Stochastic Networks with Resource Sharing

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Date	Tuesday, 20 November 2007
Venue	Colloquium Room A (S14, #03-10)
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About the Speaker	Ruth Williams is a Professor of Mathematics at the University of California at San Diego (UCSD). Her research interests are in probability, stochastic processes and their applications. She is a Fellow of the American Association for the Advancement of Science and the Institute of Mathematical Statistics. Ruth Williams has been a U.S. National Science Foundation (NSF) Presidential Young Investigator (1987-93), an Alfred P. Sloan Fellow (1988-92), a Guggenheim Fellow (2001-2002) and was an invited speaker at the International Congress of Mathematicians held in Berlin in 1998. In 2007 she was awarded the INFORMS Applied Probability Society Best Publication Award (joint with Amber Puha and H. Christian Gromoll). Ruth Williams has served as an Associate Editor for the Annals of Probability, Annals of Applied Probability, SIAM J. on Applied Mathematics, Electronic Communications in Probability, Electronic J. of Probability, Probability Surveys, Bulletin of the American Mathematical Society, and Mathematics of Operations Research. She has also served on a wide variety of committees for the University of California and the profession, including the U.S. National Committee on Mathematics, and the Board of Governors of the Institute for Mathematics and Its Applications. She is also the current chair of the Scientific Program Committee of the World Congress in Probability and Statistics to be held in Singapore in July 2008. Ruth Williams received her Bachelor of Science (Honors) and Master of Science degrees at the University of Melbourne, Australia, in 1977 and 1979, respectively, and she earned her Ph.D. degree in Mathematics from Stanford University in 1983.
Abstract	Stochastic networks are used as models for complex systems involving dynamic interactions subject to uncertainty. Application domains include manufacturing, the service industry, telecommunications, and computer systems. Networks arising in modern applications are often highly complex and heterogeneous, with network features that transcend those of conventional queueing models. The control and analysis of such networks present challenging mathematical problems. In this talk, a concrete application will be used to illustrate a general approach to the study of stochastic networks using more tractable approximate models. Specifically, we consider a connection-level model of

Internet congestion control that represents the randomly varying number of flows present in a network where bandwidth is shared fairly amongst elastic documents. This model, introduced by Massoulie and Roberts, can be viewed as a stochastic network with simultaneous resource possession. Elegant fluid and diffusion approximations will be used to study the stability and performance of this model. The talk will conclude with a summary of the current status and description of open problems associated with the further development of approximate models for general stochastic networks.

This talk is based in part on joint work with W. Kang, F. P. Kelly, and N. H. Lee

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