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**Title:** Online probabilistic inference in neural populations

**Abstract:** As animals interact with their environments, they must constantly update estimates about relevant states of the world.  For example, a batter must rapidly re-estimate the velocity of a baseball as he decides whether and when to swing at a pitch.  Bayesian models provide a description of statistically optimal updating based on prior probabilities, a dynamical model, and sensory evidence, and have proved to be consistent with the results of many diverse psychophysical studies.  In this talk I will review various schemes that have been proposed for how populations of neurons can represent the uncertainty that underlies this probabilistic formulation.  I will also propose a particular formalism for forming a spike train in a population of neurons to effectively maintain a proper probabilistic representation of the dynamic state.  A focus of the talk will be on how models based on standard, simple neural architecture and activations can effectively approximate this optimal computation, which should make the model applicable to a range of biological systems.