Contribution ID: **1** Type: **not specified**

Fast Dynamical System Modelling Forecasting

In our study of (usually chaotic) Dynamical Systems, we invented a method we call Data Driven Forecasting, or DDF, that can take observed data, recreate an approximate form to the original model with a sum of radial basis functions, and rapidly forecast the future behavior of the system. This method is faster than 4th Order Runge-Kutta, so even if the user has knowledge of the data sets original model, this surrogate model could out-speed the standard way of integrating the state of the system forward in time.

Our work includes example applications of DDF to Zebra Finch Neuron data of the voltage in response to external stimuli. DDF learns from the behavior of the voltage from the external stimuli and replicates the behavior of the neuron. With this we have built what we call a "DDF Neuron", this rapid model exhibits the behavior a neuron for a wide array of external stimuli, not just the stimuli that was trained on. Our DDF Neurons advance in time faster than Runge-Kutta methods and learn directly from observed data whereas Runge-Kutta methods must rely on a model that can be large and slow to solve.

DDF can bring rapid time series integration and forecasting to systems with complex models and incomplete observations using time delay embedding to reconstruct the state space. DDF is able to do all this with the data alone and with no knowledge of the underling dynamical model associated with the data.

Primary author: CLARK, Randall (University of California San Diego Physics Department (PhD Student))

Presenter: CLARK, Randall (University of California San Diego Physics Department (PhD Student))

Session Classification: Contributed Talks