Physics Colloquium

How well do neurons, humans, and artificial neural networks predict?

Dr. Sarah Marzen

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Claremont Colleges

Date:
12/11/2026

Time:
10:30 AM – 11:50 AM

Location:
SSB 130

About The Speaker:

Sarah Marzen first got her B.S. in Physics from Caltech, then a Ph.D. in Physics from Berkeley, and then completed a Physics of Living Systems Postdoctoral Fellowship from MIT. Finally, she happily ended up at the Claremont Colleges. She has won the Mary W. Johnson Faculty Scholarship Award four times and the CMC Faculty Scholarship Award and was named a Scialog Fellow. She also is an Affiliate Member of the National Institutes of Theory and Math in Biology. Her typical funding comes from the Department of Defense, as they shell out millions to find out how to make energy-efficient predictors.

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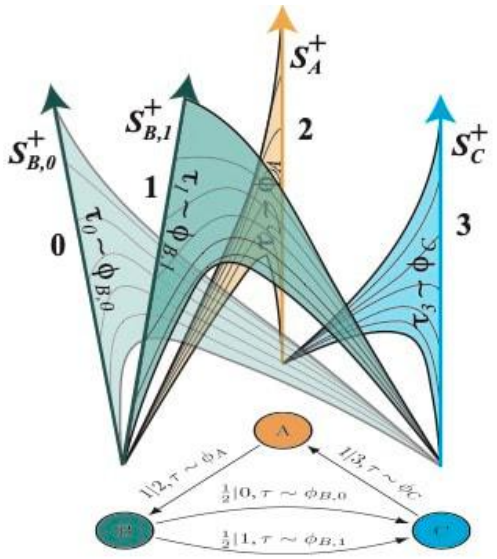

Abstract:

Sensory prediction is thought to be vital to organisms, but few studies have tested how well organisms and parts of organisms efficiently predict their sensory input in an information-theoretic sense. In this talk, we report results on how well cultured neurons ("brain in a dish") and humans efficiently predict artificial stimuli. We find that both are efficient predictors of their artificial input. That leads to the question of why, and to answer this, we study artificial neural networks, finding that LSTMs show similarly efficient prediction but do not model how humans learn well. Instead, it appears that an existing model of cultured neurons and a model of humans as order-R Markov modelers explain their performance on these prediction tasks.

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