From inverse design to implementation of nanophotonics

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Abstract:

By completely opening the parameter space in nanophotonics design, new functionalities and better performance relative to traditional optoelectronics can be achieved. We have recently developed an inverse approach to design nanophotonic structures based only on their desired performance. Moreover, constraints including structure robustness, fabrication error, and minimum feature sizes can be incorporated in design, without need to have an optics expert as a designer. Such structures are fully fabricable using modern lithography and nanofabrication techniques. We have also demonstrated devices designed using this approach, including ultra-compact and efficient wavelength and power splitters on the silicon platform. Beyond integrated photonics, this approach can also be applied to design quantum photonic circuits. For example, we are working on inverse design of nanoresonators that can localize photons efficiently into sub-wavelength volumes and lead to studies of new regimes of light-matter interaction, and new applications in computing, communications, and sensing.

Biography:

Jelena Vuckovic (PhD Caltech 2002) has been a faculty at Stanford since 2003, where she is currently a Professor of Electrical Engineering and by courtesy of Applied Physics, and where she leads the Nanoscale and Quantum Photonics Lab. Vuckovic is a recipient of numerous awards, including the Humboldt Prize, the Hans Fischer Senior Fellowship, the DARPA Young Faculty Award, the ONR Young Investigator Award, and the Presidential Early Career Award for Scientists and Engineers (PECASE). She is a Fellow of the American Physical Society (APS) and of the Optical Society of America (OSA).