



THE UNIVERSITY OF CHICAGO

COMPUTATIONAL AND APPLIED MATHEMATICS COLLOQUIUM

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Internal Models of the External World

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Jones 226, 5747 South Ellis Avenue

ABSTRACT

Biological organisms observe the external world in the context of an internal model, i.e., in the context of prejudices about what they expect to see. Such internal models help focus on the few relevant aspects of a high dimensional external signal while ignoring the rest.

We consider two biological examples of such internal models encoded using dynamical attractors — place cell neural networks (encoding internal models of space) and bacterial circadian clocks (encoding internal models of time). In these examples, we connect the physics of attractors to biologically relevant questions — How quickly can internal models be updated when they disagree with external input? What are the biophysical constraints on the reliability of internal models? When do internal models help and when do they hurt?

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