

## **Tracking Influences within Dynamic Networks**

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Cascading chains of interactions are a salient feature of many real-world social, biological, and financial networks. In social networks, social reciprocity accounts for retaliations in gang interactions, proxy wars in nation-state conflicts, or Internet memes shared via social media. Neuron spikes stimulate or inhibit spike activity in other neurons. Stock market shocks can trigger a contagion of jumps throughout a financial network. In these and other examples, we only observe individual events associated with network nodes, usually without knowledge of the underlying dynamic network structure. This talk addresses the challenge of tracking how events within such networks stimulate or influence future events. We adopt an online learning framework well-suited to streaming data, using a multivariate Hawkes model to encapsulate autoregressive features of observed events within the social network. Recent work on online learning in dynamic environments is leveraged not only to exploit the dynamics within the underlying network, but also to track that network structure as it evolves. Regret bounds and experimental results demonstrate that the proposed method (with no prior knowledge of the network) performs nearly as well as would be possible with full knowledge of the network. Joint work with Eric Hall.