MICHAELMAS TERM 2009

Saïd Business School, University of Oxford

SEMINAR SERIES

Convenors: Felix Reed-Tsochas, Institute for Science, Innovation and Society, Saïd Business
Eduardo López, Saïd Business School

Our meetings intend to provide a forum for rigorous research (in a broad range of disciplines) focusing on complex adaptive systems, using methods and techniques such as agent-based modelling and complex network analysis. Since potential areas of application for such approaches can be located across the social, natural and engineering sciences, our aim is to involve participants from a wide range of departments in Oxford. We welcome talks which focus on particular areas of application and associated technical issues, but also encourage contributions which address more fundamental conceptual or mathematical problems. The CABDyN Seminar Series is one of the activities of the CABDyN Research Cluster.

Tuesday 10th November, 12:30-14:00

James Martin Seminar Room

Dr Diego Garlaschelli
Research Fellow, Complex Systems, University of Oxford

'Exact Method for Randomising Real Networks'

ABSTRACT

In order to detect patterns in real networks, randomised graph ensembles that preserve only the local topology of an observed network are systematically used as fundamental null models, however their generation is still problematic. The existing approaches are either numerically accessible but time consuming and beyond analytic control, or analytically accessible but highly approximate, and not applicable to clustered, dense, and finite networks.

Here we solve this long-standing problem by introducing an exact and fast method that allows to obtain expectation values over randomised ensembles analytically, and works for any unweighted or weighted network. Our information-theoretic approach proceeds through the specification of a maximum-entropy distribution of graphs ensuring that the average topological properties coincide with the enforced constraints and that the conjugate parameters maximise the likelihood to obtain the observed network. Remarkably, after a fast preliminary parameter estimation, the time required to obtain exact averages of any property over the whole graph ensemble is the same as that required to compute the same property on the single original network, as it is not necessary to sample the configuration space explicitly. This makes our method much faster than the currently available ones, and with a previously unavailable predictive power.

Moreover, as it fully exploits the exact forms for the underlying null models, it paves the way to a straightforward redefinition of various network properties, such as the modularity, that are currently based on highly approximated expressions.

Sandwiches and drinks will be provided

For further information contact info.cabdyn@sbs.ox.ac.uk
Seminar webpage: http://sbs-xnet.sbs.ox.ac.uk/complexity/complexity_seminars.asp
Please note: Although the seminar programme detailed above was correct at the time of printing, seminar arrangements are subject to change so , for the latest information please check seminar webpage.