Università Commerciale Luigi Bocconi

Department of Decision Sciences

Statistics Seminar

Statistical inference on large-scale network models

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12:30pm Room 3-E4-SR03 Via Rontgen 1 Milano

Abstract

Many systems of scientific and societal interest can be investigated as networks. Increasing availability of empirical large-scale data and steady improvements in computational capacity are continuing to fuel the growth of this field. An aspect that has received less attention is the divide between the two prominent paradigms to the modeling of network structure: the physics based mechanistic approach and the statistical approach. The mechanistic approach typically assumes that microscopic mechanisms governing network formation and evolution are known, and questions often focus on understanding macroscopic features that emerge from repeated application of these known mechanisms. The statistical approach, in contrast, often starts from observed network structures and attempts to infer some aspects about the underlying data generating process.

I will first consider mechanistic network models for which there is no closed form expression for the likelihood but thanks to the possibility to easily sample a network configuration given a set of parameter values, we develop a principled framework, based on Approximate Bayesian Computation, that can be used to bring some of the mechanistic network models into the realm of statistical inference (joint work with JP Onnela).

I will then move to statistical network and develop a new Bayesian nonparametric model based on Polya urns and we will provide a closed for expression for the likelihood (joint work with S. Peluso e P. Muliere).

Finally, if time remains, I will discuss Markov chain Monte Carlo based inference for the class of exponential random graph models for which the likelihood is only available up to a normalizing constant (joint work with A. Caimo, N. Friel and C. Oates).

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