



# Optimal Networked Control Systems with MATLAB (Automation and Control Engineering)

*Jagannathan Sarangapani, Hao Xu*

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**Optimal Networked Control Systems with MATLAB®** discusses optimal controller design in discrete time for networked control systems (NCS). The authors apply several powerful modern control techniques in discrete time to the design of intelligent controllers for such NCS. Detailed derivations, rigorous stability proofs, computer simulation examples, and downloadable MATLAB® codes are included for each case.

The book begins by providing background on NCS, networked imperfections, dynamical systems, stability theory, and stochastic optimal adaptive controllers in discrete time for linear and nonlinear systems. It lays the foundation for reinforcement learning-based optimal adaptive controller use for finite and infinite horizons. The text then:

- Introduces quantization effects for linear and nonlinear NCS, describing the design of stochastic adaptive controllers for a class of linear and nonlinear systems
- Presents two-player zero-sum game-theoretic formulation for linear systems in input–output form enclosed by a communication network
- Addresses the stochastic optimal control of nonlinear NCS by using neuro dynamic programming
- Explores stochastic optimal design for nonlinear two-player zero-sum games under communication constraints
- Treats an event-sampled distributed NCS to minimize transmission of state and control signals within the feedback loop via the communication network
- Covers distributed joint optimal network scheduling and control design for wireless NCS, as well as the effect of network protocols on the wireless NCS controller design

An ideal reference for graduate students, university researchers, and practicing engineers, **Optimal Networked Control Systems with MATLAB®** instills a solid understanding of neural network controllers and how to build them.

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