

Preface

We describe in this book, recent advances on the design of hybrid intelligent systems based on nature-inspired optimization and their application in areas such as intelligent control and robotics, pattern recognition, medical diagnosis, time series prediction and optimization of complex problems. The book is organized into seven main parts, with each containing a group of chapters around a similar subject. The first part consists of chapters related to theoretical aspects of type-2 and intuitionistic fuzzy logic, i.e., the chapters that propose new concepts and algorithms based on type-2 and intuitionistic fuzzy systems. The second part contains chapters on neural networks theory, which are basically chapters dealing with new concepts and algorithms in neural networks. The second part also contains chapters describing applications of neural networks in diverse areas, such as time series prediction and pattern recognition. The third part contains chapters that present enhancements to metaheuristics based on fuzzy logic techniques describing new nature-inspired optimization algorithms that use fuzzy dynamic adaptation of parameters. The fourth part presents diverse applications of nature-inspired optimization algorithms. The fifth part contains chapters describing applications of fuzzy logic in diverse areas, such as time series prediction and pattern recognition. The sixth part contains chapters describing new optimization algorithms and their applications in different areas. Finally, the seventh part contains chapters that present the design and application of different hybrid intelligent systems.

In the first part of theoretical aspects of type-2 and intuitionistic fuzzy logic, there are eight chapters that describe different contributions that propose new models, concepts and algorithms centered on type-2 and intuitionistic fuzzy systems. The aim of using fuzzy logic is to provide uncertainty management in modeling complex problems.

In the second part of neural networks theory and applications, there are eight chapters 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. There are also chapters 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 third part of fuzzy logic for the augmentation of nature-inspired optimization metaheuristics, there are ten chapters 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, harmony search and other methods. The nature-inspired methods include variations of ant colony optimization, particle swarm optimization, bat algorithm, as well as new nature-inspired paradigms.

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

In the fifth part of fuzzy logic applications there are six chapters 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, fuzzy control, and pattern recognition.

In the sixth part of optimization, there are nine chapters 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, there are eight chapters that present nature-inspired design and applications of different hybrid intelligent systems. There are also chapters that describe different contributions on the application of these kinds of hybrid intelligent systems to solve complex real-world problems, such as time series prediction, medical diagnosis, and pattern recognition.

In conclusion, the edited book comprises chapters on diverse aspects of fuzzy logic, neural networks, and nature-inspired optimization metaheuristics 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 chapters.

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