



DEPARTMENT OF APPLIED MATHEMATICS

應 用 數 學 系

**The Hong Kong Polytechnic University  
Department of Applied Mathematics**

**Colloquium**

**Directed networks with a noisy bi-degree sequence**

by

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**Abstract**

Although a lot of approaches are developed to release network data with a differentially privacy guarantee, inference using noisy data in many network models is still unknown or not properly explored. In this paper, we release the bi-degree sequences of directed networks under a general additive noisy mechanism with the Laplace mechanism as a special case and use the  $p_0$  model for inferring the degree parameters. We show that the estimator of the parameter without the denoised process is asymptotically consistent and normally distributed.

This is contrast sharply with known results that valid inference such as the existence and consistency of the estimator needs the denoised process. Along the way, a new phenomenon is revealed in which an additional variance factor appears in the asymptotic variance of the estimator when the noise becomes large. Further, we propose an efficient algorithm for finding the closet point lying in the set of all graphical bi-degree sequences under the global  $L_1$  optimization problem. The algorithm simultaneously produces a synthetic directed graph.

Numerical studies demonstrate our theoretical findings.

**Date : 20 June, 2018 (Wednesday)**

**Time : 4:00p.m. – 4:45p.m.**

**Venue : TU801, The Hong Kong Polytechnic University**

**\*\*\* ALL ARE WELCOME \*\*\***