1135-37-2172 **David Darmon*** (david.darmon.ctr@usuhs.edu). *Information Theoretic Model Selection for Reconstruction of Stochastic Dynamical Systems from Data.* Preliminary report.

In the absence of mechanistic or phenomenological models of real world systems, data-driven models become necessary. The discovery of various embedding theorems in the 1980s and 1990s motivated a powerful set of tools for analyzing deterministic dynamical systems via delay-coordinate embeddings of observations of their component states. However, in many branches of science, the condition of operational determinism is not satisfied, and stochastic models must be brought to bear. For such stochastic models, the tool set developed for delay-coordinate embedding is no longer appropriate, and a new toolkit must be developed. We present an information theoretic criterion for data-driven modeling of stochastic dynamical systems: the negative log-predictive likelihood. We develop a non-parametric estimator for the negative log-predictive likelihood, and demonstrate its performance on stochastic maps and flows. Finally, we show how the output of the model selection procedure can be used to compare candidate predictors for a stochastic system to an information theoretic lower bound. (Received September 25, 2017)