
TCSUH Bi-Weekly Seminar

Superconducting Diodes as a New Platform for Cryogenic Computing

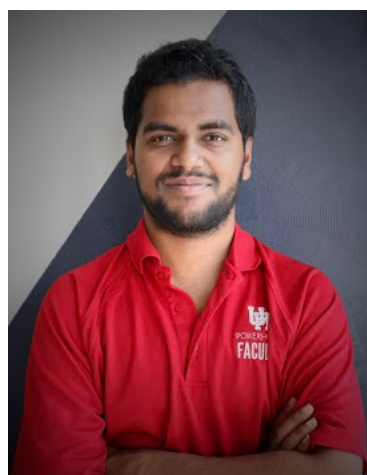
Prof. Pavan Hosur

Department of Physics, University of Houston, Houston, TX 77204
PI, Texas Center for Superconductivity at the University of Houston

Thursday, February 13, 2025

In Person – Room 102, Houston Science Center, 12:00 p.m. – 1:00 p.m

Sandwiches will be provided on a first-come, first-served basis.



ABSTRACT: In recent years, the rapid growth of computational power and the emergence of quantum computers have transformed the computing landscape. However, these advances have also heightened the urgency for scalable, cryogenic computing systems that dissipate minimal heat and integrate seamlessly with their quantum counterparts. In this talk, I will introduce superconducting diodes (SDs) as a promising solution to these challenges. I will discuss the fundamental physics that govern SD efficiency and present a route to a perfect, 100% efficient SD without fine-tuning. I will then describe constructions of basic logic gates – NOT, AND, OR, NAND, and NOR – based on high efficiency SDs, enabling any digital circuit to be built from them in principle. These results address pressing classical and quantum computing issues and pave the way for a new era of cryogenic computing.

BIO: Pavan Hosur is an Associate Professor of Physics. He received his PhD in physics from UC Berkeley in 2012 and did postdoctoral research at Stanford University in 2016. He joined UH in 2016 as an Assistant Professor and was promoted to Associate Professor in 2022. Dr. Pavan Hosur's research interests are in theoretical condensed matter physics and quantum statistical mechanics. Within condensed matter theory, he is currently excited about topological phases of matter, especially gapless ones such as Dirac and Weyl semimetals. He is also interested in exploring unusual broken symmetry phases and devising ways to detect them in experiments. Questions in quantum statistical mechanics that he is thinking about revolve around quantum ergodicity, quantum chaos, and, generally, how ideas from classical statistical mechanics apply to quantum systems. These questions have recently received a surge of interest via work on Eigenstate Thermalization and Many-Body Localization, but many aspects remain unclear. Hosur hopes to understand and contribute toward resolving them in the coming years.

Persons who require special accommodations to attend this lecture should call (713) 498-9703.
