



Neural Networks in Bioprocessing and Chemical Engineering

D. R. Baughman, Y. A. Liu

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Neural networks have received a great deal of attention among scientists and engineers. In chemical engineering, neural computing has moved from pioneering projects toward mainstream industrial applications. This book introduces the fundamental principles of neural computing, and is the first to focus on its practical applications in bioprocessing and chemical engineering. Examples, problems, and 10 detailed case studies demonstrate how to develop, train, and apply neural networks. A disk containing input data files for all illustrative examples, case studies, and practice problems provides the opportunity for hands-on experience. An important goal of the book is to help the student or practitioner learn and implement neural networks quickly and inexpensively using commercially available, PC-based software tools. Detailed network specifications and training procedures are included for all neural network examples discussed in the book.

Each chapter contains an introduction, chapter summary, references to further reading, practice problems, and a section on nomenclature

Includes a PC-compatible disk containing input data files for examples, case studies, and practice problems

Presents 10 detailed case studies

Contains an extensive glossary, explaining terminology used in neural network applications in science and engineering

Provides examples, problems, and ten detailed case studies of neural computing applications, including:

Process fault-diagnosis of a chemical reactor

Leonard–Kramer fault-classification problem

Process fault-diagnosis for an unsteady-state continuous stirred-tank reactor system

Classification of protein secondary-structure categories

Quantitative prediction and regression analysis of complex chemical kinetics

Software-based sensors for quantitative predictions of product compositions from fluorescent spectra in bioprocessing

Quality control and optimization of an autoclave curing process for manufacturing composite materials

Predictive modeling of an experimental batch fermentation process

Supervisory control of the Tennessee Eastman plantwide control problem

Predictive modeling and optimal design of extractive bioseparation in aqueous two-phase systems

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