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*Modeling the Influence Structure of a Network with Hawkes Processes.*

Inferring the influence structure of actors in a large-scale network is an important general problem applicable to finance (stock price fluctuations), neuroscience (neuron firing), seismology (earthquake activity), and social networks (social influence). The Hawkes process is a multidimensional stochastic model that can capture the network structure, mutual influence, and clustered event timing inherent in these applications. However, current methods for estimating the parameters of this model typically require highly sophisticated optimization machinery to prevent overfitting. We propose a simpler approach using a maximum a posteriori (MAP) Expectation-Maximization (EM) scheme, with priors on the network structure to achieve the necessary regularization, that has the added benefit of revealing the hidden branching structure of the network activity. To our knowledge this method is novel. We show the method produces interpretable results using a large mobile phone dataset and email records. (Received September 05, 2017)