

# 11:00 Réseaux d'ordinateurs et G-réseaux *Computer networks and G-networks*

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Chemical reaction networks, Ising-type models in physics, neuronal circuits, gene regulatory networks, electronic circuits, economic markets, and computer networks are all instances of «networked systems». They are often considered as stochastic networks, even in the case of electronic circuits when their components and connections are «ultra small», or unreliable, or when they are noisy. In a series of papers which have recently appeared in journals of physics, biology, computational neuroscience, and Internet technology, we address the dynamics of such systems in a unified manner through their «master equations», also known in mathematics as instances of Chapman-Kolmogorov equations, using the theory of «G-networks» which we have developed for queueing networks. In this talk, we introduce these models with the example of spiked neuronal networks, which we then illustrate through applications to cortico-thalamic sensory circuits, to network routing and also image processing. A similar approach will then be applied to gene regulatory networks and to the analysis of chemical reactions. Finally, we will show that the price equilibrium in a network of auctions can be studied using similar methods.

**Erol Gelenbe** is the Dennis Gabor Professor and Head of Intelligent Systems and Networks in the Electrical and Electronic Engineering Department at Imperial College. Prior to Imperial, he was the Associate Dean of Engineering and founding Director of the School of Electrical Engineering and Computer Science at the University of Central Florida. Prior to that at Duke University, he was the Nello L. Teer Professor and Head of the Department of Electrical and Computer Engineering, with secondary appointments as Professor of Computer Science and of Experimental Psychology. Before Duke, he was a Professor at the University of Paris and also taught at Ecole Polytechnique (Paris). During his twenty years in France, he founded research groups in "computer and network performance evaluation" at INRIA and throughout French universities, founded several post-graduate programmes, introduced network performance evaluation technology into France Telecom and other ITC companies, and contributed specific methods to commercial performance evaluation software packages such as QNAP2. He was appointed to his first chair at the age of 27 at the University of Liege (Belgium). Erol's current research projects include distributed system performance, novel "self-aware" computer and sensor networks, and probability models inspired by physics, chemistry, biology and economics. He teaches a course on the performance of distributed systems and networks at the undergraduate and postgraduate levels. Erol is a Fellow of the IEEE, ACM and IET. He is a member of the French National Academy of Engineering, the Academy of Sciences of Turkey and of Academia Europaea. He received the 2008 ACM SIGMETRICS Life-time Achievement Award, the 1996 Grand Prix France Telecom of the French Academy of Sciences and the Parlar Science Award of Turkey in 1994. He was awarded the honors of Doctor Honoris Causa by the University of Roma Tor Vergata, Italy, the University of Liege in Belgium, and Bogazici University in Turkey. The President of Italy awarded him the decorations of Grand Officer of the Order of the Star of Solidarity in 2007 and Commander of Merit in 2005, and France awarded him the Officer of Merit Medal and the Chevalier des Palmes Academiques honor.