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Abstracts of Plenary and Invited Lectures

Section:

12. Probability and Statistics

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Reflecting Diffusions and Queueing Networks

Certain diffusion processes, known as reflecting Brownian motions, have been proposed as approximations for heavily loaded queueing networks. Although there is now a substantial theory for these diffusions, limit theorems justifying their role as approximations for queueing networks have only been proved in some cases. Indeed, since a surprising example of Dai and Wang (1993) it has been known that these approximations are not always valid, and a challenging open problem has been that of establishing general conditions under which they do hold.
In this talk, some foundational theory for the diffusions will be described, including an invariance principle. The history of heavy traffic limit theorems for queueing networks will be briefly reviewed. Then an indication will be given of how the invariance principle can be used to obtain general sufficient conditions under which a heavy traffic limit theorem holds for open queueing networks. One of the key sufficient conditions will be that a property called state space collapse holds. In a companion talk, Bramson will relate state space collapse to the behavior of a balanced fluid limit (or law of large numbers approximation) for a queueing network. The combination of these results yields new heavy traffic limit theorems for some classes of networks. Queueing networks with a first-in-first-out service discipline will be used as examples throughout the talk.