Tuesday the 13 November 2018 at 09:30
Politecnico di Torino, DISMA, Aula Buzano (third floor)

Badal JOSHI

Associate Professor, California State University, San Marcos

Graphical symmetries of reaction networks and their stationary measures

Prof. Enrico Bibbona introduces the seminar

Abstract

Reaction networks are used to model chemical reactions, biochemical reactions, interacting populations in ecology, genetics and infectious disease dynamics among many other systems. Depending on the system scale, three most commonly used models are continuous-time Markov chain (CTMC), stochastic differential equations and ordinary differential equations (ODE). With increased data and scientific focus shifting towards biochemistry which often involves populations as small as few tens of molecules, CTMC models have seen a dramatic increase in relevance.

The stationary distribution of a continuous-time Markov chain model describes its long-term dynamics. In general, it is impossible to obtain the explicit form of the stationary distribution, even for very small networks. However, when the network has some natural symmetries, we can obtain the explicit stationary distribution, and it can be connected with the equilibria of the corresponding ODE system.

Prof. Joshi will discuss the symmetries of reaction balance, complex balance, reaction vector balance, and cycle balance and their properties in both the deterministic setting (ODE) and stochastic setting (CTMC). He will also discuss the relations between the various forms of balance and the connection with existence and form of the stationary distribution.

Biography

Originally from India, Prof. Badal Joshi completed his PhD in Mathematics from Ohio State University. His specialisation was in Mathematical Biology and his thesis focussed on building and analysing a stochastic model of neuronal networks. Then Dr Joshi moved to Duke University for a postdoctoral position. While at Duke, Dr Joshi worked on both neuron networks and chemical reaction networks. After a short postdoc at the University of Minnesota, Dr Joshi joined the Department of Mathematics at California State University San Marcos as an Assistant Professor in 2013. His current research is focussed on both deterministic and stochastic models of reaction networks and especially connections between the two types of models.

Save the date for the next event: November 14, 2018
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