fortinet Founders Chair of the Electrical Engineering Department at Stanford. Vuckovic has received many awards and honors including recently the Geoffrey Frew Fellowship from the Australian Academy of Sciences (2023), the Vannevar Bush Faculty Fellowship (2022), the Mildred Dresselhaus Lectureship from MIT (2021), the James Gordon Memorial Speakership from the OSA (2020), the IET A. F. Harvey Engineering Research Prize (2019), Distinguished Scholarship of the Max Planck Institute for Quantum Optics (2019), the Hans Fischer Senior Fellowship from the Institute for Advanced Studies in Munich (2013), and the Humboldt Prize (2010). She is a member of the National Academy of Sciences (NAS), Fellow of the APS, of the Optica, and of the IEEE, and an associate editor of the ACS Photonics.