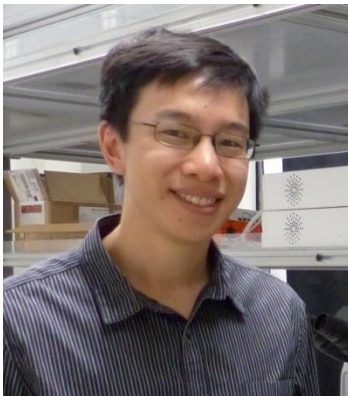




## Birck Nanotechnology Center



**Dr. Fan** is an Assistant Professor in the Department of Electrical Engineering at Stanford University, where he is researching new design methodologies and materials approaches to nanophotonic systems. He received his bachelor's degree with highest honors from Princeton University and his doctorate from Harvard University, where he worked with Federico Capasso. 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, which is the highest honor bestowed by the United States government on outstanding scientists and engineers in the early stages of their research careers.

# High Performance Meta-optical Systems for Extreme Waveform Control

**Prof. Jonathan Fan**

Wednesday, April 25, 2018

11:00am – 12:15pm

BRK 1001

In this talk, I will show that new classes of ultra-high efficiency dielectric metasurfaces, based on topology optimization, can be realized for extreme waveform control. These devices utilize qualitatively new types of light-matter interactions based on strong near-field interactions between dielectric nanostructures, and they enable new diffractive optics phenomena compared to the current state-of-the-art. A theoretical analysis of the supermodes supported by these devices elucidates the underlying physical mechanisms that make such beam deflection possible. To demonstrate the power and versatility of our design approach, I will present devices that can efficiently deflect light to extreme angles, exhibit anomalous refraction, and multiplex different beam steering functions for differing wavelengths. I will also discuss and demonstrate how these concepts can generalize to ultra-high efficiency, large numerical aperture metalenses. We envision that high performance computational design and big data approaches will be essential to defining and designing the next generation of nano-based optical devices.