

# Preface

We describe, in this book, recent advances on the design of intelligent systems based on fuzzy logic, neural networks, and nature-inspired optimization and their application in areas, such as intelligent control and robotics, pattern recognition, time series prediction, and optimization of complex problems. The book is organized in eight main parts, which contain a group of papers around a similar subject. The first part consists of papers with the main theme of theoretical aspects of fuzzy logic, which basically consists of papers that propose new concepts and algorithms based on fuzzy systems. The second part contains papers with the main theme of neural networks theory, which are basically papers dealing with new concepts and algorithms in neural networks. The third part contains papers describing applications of neural networks in diverse areas, such as time series prediction and pattern recognition. The fourth part contains papers describing new nature-inspired optimization algorithms. The fifth part presents diverse applications of nature-inspired optimization algorithms. The sixth part contains papers describing new optimization algorithms. The seventh part contains papers describing applications of fuzzy logic in diverse areas, such as time series prediction and pattern recognition. Finally, the eighth part contains papers that present enhancements to meta-heuristics based on fuzzy logic techniques.

In the first part of theoretical aspects of fuzzy logic, there are five papers that describe different contributions that propose new models, concepts, and algorithms centered on fuzzy logic. The aim of using fuzzy logic is to provide uncertainty management in modeling complex problems.

In the second part of neural networks theory, there are five papers that describe different contributions that propose new models, concepts, and algorithms centered on neural networks. The aim of using neural networks is to provide learning and adaptive capabilities to intelligent systems.

In the third part of neural network applications, there are five papers that describe different contributions on the application of these kinds of neural models to solve complex real-world problems, such as time series prediction, medical diagnosis, and pattern recognition.

In the fourth part of nature-inspired optimization, there are six papers that describe different contributions that propose new models, concepts, and algorithms for optimization inspired in different paradigms of natural phenomena. The aim of using these algorithms is to provide optimization capabilities to intelligent systems or provide design methodologies for achieving optimal topological and parametric design of intelligent systems.

In the fifth part of nature-inspired optimization applications, there are seven papers that describe different contributions on the application of these kinds of algorithms to solve complex real-world optimization problems, such as time series prediction, medical diagnosis, robotics, and pattern recognition.

In the sixth part of optimization, there are seven papers that describe different contributions that propose new models, concepts, and algorithms for optimization inspired in different paradigms. The aim of using these algorithms is to provide general optimization methods and solution to some real-world problem in areas, such as scheduling, planning, and project portfolios.

In the seventh part of fuzzy logic applications, there are seven papers that describe different contributions on the application of these kinds of fuzzy logic models to solve complex real-world problems, such as time series prediction, medical diagnosis, recommending systems, education, and pattern recognition.

In the eighth part of fuzzy logic for the augmentation of nature-inspired optimization meta-heuristics, there are five papers that describe different contributions that propose new models and concepts, which can be considered as the basis for enhancing nature-inspired algorithms with fuzzy logic. The aim of using fuzzy logic is to provide dynamic adaptation capabilities to the optimization algorithms, and this is illustrated with the cases of the bat algorithm, cuckoo search, and other methods. The nature-inspired methods include variations of ant colony optimization, particle swarm optimization, the bat algorithm, as well as new nature-inspired paradigms.

In conclusion, the edited book comprises papers on diverse aspects of fuzzy logic, neural networks, and nature-inspired optimization meta-heuristics and their application in areas, such as intelligent control and robotics, pattern recognition, time series prediction, and optimization of complex problems. There are theoretical aspects as well as application papers.

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