Studies in Computational Intelligence

Volume 780

Series editor

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Seyedali Mirjalili

Evolutionary Algorithms and Neural Networks

Theory and Applications

Springer

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ISSN 1860-949X ISSN 1860-9503 (electronic)
Studies in Computational Intelligence
ISBN 978-3-319-93024-4 ISBN 978-3-319-93025-1 (eBook)
https://doi.org/10.1007/978-3-319-93025-1

Library of Congress Control Number: 2018943379

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The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

To my mother and father

Preface

This book focuses on both theory and application of evolutionary algorithms and artificial neural networks. An attempt is made to make a bridge between these two fields with an emphasis on real-world applications.

Part I presents well-regarded and recent evolutionary algorithms and optimisation techniques. Quantitative and qualitative analyses of each algorithm are performed to understand the behaviour and investigate their potentials to be used in conjunction with artificial neural networks.

Part II reviews the literature of several types of artificial neural networks including feedforward neural networks, multi-layer perceptrons, and radial basis function network. It then proposes evolutionary version of these techniques in several chapters. Most of the challenges that have to be addressed when training artificial neural networks using evolutionary algorithms are discussed in detail.

Due to the simplicity of the proposed techniques and flexibility, readers from any field of study can employ them for classification, clustering, approximation, and prediction problems. In addition, the book demonstrates the application of the proposed algorithms in several fields, which shed lights to solve new problems. The book provides a tutorial on how to design, adapt, and evaluate artificial neural networks as well, which would be beneficial for the readers interested in developing learning algorithms for artificial neural networks.

Brisbane, Australia
April 2018

Dr. Seyedali Mirjalili

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Acronyms

ABC	Artificial bee colony
ACO	Ant colony optimisation
ANN	Artificial neural network
AVE	Average
BAT	Bat algorithm
BBO	Biogeography-based optimisation
BP	Backpropagation
BPSO	Binary particle swarm optimisation
CS	Cuckoo search
DE	Differential evolution
DNN	Deep neural network
EA	Evolutionary algorithm
ES	Evolutionary strategy
FNN	Feedforward neural network
GA	Genetic algorithm
GBEST	Global best
GWO	Grey wolf optimiser
HSI	Habitat suitability index
ILS	Iterated local search
MLP	Multi-layer perceptron
MSE	Mean square error
N/A	Not application
NFL	No free lunch theorem
NN	Neural network
PBEST	Personal best

PBIL	Population-based incremental learning
PSO	Particle swarm optimisation
RBF	Radial basis function
SA	Simulated annealing
STD	Standard deviation