Preface

Due to the complexity and nonlinearity of ecological systems, artificial neural networks have recently attracted extensive attention from ecologists worldwide. These neural networks are being used in ecology for modeling, simulation, function approximation, prediction, classification, and data mining, etc. This book provides readers with deep insights on algorithms, codes, and applications of artificial neural networks in ecology. Moreover, a new area of ecology, computational ecology, is proposed and the scope of computational ecology is outlined. This book is a valuable reference for research scientists, university teachers, graduate students and advanced-level undergraduates in the areas of ecology, environmental science, and computational science.

This book is composed of three parts. In the first part of the book (Chap. 1), an ecological science — computational ecology — is proposed and defined in detail. As one of the areas of computational ecology, artificial neural networks and ecological applications are briefly introduced. The second part (Chaps. 2–11) discusses algorithms and methods, design and customization, learning theory, architecture choice, interpretability, mathematical foundation, and Matlab neural network toolkit, etc. The third part (Chaps. 12–22) provides case studies of ecological applications of artificial neural networks, Matlab codes, and comparisons of artificial neural networks with conventional methods, etc.

This book has the following features: (1) It is an integrated and self-contained monograph. Both algorithms and applications are included in the book. Artificial neural networks in the book are mostly treated in a mathematical way. Mathematical principles and foundations of artificial

neural networks are discussed in the book, which will be heuristic to understand the similarities and differences between neural network models and conventional models in ecology. A large number of conventional models are compared to artificial neural networks in the book. (2) Unlike previous books, the most recent advances on ecological applications of artificial neural networks are included in the book. (3) Matlab codes are presented in the book for easy reference by readers. (4) A new ecological science, computational ecology, is formally proposed and described in the book.

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