Cost Optimization for Poisson Arrival Queues with General Service and Reverse Balking [*]

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Abstract

This manuscript investigates an $M/G/1$ queueing system incorporating reverse balking, a phenomenon where customers are less likely to balk as the number of customers in the system increases. The focus of the study is on the cost optimization of the proposed queueing system considering different service-time distributions. To tackle the optimization problem, a range of techniques is employed, including deterministic methods such as the quadratic fit search method (QFSM) and the quasi-Newton method (QNM), as well as a heuristic approach, the genetic algorithm (GA). Additionally, a machine learning method, random forest (RF), is applied to predict and optimize the system's operating cost. The results demonstrate the effectiveness of these approaches in optimizing system performance, providing valuable insights for real-world applications. This article demonstrated the methodology considering a hypothetical scenario of a textile manufacturing company operating with a generalized Erlang service-time distribution.

Keywords: $M/G/1$ queueing system; non-Markovian; reverse balking; optimization; machine learning..