

Invited talk : Symmetry and Topology in Photonic Nanostructures

The quest for smaller, lighter, and more efficient optical components usually comes at the price of reduced functionalities. In this talk, I will provide an overview of how topological approaches to control light-matter interaction enable novel photonic devices with unique features and enhanced performance. I will discuss our recent breakthrough in demonstrating the first topological light source that unidirectionally outcouples to a waveguide from magnetic biased photonic crystal cavities of arbitrary shape. I will also discuss singularities of non-Hermitian systems and their application in biology and healthcare by detecting attomolar concentrations of anti-immunoglobulin G. In the last part of the talk, I will present a premier achromatic broadband metalens that is strategically engineered to span an octave bandwidth with high efficiency. Such devices will be suitable for free space and integrated optics and pave the way towards more complex and versatile systems with applications in high-capacity classical and quantum communications, as well as sensing.

Bio: Abdoulaye Ndao

Professor Abdoulaye Ndao is an Assistant Professor of Electrical and Computer Engineering. Before joining UC San Diego, Abdoulaye Ndao was assistant professor at Boston University from 2020 to 2023. He was previously a postdoctoral researcher at UC San Diego and UC Berkeley. He received his Master's and Ph.D. degrees in physics from the University of Franche Comte (France).

Dr. Ndao is a recipient of many prestigious awards, including the 2024 Sloan Research Fellowship, 2023 Beckman Young Investigator Award, Arnold & Mabel Beckman Foundation, 2023 Boston University ECE, Outstanding Teaching Award, 2023 Scialog: Advancing Bioimaging Award, 2022 Sculpted Light in the Brain Innovation Grant, 2022 Scialog: Advancing Bioimaging Award, 2022 Boston University ECE Outstanding Faculty Committee Service Award, 2021 Reidy Family Career Development Professorship. "the very best young faculty", 2021 Rising Star of Light by Nature's Light Science and Applications journal, 2020 Top 50 Chemistry and Materials Sciences Articles, 2018 Best oral presentation, 6th Annual UC San Diego Postdoctoral Research Symposium, 2018 Gordon Research Travel, 2017 Physics World Top Ten Breakthrough of 2017 : first topological laser, 2017 Triton Innovation Challenge grand prize winner for Lidar applications, 2017 Prize winner of Institute for the Global Entrepreneur at UC San Diego, 2014 Ph.D. candidate, obtained with awards: Jury's congratulations, 2011 – 2014 Ministry Research Fellowship to name a few. His research interests span wide-ranging topics in photonics, material sciences, and physics.