SAID BUSINESS SCHOOL, University of Oxford

SEMINAR SERIES / Trinity 2013

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Seminar webpage: www.cabdyn.ox.ac.uk/complexity_seminars.asp

Sandwiches and drinks will be provided

Please note: although the seminar programme detailed was correct at time of printing, seminar arrangements are subject to change – for the latest information, please check the seminar webpage.

'Multiscale analysis of spreading in a large communication network'

Mikko Kivelä

OCIAM, Mathematical Institute, University of Oxford

Tuesday 7th May 2013, 12.30 -14.00

Andrew Cormack Seminar Room, Saïd Business School

ABSTRACT:

In temporal networks, links are not permanently active, but a network is defined by recurrent events taking place on the links at specific points in time. In such networks, both the topology of the underlying network and the timings of interaction events can be crucial in determining how a dynamic process mediated by the network unfolds. We have explored the limiting case of the speed of spreading in the SI model, set up such that an event between an infectious and a susceptible individual always transmits the infection. The speed of this process sets an upper bound for the speed of any dynamic process that is mediated through the interaction events of the network. With the help of temporal networks derived from large-scale time-stamped data on mobile phone calls, we extend earlier results that indicate the slowing-down effects of burstiness and temporal inhomogeneities. We perform a multiscale analysis and pinpoint the importance of the timings of event sequences on individual links, their correlations with neighboring sequences, and the temporal pathways taken by the network-scale spreading process. This is achieved by studying empirically and analytically different characteristic relay times of links, relevant to the respective scales, and a set of temporal reference models that allow for removing selected time-domain correlations one by one. Our analysis shows that for the spreading velocity, time-domain inhomogeneities are as important as the network topology, which indicates the need to take time-domain information into account when studying spreading dynamics. In particular, results for the different characteristic relay times underline the importance of the burstiness of individual links.

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