Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Vector Encoding in Biochemical Networks GARRETT POTTER, BO SUN, Oregon State University — Encoding of environmental cues via biochemical signaling pathways is of vital importance in the transmission of information for cells in a network. The current literature assumes a single cell state is used to encode information, however, recent research suggests the optimal strategy utilizes a vector of cell states sampled at various time points. To elucidate the optimal sampling strategy for vector encoding, we take an information theoretic approach and determine the mutual information of the calcium signaling dynamics obtained from fibroblast cells perturbed with different concentrations of ATP. Specifically, we analyze the sampling strategies under the cases of fixed and non-fixed vector dimension as well as the efficiency of these strategies. Our results show that sampling with greater frequency is optimal in the case of non-fixed vector dimension but that, in general, a lower sampling frequency is best from both a fixed vector dimension and efficiency standpoint. Further, we find the use of a simple modified Ornstein-Uhlenbeck process as a model qualitatively captures many of our experimental results suggesting that sampling in biochemical networks is based on a few basic components.

Garrett Potter
Oregon State University

Date submitted: 04 Nov 2015 Electronic form version 1.4