Contribution ID: **32** Type: **not specified**

Dynamic Scheduling of a Multiclass Queue in the Halfin-Whitt Regime: A Computational Approach for High-Dimensional Problems

Tuesday, June 18, 2024 4:30 PM (30 minutes)

We consider a multi-class queueing model of a telephone call center, in which a system manager dynamically allocates available servers to customer calls. Calls can terminate through either service completion or customer abandonment, and the manager strives to minimize the expected total of holding costs plus abandonment costs over a finite horizon. Focusing on the Halfin-Whitt heavy traffic regime, we derive an approximating diffusion control problem, and building on earlier work by Han et al. (2018), develop a simulation-based computational method for the solution of such problems, one that relies heavily on deep neural network technology. Using this computational method, we propose a policy for the original (pre-limit) call center scheduling problem. Finally, the performance of this policy is assessed using test problems based on publicly available call center data. For the test problems considered so far, our policy does as well as the best benchmark we could find. Moreover, our method is computationally feasible at least up to dimension 100, that is, for call centers with 100 or more distinct customer classes.

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Session Classification: Parallel session: Reinforcement learning and queueing I