1157-90-517 **Ruixin Wang**, **Prateek Jaiswal** and **Harsha Honnappa*** (honnappa@purdue.edu), 315 N. Grant St, West Lafayette, IN 47906. *Variational Inference Using Coupled Neural Differential Equations.*

Neural ordinary and stochastic differential equations (henceforth, "Neural DE") have emerged as important methodological innovations for predicting time-series using deep neural networks. Motivated by applications in operations research, in this talk we present two extensions of this emerging methodology for learning stochastic process models from trace data. First, we introduce an extension of the Neural DE framework to learn a system of coupled differential equations. The latter are crucial for modeling doubly-stochastic and non-stationary stochastic process models. Second, we use this framework to learn the (latent) stochastic intensity, modeled as a stochastic differential equation, of a doubly-stochastic point process, using a variational autoencoder. We illustrate our methodology by presenting examples for learning Cox or doubly stochastic Poisson processes, and infinite server queues driven by Cox and Hawkes processes. These models are highly relevant to performance prediction and decision support in operations research. Time permitting, we will also discuss our on work on de-biasing the variational autoencoder. (Received February 03, 2020)