Generating Samples for Training Neural Networks for *GI/G/K* Type Queueing Models

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Dr. Qi-Ming He is a professor in the Department of Management Sciences at the University of Waterloo. He received a PhD from the Institute of Applied Mathematics, Chinese Academy of Sciences in 1989 and a PhD from the Department of Management Science at the University of Waterloo in 1996. His main research areas are algorithmic methods in applied probability, queueing theory, and production management. In investigating various stochastic models, his favorite methods are matrix analytic methods. Recently, he is working on queueing systems with multiple types of customers and abandonment, Markov modulated fluid flow processes, representations of phase-type distributions and their applications, and the application of neural networks (big models) in stochastic models.

Abstract： We introduce a program for generating samples (data) for training neural networks (aka: big models) for *GI/G/K* type queueing models, which have few analytic solutions. The program is based on matrix-analytic methods. By putting together the CSFP (count-server-for-phase) method, the matrix-geometric solutions for quasi birth-and-death processes, and the matrix-exponential solutions for Markov modulated fluid flow (MMFF) processes, we are able to generate a large number of samples (data), which are dense in the set of all queueing models of interest, for training and validating neural networks for the *GI/G/K* type queueing models. The effectiveness of the program is compared to existing asymptotic methods. The work sheds lights on the training of neural networks for complex stochastic systems. (Joint work with Haoran Wu, Zhenggao Wu, Haokun Zhao, Fangfang Lyu, and Kiefer Joe Burgess)

时间：2024年9月25日（周三）　9:30-11:00
地点：中国科学院数学与系统科学研究院思源楼625

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