BETR Solid State Technology and Devices Seminar

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High-Throughput Single-Molecule Assays Using DNA Origami

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Abstract: Single-molecule bioassays have enabled us to significantly improve our understanding of biological systems by unmasking underlying heterogeneity, in molecular systems, that is often hidden in ensemble experiments. These assays typically involve the collection of highly noisy data and processed insights being directly correlated to the throughput of the experiments. Thus, the challenges associated with the controllable manipulation and organization of individual molecules, present a significant challenge to the development of high-throughput single-molecule devices. In this talk, I will introduce a directed self-assembly technique to organize arbitrary molecules on planar substrates, using DNA origami, as well as its use in creating novel single-molecule devices and high-throughput bioassays. Finally, I will describe a generalized method for templating inorganic materials onto DNA origami while maintaining all the key programmability of DNA origami to further increase the throughput of experiments dealing with single-molecule manipulation.

Bio: Dr. Ashwin Gopinath is an Assistant Professor in the Department of Mechanical Engineering at MIT. His research is at the intersection of self-assembly, micro-fabrication, biophysics and machine learning. Dr. Gopinath obtained his Ph.D. in from Boston University, was as a research scientist at Caltech and Google before starting his independent group at MIT in 2019. He has co-authored 21 papers in journals like Nature, Science and PNAS as well as received several awards, most recent of which is the Robert Dirk Prize in Molecular Programming for his seminal contributions in merging DNA nanotechnology with conventional semiconductor nanofabrication.