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"Machine learning methods for designing and modeling photonic systems"

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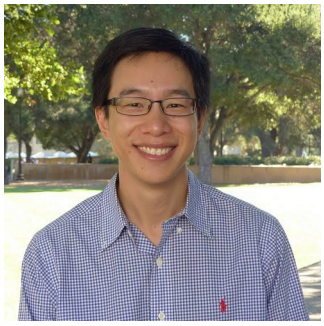

Bio: Jonathan Fan is an Associate Professor in the Department of Electrical Engineering at Stanford University, where he is researching topics at the intersection of algorithms, materials science, and photonics. He received his bachelor's degree with highest honors from Princeton University and his doctorate from Harvard University. He is the recipient of the Air Force Young Investigator Award, Sloan Foundation Fellowship in Physics, Packard Foundation Fellowship, and the Presidential Early Career Award for Scientists and Engineers.

Abstract: I will discuss computational algorithms based on deep neural networks that can accelerate the design and simulation of nanophotonic devices, using metasurfaces and metamaterials as model systems. I will discuss how physics-augmented deep networks can be trained with a combination of data and physical constraints to serve as accurate surrogate electromagnetic solvers for a wide range of problems. I will further discuss how these models can be used to train generative networks to perform inverse design. Finally, I will discuss our efforts in utilizing large language models to streamline the design and simulation experience for practitioners. We anticipate that with proper co-design of the neural network architecture with the scientific computing task, our surrogate solver and optimizer concepts can be adapted to a wide range of systems.