The book provides a solid introduction to the Adaptive and Learning Systems used in Neural Networks. The structure of the discussed material makes it not only available for applied science, engineering, and computer science students at postgraduate level, researchers dealing with Neural Networks but also for those students at graduate level which have a stronger mathematical background.

The material of the Book is organized into four main sections:

a) Chapter 1-5 deals mainly with pattern recognition in the context of supervised and unsupervised feedforward neural networks. Chapter 1 discusses fundamentals of pattern recognition based on classical model i.e.: representation, feature extraction, and classification. Chapter 2 refers to the Statistical Pattern Recognition Systems and Bayes Classifiers, where the problem of pattern classification is expressed in terms of a statistical decision. The reader is given a very comprehensive references related to the practical applications of the topic in question. Chapter 3 continues to discuss the algorithms for pattern classification. Both nonoverlapping classes (with reliable samples and erroneously classified samples) and overlapping classes are considered. Finally, the algorithm for classification for more than two classes (a Multiclass Algorithm) is briefly described. A proper mathematical insight is here provided. Chapter 4 contains a brief discussion of pattern recognition mechanism (signal preprocessing, feature extraction, decision mechanism, system design technique) supplemented with the some applications (sleep state classification and video pattern recognition). The latter are presented in a very transparent manner allowing the reader to understand the power of the pattern recognition techniques. Chapter 5 refers to the notions, theory and applications of the training techniques used for multilevel, quasi-level controllers. This section is closed with collection of well chosen exercise problems.

b) Chapter 6-7 discusses optimization first for deterministic and stochastic objective functions and then deals with adaptive optimization approaches. Chapter 6 deals with the identification of parameters in the static and dynamic situations. The Gradient Identification Algorithms with stationary and time-varying parameters are discussed accordingly. The pertinent mathematical depth is also included. Finally, the presence of noise is assumed for both cases. Chapter 7 refers directly to the Adaptive Optimization Procedures. The problem here is to minimize the unknown function of several parameters. Different unimodal and multimodal techniques are briefly studied in this section. Presented methods refer to the different categories of the functions (deterministic versus noisy, discrete versus continuous, single versus multi-dimensional). Collection of testing problems is annotated to this section of the book.

c) Chapter 9-10 concentrates on gradient based optimization algorithms applied in general stochastic approximation theory. Chapter 9 deals with the stochastic approximation of the deterministic unknown function, where for each its argument value a random variable is observable. First, the topic of finding the extremum of the unknown function based on noisy observation is tackled. Algorithms for finding zeroes of functions are discussed followed by the brief description of Kiefer-Wolfowitz scheme. The issue of recovery of the function from the noisy measurements is subsequently covered. Finally, the different methods of accelerating convergence are presented (two
Appedices comprise the proofs for convergence of the Basic Stochastic Approximation Scheme and Function Recovery Algorithm).

d) Chapter 8 & 11 treat reinforcement learning control systems and stochastic automata. Chapter 8 introduces the concept of Reinforcement Learning in general and in the context of Control Systems and Pattern Recognition Systems. This section provides a sufficient theoretical depth to the reader supplemented with the very illustrative examples. The last Chapter provides a comprehensive introduction to the stochastic automata including deterministic automata functioning in random environment as well as variable structure stochastic automata. Finally, the generalizations of basic Reinforcement Learning Model are presented. Automata operating in random environments (interpreted as automata playing games) are discussed in more detail. The corresponding computer simulations supplement the topic in question. This Section is closed again with the carefully chosen set of exercise problems.

Overall this book is a very valuable contribution to the Neural Network Field. It offers not only the bridge between the first and the second wave of Neural Network research but also in a terse but informative manner provides the reader with the current state of the art of Adaptive and Learning Systems used in Neural Networks. The material in the Book is treated with a sufficient mathematical rigour necessary for this topic. Without any hesitation I strongly recommend this book to any student or researcher (e.g. from electrical engineering, computer science, or applied science) who wishes to make himself familiar with the Adaptive and Learning Systems used in Neural Networks.

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