The Hong Kong University of Science and Technology

Department of Mathematics

PhD THESIS EXAMINATION

Network Analysis under Sparse Condition

By

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ABSTRACT

In this thesis, we will introduce two general parametric models for network analysis. Firstly, we propose a general framework for modeling mutual interaction in a probabilistic network. Such a framework encompasses many classical parametric models in the pairwise comparison and enjoys ample flexibility of parametrization for practical purposes. Within this set-up, we establish that the maximum likelihood estimator (MLE) for the latent scores of the subjects is uniformly consistent under a near-minimal condition onnetwork sparsity. Secondly, we consider a bivariate gamma model that links the edge probability with the two strength parameters by a symmetric bivariate function. The proposed model is applicable to mirror various undirected networks and can cover a lot of existing models. Asymptotic theory is established to justify the consistency and asymptotic normality of the moment estimators.

Date: 29 Jun 2020, Monday

Time: 2:30 p.m.

ZOOM Meeting: https://hkust.zoom.com.cn/j/5121999867

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