University of Miami, Physics Department Colloquium

Date: Monday, Feb 2, 2026
Time: 4:00 pm – 5:00 pm
Location: Physics Library – Rm 335, Knight Physics Building

Toward the Physics of Intelligence: From Neurons to Language

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Abstract

Intelligence is among the most striking emergent phenomena in nature: the simple on–off activities of individual neurons somehow gives rise to brains and machines that can learn, talk, and think. Statistical physics has made seminal contributions to the development of AI and computational neuroscience, but much of its success has traditionally focused on toy models and simplified systems. In this talk, I will discuss efforts that build on, and then move beyond this paradigm to confront the complexity of real brains and machines. Leveraging ideas from coarse-graining, scaling, and spin-glass theory, we can shed light on a wide range of realistic phenomena: from odor memories in fruit flies, to the emergence of summarization in human recall, to the entropy of large language models. Finally, I will outline prospects for using statistical physics as a unifying framework to build a theory of intelligence that can bridge scales from neurons to language.