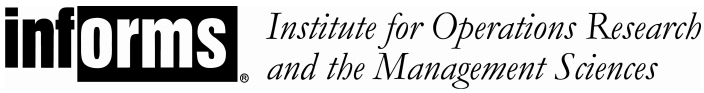

The Applied Probability Society of INFORMS

presents its

2011 Best Publication Award

to

David Gamarnik and Dmitriy Katz

for their three papers:

ON DECIDING STABILITY OF CONSTRAINED HOMOGENEOUS RANDOM WALKS AND QUEUEING SYSTEMS,
by Gamarnik
Mathematics of Operations Research, 2002, Vol. 27, 272-293;

ON THE UNDECIDABILITY OF COMPUTING STATIONARY DISTRIBUTIONS AND LARGE DEVIATION RATES FOR CONSTRAINED RANDOM WALKS,
by Gamarnik
Mathematics of Operations Research, 2007, Vol. 32, 257-265;

ON DECIDING STABILITY OF MULTICLASS QUEUEING NETWORKS UNDER BUFFER PRIORITY SCHEDULING POLICIES,
by Gamarnik and Katz
The Annals of Applied Probability, 2009, Vol. 19, 2008-2037.

Stability is one of the most fundamental properties of stochastic networks, and its verification needs to precede any performance analysis of the network in stationarity, That is one of the primary reasons why finding stability conditions for stochastic networks has been a subject of extensive and continuing research in applied probability and queueing theory. While exact stability conditions have been identified in some special classes of networks, the problem remains very difficult in general settings.

This series of papers provides a novel, deep and unexpected insight into the inherent difficulty of the problem. It shows that, in general, network stability is an undecidable property, in the sense of Turing. These are the first undecidability results in the context of queueing theory, thus establishing a remarkable connection between the theory of queueing systems and stochastic processes on the one hand, and the classical theory of algorithms and computations, on the other. Moreover, this work shows that for certain classes of models, even when stability is known in advance (for example, via existence of suitable Lyapunov functions), the problems of computing stationary distributions and/or large deviation rates can still be undecidable.

Thus, by combining probabilistic and theoretical computer science tools, the papers obtain major new results in stochastic networks. The approach promises to be very fruitful and to generate significant impact on future research in the area, as already exemplified by the authors' recent follow-up work on the undecidability of the stability of the Skorohod problem.

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