

Seminar:1/22/2024

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Title: Group Network Hawkes Process

Abstract: In this work, we study the event occurrences of individuals interacting in a network. To characterize the dynamic interactions among the individuals, we propose a group network Hawkes process (GNHP) model whose network structure is observed and fixed. In particular, we introduce a latent group structure among individuals to account for the heterogeneous user-specific characteristics. A maximum likelihood approach is proposed to simultaneously cluster individuals in the network and estimate model parameters. A fast EM algorithm is subsequently developed by utilizing the branching representation of the proposed GNHP model. Theoretical properties of the resulting estimators of group memberships and model parameters are investigated under both settings when the number of latent groups G is over-specified or correctly specified. A data-driven criterion that can consistently identify the true G under mild conditions is derived. Extensive simulation studies and an application to a data set collected from Sina Weibo are used to illustrate the effectiveness of the proposed methodology.