

Chapter 3

Artificial Neural Network Approach in Design of Queueing Models

C. Yuvarani

DRBCCC Hindu College, India

C. Vijayalakshmi

Central University of Tamil Nādu, India

ABSTRACT

Queues are encountered in many different fields in day-to-day life. Waiting in queue for service is unpleasant and annoying for the customer. Many researchers developed advanced queueing models to minimise the waiting time of customers in the line. But it is not easy to forecast the waiting time of a customer in an advanced queueing system as it involves more complexity. Artificial neural networks can be applied to simulate the queueing system so that the difficulties encountered by using the classical approach can be overcome. In this chapter, trained neural network is used for predicting the waiting time of each customer. Also, an attempt has been made to provide sufficient information about the work done on queues using machine learning, and an ANN model is developed in order to simulate M/M/S queueing model.

INTRODUCTION

Queues are common in many different fields such as in bank, supermarket, computer networks etc. Theory of queues is worried about the improvement of numerical models to examine the performance of a system that offers service for randomly emerging

DOI: 10.4018/978-1-6684-7679-6.ch003

needs. The prediction of waiting time of customers in a complex queueing system through mathematical analysis is very complicated and time consuming. Queueing simulation is an approach used for prediction of the behaviour of such complex queueing systems where the analytical method is difficult. Queueing simulation is utilized to decide potential bottlenecks in allocation of the resources and this empowers to break down their result on holding up lines. This paper focuses on the recent developments of ANN in queueing theory and an ANN for a multi-server queueing model is developed to forecast the waiting time.

Queueing Models

Theory of Queues has been around since early twentieth century and are mathematical techniques to forecast behaviours of queueing models. Examining behaviours of queueing models is an interesting area both for organizations and customers. Organizations could utilize the information to deal with their labour supply in a more brilliant and more proficient manner. The queueing theory models endeavour to evaluate the queueing system behaviour given various assumptions.

The basic queueing system is shown in Figure 1.

The concepts of queueing theory are applied to obtain an optimum balance between the cost associated with customers waiting time and service facilities idle time in order to obtain maximized profit. It is concerned with the planning and design of service facilities to meet out the randomly fluctuating needs for service, so that congestion is minimized.

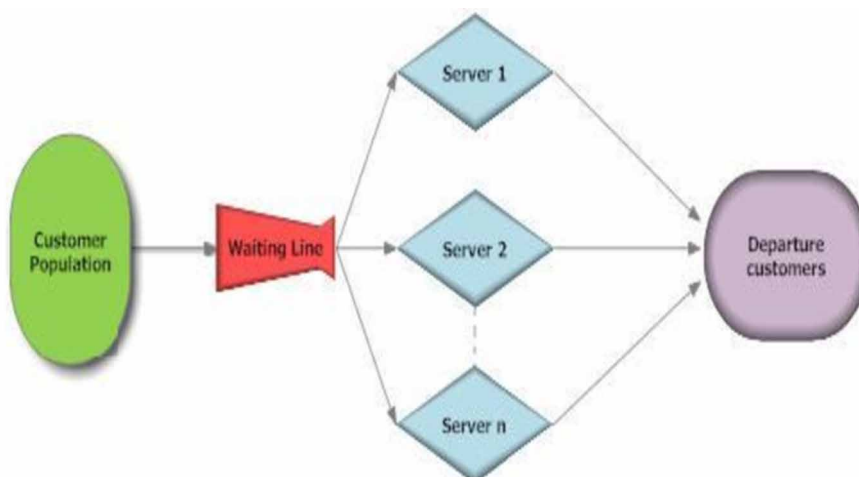


Figure 1. Basic queueing model

14 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/artificial-neural-network-approach-in-design-of-queueing-models/326228

Related Content

NeuroAlgebra and NeuroGeometry for Dealing the Heteroclinic Patterns

Prem Kumar Singh (2022). *Theory and Applications of NeuroAlgebras as Generalizations of Classical Algebras* (pp. 90-102).

www.irma-international.org/chapter/neuroalgebra-and-neurogeometry-for-dealing-the-heteroclinic-patterns/302853

A Holistic Applied Mathematical Model for Business Transformation: The Holistic Intelligent Cities Design Concept (HICDC)

(2020). *Using Applied Mathematical Models for Business Transformation* (pp. 298-339).

www.irma-international.org/chapter/a-holistic-applied-mathematical-model-for-business-transformation/246220

Applying Graph Theory to Detect Cases of Money Laundering and Terrorism Financing

Natalia G. Miloslavskaya, Andrey Nikiforov, Kirill Plaksyand Alexander Tolstoy (2020). *Handbook of Research on Advanced Applications of Graph Theory in Modern Society* (pp. 297-319).

www.irma-international.org/chapter/applying-graph-theory-to-detect-cases-of-money-laundering-and-terrorism-financing/235541

Tech-Driven Inclusion in Mathematics Education: A Phenomenological Exploration of Student Voices in Higher Learning

Olajumoke Olayemi Salami (2026). *Global Perspectives on Equity, Diversity, and Inclusion in Mathematics Classrooms* (pp. 277-308).

www.irma-international.org/chapter/tech-driven-inclusion-in-mathematics-education/396303

A Survey on Fake News Detection Using Word Embedding Using the Linguistic Features

Puspita Dashand Sakthiyavathi K. (2023). *Stochastic Processes and Their Applications in Artificial Intelligence* (pp. 1-9).

www.irma-international.org/chapter/a-survey-on-fake-news-detection-using-word-embedding-using-the-linguistic-features/326226