NETWORK PARADOXES AND THE INEFFICIENCY OF NONCOOPERATIVE GAMES

Joel E. Cohen
Rockefeller University
1230 York Avenue, Box 20
New York, NY 10021

Summary

One might think that adding an additional road to a traffic network would improve, or at least not worsen, the time travelers take to go from a given origin to a given destination in the network. In 1968, D. Braess showed that adding a road to a congested traffic network can sometimes worsen the travel time from origin to destination for all travelers. Analogous surprises can occur in networks of queues: adding servers may slow the average time through a network for all travelers. (Strangely, in queuing networks, giving travelers more information about queue lengths may make them worse off than giving them less information.) These results are special cases of a general theorem, due to P. Dubey in 1986: in n-person noncooperative games with smooth payoff functions, Nash equilibria are generically Pareto-inefficient. This tutorial talk will assume no prior background in the theory of traffic networks, queues or games.