Preface

Conventional computing or hard computing often depends on a precisely stated analytical model and many times involves a lot of complexity during computation along with high computation time. Nowadays, there are a lot of real-world engineering problems, which cannot be studied precisely due to the presence of impreciseness and uncertainties. To tackle these types of problems, soft computing techniques have found wide applications and have been proved to be a powerful problem-solving methodology because of their strong learning and cognitive ability and good tolerance of uncertainty and imprecision. Basically, they are an extension of heuristics and help in solving typical problems that are hard to model mathematically. Moreover, they are easy to accommodate with changed scenario and can be executed with parallel computing. Needless to say, soft computing techniques are an emerging approach, which includes techniques such as fuzzy logic, evolutionary computing, artificial neural network, and applied statistics. An interesting fact to be noted down is that they are actually distinct applied techniques to solve a wide range of problems but when applied in collaboration help a lot in solving complicated problems easily or relatively easily. They have wide applications in fields such as machine intelligence, computer vision, VLSI design, medical diagnosis, pattern recognition, network optimization, and weather forecasting.

Keeping aforementioned facts in view, we have tried to edit a book comprising some of the contemporary researches in different real-world problems where soft computing techniques have been applied. The book consists of ten chapters in which the following studies are conducted:

- Chapter 1 focuses on the application of neural network models for freezing of gait detection and prediction in Parkinson’s disease in which authors develop a user-independent freezing of gait detection and prediction model that would go along with nonpharmacological treatments.
- Chapter 2 examines a new fuzzy de novo programming approach for optimal system design, which proposes a new approach for solutions of de novo programming problems in fuzzy environment. This approach is built on the approach by Li and Lee (1993), which uses positive and negative ideal solutions.
- Chapter 3 discusses a probabilistic bilevel programming in Stackelberg game under fuzzy environment in which researchers develop a computational algorithm to solve a stochastic bilevel programming in Stackelberg game using fuzzy optimization technique.
- Chapter 4 studies intuitionistic fuzzy trigonometric distance and similarity measure and their properties. In this chapter, the concept of intuitionistic fuzzy sets is introduced. Similarity and distance measures between intuitionistic fuzzy sets are also explained and extended these measures to intuitionistic fuzzy sets. Some new trigonometric similarity and distance measures of intuitionistic fuzzy sets.
sets are studied and it is shown that an intuitionistic fuzzy distance measure satisfies the required identities of intuitionistic fuzzy similarity measures.

- Chapter 5 develops a mathematical model through transmutation of activation energy function. This work incorporates the different perspective of modeling of activation energies through ingression of an additional parameter of distribution function to increase the flexibility and controlling ability of modeling by the linear mixing.

- Chapter 6 addresses forecasting of air quality parameters using soft computing techniques. In this chapter, authors studied the application of soft computing techniques of artificial neural networks and genetic programming for forecasting of air quality parameters a few time steps in advance.

- Chapter 7 examines arithmetic operations on generalized semielliptic intuitionistic fuzzy numbers (IFNs) and its application in multicriteria decision making. In this chapter, authors discuss the generalized semielliptic IFN and performed its arithmetic operations with the help of \((a, \beta)\) cut method. In this study, they compared the proposed IFN with normal triangular, trapezoidal, semielliptic IFNs.

- Chapter 8 discusses the method for solving intuitionistic fuzzy assignment problem. In this research, authors use a newly proposed centroid concept ranking method for intuitionistic fuzzy numbers and solve assignment problem where assignment costs are taken as triangular intuitionistic fuzzy numbers.

- Chapter 9 focuses on optimization of electric discharge machining process through evolutionary computing and fuzzy multicriteria decision-making techniques. This study intended to explore the best possible set of process parameters, namely, current, voltage, and pulse on time during electric discharge machining process in order to determine the changes in performance characteristics like material removal rate and electrode wear rate for machining of high carbon high chromium die steel workpiece by applying the titanium nitride–coated copper electrode.

- Chapter 10 studies the fuzzy reliability of systems using different types of level \((\lambda, 1)\) interval-valued fuzzy numbers. In this chapter, authors obtain the fuzzy reliability of series, parallel, parallel–series, and series–parallel systems assuming that all components of the system follow different types of level \((\lambda, 1)\) interval-valued fuzzy numbers (both triangular and trapezoidal).

The book will be useful to scientists, engineers, managers, senior and postgraduate students, as well as research scholars.

**Acknowledgments**

It is well known that besides the editors, many individuals have put much time and energy into the book. First and foremost, we would like to express our gratitude to chapter contributors and reviewers for their timely efforts. We would like to extend
extra special thanks and appreciation to the editorial, production, and marketing team at De Gruyter who helped in bringing the project in the final shape.

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