PHYSICS SEMINAR SERIES:

Learning without neurons

Prof. Arvind Murugan

University of Chicago

Date:
09/01/2023

Time:
10:30 AM-11:50 AM

Zoom Link:
https://ucmerced.zoom.us/j/87680766458?pwd=RDIraSs5SERYakt4V0NnMnJLd2JYdz09&from=addon

About the Speaker:

Arvind Murugan received his BS in mathematics from Caltech, and his PhD in high energy physics from Princeton. He joined the physics faculty at the University of Chicago after postdoctoral research at the Institute for Advanced Study (Princeton) and Harvard University.

The major thrust of his research is how physical and biological systems can learn from their environmental history and manifest neural network-like behavior. His current work focuses on learning in molecular self-assembly and mechanical systems; and on the biological side, in the evolution of molecular error correction and the evolution in changing environments.

He is a Simons Investigator in the Mathematical Modeling of Living Systems and an NSF CAREER awardee.

Abstract:

Our model for learning is based on neural networks, i.e., networks of linear threshold devices. Even physical realizations of neural computation, such as molecular or electrical circuits, effectively mimic these network architectures at an element-by-element level. Here, we explore an alternative paradigm for neural computation. In this framework, inevitable collective physical processes can learn in Hebbian-inspired ways to recognize (chemical/mechanical) patterns without being designed to mimic a neural network element-by-element. We use examples from our work on neural computation that is latent in the nucleation of molecular structures and in bifurcations in mechanical systems.

For more information, contact: Prof. Ajay Gopinathan
agopinathan@ucmerced.edu