

SCMS & SDS Joint Seminar

JOIN STATISTICS SEMINAR OF SCMS AND SDS

STATISTICAL ESTIMATION OF PREFERENTIAL ATTACHMENT NETWORKS

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Lecture

Time: 10:30-11:30 am., Thursday, Oct. 19, 2017

Venue: Room 1501, East Main Guanghua Tower, Handan Campus

Abstract: The preferential attachment (PA) network is a popular way of modeling the social networks, the collaboration networks and etc. The PA network model is an evolving network where new nodes keep coming in. When a new node arrives, it establishes only one connection with an existing node. The random choice on the existing node is via a multinomial distribution with probability weights based on a preferential function $f(k)$ on the degrees. $f(k)$ is assumed a priori non-decreasing, which means the nodes with high degrees are more likely to get new connections, i.e., "the rich get richer". We proposed an estimator on $f(k)$, that maps the natural numbers to the positive real line. We show, with techniques from branching process, our estimator is consistent. If $f(k)$ is affine, meaning $f(k) = k + \delta$, it is well known that such a model leads to a power-law degree distribution. We proposed a maximum likelihood estimator for δ and establish the asymptotic normality and efficiency on the MLE. If the PA function is sublinear and assumes a parametric form, then we show the maximum likelihood estimator is also efficient, despite the difficulty in analyzing the likelihood. We will also talk about some recent advances revealing the connection between the empirical estimator and the maximum likelihood estimator.

(joint work with Aad van der Vaart)