Preface

Swarm Intelligence (SI) is a relatively new area of artificial intelligence, in which the essential part is a cooperation between agents. In the literature we can find many algorithms which are in the family of SI, but as pioneers of swarm intelligence we can identify three algorithms such as: stochastic diffusion search, ant colony optimization (ACO), and particle swarm optimization (PSO). The swarm's intelligence family is constantly growing and newer algorithms based on the nature and cooperation between particular agents are created. Already existing SI algorithms have been strongly developed, and their new modifications are proposed. Due to these modifications, we can, for example, use the PSO algorithm for solving discrete problems (the original version of the PSO is adapted to the continuous optimization problems) or the ACO algorithm can be used for solving continuous problems (the original version of ACO is proposed for discrete optimization problems).

Currently, SI algorithms are widely used in various applications. In this book we present a short brief on 24 swarm intelligence algorithms which are chosen from the whole family of SI algorithms. In each chapter you will find a brief description of one selected algorithm together with a discussion of its modifications and a presentation of its practical application. Below you can see a list (in alphabetical order) of the SI algorithms which are presented in this book. In this list, for each SI algorithm, we present a short description of its exemplary application which is discussed in this book. The SI algorithms and their exemplary applications which are presented in this book are as follows:

• **Ant Colony Optimization**
Exemplary application: Optimal shunt capacitors allocation problem aiming to minimize power delivery loss and node voltage deviation subjected to various system and distribution network operator constraints,

• **Artificial Bee Colony**
Exemplary application: Software requirement selection in order to minimize the cost and maximize the customer satisfaction under resource constraints, budget bounds and requirement dependencies,

• **Bacterial Foraging**
Exemplary application: Simultaneous allocation problem of distributed generations (small generating units typically connected to the utility grid in parallel near load

centers) and shunt capacitors in distribution systems in order to reduce annual energy losses and to maintain better node voltage profiles,

• **Bat Algorithm**
Exemplary application: Problem of distribution network reconfiguration in order to find the best possible topology of the distribution network that can give minimum losses and a better node voltage profile in the system,

• **Cat Swarm Optimization**
Exemplary application: Generation of optimal diet which consists of four principal meals in a day namely, breakfast, lunch, dinner, supper, and which is based on the person's food preferences,

• **Chicken Swarm Optimization**
Exemplary application: Detection of falls in daily living activities,

• **Cockroach Swarm Optimization**
Exemplary application: Traveling salesman problem in which the main goal is to find the path of shortest length or minimum cost between all the requested points (cities), visiting each point exactly once and returning to the starting point,

• **Crow Search Algorithm**
Exemplary application: Tuning of the number of nodes of each layer of a deep neural network used for predicting the status of the jobs using the CIEMAT Euler log,

• **Cuckoo Search**
Exemplary application: Designing the power system stabilizer parameters of a multi-machine power system to enhance small-signal stability,

• **Dynamic Virtual Bats Algorithm**
Exemplary application: Identify/estimate the parameters of a quarter-car suspension system,

• **Dispersive Flies Optimisation**
Exemplary application: Neuroevolution-based approach for training a neural network which is applied to the problem of detecting false alarms in Intensive Care Units based on physiological data,

• **Elephant Herding**
Exemplary application: Optimal economic dispatch of microgrids composed of multiple distributed energy resources to minimize the daily operating cost of the systems,

• **FireFly Algorithm**
Exemplary application: Few areas of the potential applications of the firefly algorithm are highlighted,

• **Glowworm Swarm Optimization**
Exemplary application: Multiple source localization and boundary mapping; clustering; sensor deployment scheme in wireless networks; signal source localization,

• **Grasshopper Optimisation**
Exemplary application: Clustering problem - which represents a task of dataset division into a set of C disjoint clusters,

• **Grey Wolf Optimizer**
Exemplary application: Five engineering optimization problems are shown: welded beam design problem, pressure vessel design problem, speed reducer design problem, three-bar truss design problem, tension compression spring problem,

• **Hunting Search**
Exemplary application: Carbon steel rectangular cantilever beam design problem in order to carry a certain load acting at the free tip with minimum overall cost and fabrication,

• **Krill Herd**
Exemplary application: Optimum design of retaining walls for minimizing their cost and weight,

• **Monarch Butterfly Optimization**
Exemplary application: Optimal allocation of distributed generations (DGs) in distribution system; the objective is to determine the optimal sites (nodes) and sizes (DG capacities) of 3 DGs for minimum real power loss of 33-bus distribution system,

• **Particle Swarm Optimization**
Exemplary application: Design of stable IIR (Infinite Impulse Response) digital filter with non-standard amplitude characteristic,

• **Salp Swarm Algorithm**
Exemplary application: Welded beam design problem,

• **Social Spider Optimization**
Exemplary application: Economic load dispatch problem - optimal combination of power generation where the total production cost of the system is minimized,

• **Stochastic Diffusion Search**
Exemplary application: Identifying metastasis in bone scans,

• **Whale Optimization Algorithm**
Exemplary application: Optimum design of shallow foundation.

Also, I would like to notice that in the first volume of this book – entitled: *Swarm Intelligence Algorithms: A Tutorial* – you can find a very detailed explanation for each SI algorithm (detailed description, pseudo-code, source-code in Matlab, source-code in C++, and detailed step-by-step numerical example).

At the end of this short preface, I would like to thank very much all the contributors for their hard work in preparation of the chapters for this book. I also would like to wish all readers enjoyment in reading this book.

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