

CABDyN / INET Oxford SEMINAR SERIES

Keble College - Hilary 2014

'Sparse random graphs with exchangeable point processes'

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Tuesday 4th February, 12.30 -14.00

Roy Griffiths Room (ARCO), Keble College

ABSTRACT:

Statistical network modeling has focused on representing the graph as a discrete structure, namely the adjacency matrix, and considering the exchangeability of this array. In such cases, the Aldous-Hoover representation theorem (Aldous, 1981; Hoover, 1979) applies and informs us that the graph is necessarily either dense (the number of edges increases quadratically with the number of nodes) or empty. In this paper, we instead consider representing the graph as a point process on the positive quadrant. For the associated definition of exchangeability in this continuous space, we rely on the Kallenberg representation theorem (Kallenberg, 2005). We show that for certain choices of the specified graph construction, our network process is both exchangeable and sparse with power-law degree distribution. In particular, we build on the framework of completely random measures (CRMs) and use the theory associated with such processes to derive important network properties, such as an urn representation for network simulation. The CRM framework also provides for interpretability of the network model in terms of node-specific sociability parameters, with properties such as sparsity and power-law behavior simply tuned by three hyperparameters. Our theoretical results are explored empirically and compared to common network models.

This is joint work with E.B. Fox (U. Washington).

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Seminar webpage:
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