AMS280B-01: Seminars in Statistics for Oct-15th (Monday 4pm at BE 156)

Speaker: Xi Chen, Software Engineer, Machine Learning at LinkedIn

Title: Bayesian Dynamic Modeling for Streaming Network Data

Abstract: Streaming network data of various forms arises in many applications, raising interest in research to model and quantify the nature of stochasticity and structure in dynamics underlying such data. One example context is that of traffic flow count data in networks, such as in automobile or aviation transportation, certain directed social network contexts, and Internet studies. Using an example of Internet browser traffic flows through site-segments of an international news website, I present Bayesian analyses of two new, linked classes of models which, in tandem, allow fast, scalable and interpretable Bayesian inference on dynamic patterns over time underlying flows. I develop two kinds of flexible state-space models for streaming count data, able to adaptively characterize and quantify network dynamics efficiently in real-time. These models are then used as emulators of more structured, time-varying gravity models that allow formal dissection of network dynamics. This yields interpretable inferences on traffic flow characteristics, and on dynamics in interactions among network nodes. Bayesian monitoring theory defines a strategy for sequential model assessment and adaptation in cases when network flow data deviates from model-based predictions. Exploratory and sequential monitoring analyses of evolving traffic on a network of web site-segments in e-commerce demonstrate the utility of this coupled Bayesian emulation approach to analysis of streaming network count data.