Recent Work on Stochastic Service Systems with Strategic Customers
Online Workshop organized by Koç University
June 7, 2021 16.00 – 18.40 (Istanbul time, GMT+3)
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Time: 16.00 (Istanbul time, GMT+3)
Pricing in Service Systems with Risk-Averse Strategic Customers
Speaker: Hadi Mahmoudzadeh
Koç University
(joint work with Pelin G. Canbolat, Athanasia Manou, and Fikri Karaesmen)

Abstract: We consider models of service systems with strategic and risk-averse customers. We assume that service experience of a customer can be either improved or deteriorated by the presence of other customers, i.e., we consider cases with positive, negative, or no externalities. Such customers make decisions on whether to join the system or not, taking into account the random reward, service experience and their degree of risk aversion. Assuming an exponential utility function for customers, we first present an equilibrium analysis of the case where the customer base consists of a finite number and the service system is static with a general externality structure. We then investigate how pricing is affected by risk tolerance in this environment. Next, we present a Markovian queue with risk-sensitive customers and characterize the equilibrium along with the pricing decisions for this model.

Time: 16.40 (Istanbul time, GMT+3)
Optimal Queue Length Information Disclosure When Service Quality is Uncertain
Speaker: Pengfei Guo
City University of Hong Kong
(joint work with Moshe Haviv, Zhenwei Luo and Yulan Wang)

Abstract: Consider a single-server service system with uncertain quality (which is assumed to be binary). Both the server and customers know the distribution of quality levels and are engaged in the following two-stage game. In the first stage, the server commits to a strategy (possibly mixed) that, given a realized quality level, states whether or not the queue length will be revealed to customers upon their arrival. In the second stage, quality is realized and the server's corresponding queue-disclosure action is observed by the customers, who then update their belief on the service quality and decide whether or not to join the service system. The server's decision problem is to find an optimal commitment strategy to maximize his expected effective arrival rate, anticipating the customers' equilibrium queueing behavior toward his queue-disclosure strategy. Using a Bayesian-persuasion approach, we reformulate the server's decision problem as looking for the best resulting posterior distribution on service quality. This reformulation yields useful insights into when and why a commitment strategy helps. In particular, we demonstrate that the maximal expected effective arrival rate, as a function of the prior, can be graphed as the upper envelope of all convex combinations of points on the effective arrival rate function of the revealed queue and those of the concealed queue. We also show that when the market size is sufficiently small (resp. large), the server always conceals (resp. reveals) the queue regardless of the realized service quality. In a medium-sized market, however, the server's optimal commitment strategy is often mixed, that is, randomized over queue disclosure and concealment. These results remain quite robust no matter whether customers are individual decision makers or act as one to maximize their

total utility. We also find that, due to the change of the optimal disclosure strategy, customers' total utility when they behave collectively can be less than that when they behave individually.

Time: 17.20 (Istanbul time, GMT+3)
Strategic Joining to a Queue with Arrival Rate Uncertainty
Speaker: Moshe Haviv
Chinese University of Hong Kong and and Hebrew University
(joint work with Refael Hassin and Binyamin Oz)

Abstract: We consider a general queueing model with a Poisson arrival process whose rate is random, and realized once for the entire process. We show that the distribution of the arrival rate at arrival instants is the size-biased counterpart of the original distribution. In particular, the ASTA (arrivals see time averages) property does not hold but rather a rate-biased version of it that, we define and coin by the term RASTA (Rate-biased ASTA). We show that the RASTA phenomenon plays a crucial role in the analysis of strategic behavior of customers who evaluate the consequences of the actions they take upon arrival. We study such a system with a single server and strategic customers who decide whether to join or balk without observing the queue.

Time: 18.00 (Istanbul time, GMT+3)
What Level of Information should be Provided to Strategic Customers in a Transportation Station? A Review and New Results
Speaker: Antonis Economou
National & Kapodistrian University of Athens
(joint work with Dimitrios Logothetis)

Abstract: Nowadays, a transportation station has the possibility to provide its potential passengers with information regarding the arrival times of the successively arriving facilities, the congestion in the station and the space availability of future facilities. Such information influences the behavior of the passengers who think strategically and consequently the throughput and the welfare that are generated by the system.
In this talk, we will review a general model of a transportation station where strategic customers arrive according to a Poisson process, the arriving instants of the transportation facilities form a renewal process and the capacities of successively arriving facilities are finite. Customers decide whether to stay or balk based on their expected waiting costs and the probability of being served, conditioning on the information provided.
We will present a review of the literature and some new results about various information structures that have been suggested and their impact of customer strategic behavior. In particular, we will show how the customer equilibrium strategies can be derived under the different information scenarios. Moreover, we will present various theoretical and numerical results about the ideal level of information that should be provided according to the operational and economic parameters of a given system.