Industrial & Systems Engineering
Seminar Announcement

Fluid Models for Resource Matching and Allocation

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Abstract: We consider a bipartite queueing system (BQS) with multiple types of servers and customers, in which different customer-server combinations generate different utilities. When a resource is available, each customer is assigned with a score which depends on the degree of matchness between the resource type and customer type as well as the customer's waiting time. The resource is then allocated to the customer with the highest score. We study the fluid approximation for a BQS equipped with such a scoring policy under two different assumptions on customer behavior: (1) Customers can only accept whatever resource that is allocated to them. Under this assumption, the trajectory of fluid process can be computed over any finite horizon using network flow theory and the steady-state can be efficiently characterized. We can then solve the scoring formula that optimizes the system's long-run performance. (2) A customer can choose a resource type which maximizes his expected utility. In this case, the fluid model has a unique equilibrium. We can then characterize the achievable region, which consists of all equilibria achievable by a certain scoring policy, and solve for the optimal scoring policy. We illustrate the application of our theory in the allocation of scarce resources such as public housing for low-income householders and kidneys from deceased donors.

Bio: *Yichuan Ding* is currently an assistant professor from the Sauder School of Business, University of British Columbia. He obtained his Ph.D. degree from the Department of Management Science and Engineering, Stanford University in 2012. He researches broadly in operations research theories and their applications in public sectors, including cadaver kidney exchange and allocation policies, affordable housing management.

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