

1. Record Nr.	UNINA9910874692003321
Autore	Li Changhe
Titolo	Intelligent Optimization : Principles, Algorithms and Applications
Pubbl/distr/stampa	Singapore : , : Springer, , 2024 ©2024
ISBN	9789819732869 9789819732852
Edizione	[1st ed.]
Descrizione fisica	1 online resource (369 pages)
Altri autori (Persone)	HanShoufei ZengSanyou YangShengxiang
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Preface -- Acknowledgments -- Contents -- Acronyms -- Part I Introduction and Fundamentals -- 1 Introduction -- 1.1 Optimization and Machine Learning -- 1.2 Optimization Problems -- 1.2.1 Mathematical Formulation -- 1.2.2 Continuous Optimization Versus Discrete Optimization -- 1.3 Optimization Algorithms -- 1.3.1 Deterministic Algorithms and Probabilistic Algorithms -- 1.3.2 Intelligent Optimization Techniques -- References -- 2 Fundamentals -- 2.1 Fitness Landscapes -- 2.1.1 Solution Space -- 2.1.2 Objective Space -- 2.1.3 Neighbourhood -- 2.1.4 Global Optimum -- 2.1.5 Local Optimum -- 2.2 Properties of Fitness Landscape -- 2.2.1 Modality -- 2.2.2 Ruggedness -- 2.2.3 Deceptiveness -- 2.2.4 Neutrality -- 2.2.5 Separability -- 2.2.6 Scalability -- 2.2.7 Domino Convergence -- 2.2.8 Property Control, Analysis, and Visualization -- 2.3 Computational Complexity -- 2.3.1 Complexity Measures -- 2.3.1.1 Time Complexity -- 2.3.1.2 Space Complexity -- 2.3.1.3 Ways of Measures -- 2.3.1.4 Time Versus Space -- 2.3.2 P Versus NP Problem -- References -- 3 Canonical Optimization Algorithms -- 3.1 Numerical Optimization Algorithms -- 3.1.1 Line Search -- 3.1.2 Steepest Descent Method -- 3.1.3 Newton Method -- 3.1.4 Conjugate Gradient Method -- 3.2 State Space Search -- 3.2.1 State Space -- 3.2.1.1 The Shortest Path Problem

-- 3.2.1.2 The Travelling Salesman Problem -- 3.2.2 Uninformed Search -- 3.2.2.1 Breadth-First Search -- 3.2.2.2 Depth-First Search -- 3.2.2.3 Depth-Limited Search -- 3.2.3 Informed Search -- 3.2.3.1 Greedy Search -- 3.2.3.2 A* Search -- 3.2.3.3 Monte-Carlo Tree Search -- 3.3 Single-Solution-Based Random Search -- 3.3.1 Hill Climbing -- 3.3.2 Simulated Annealing -- 3.3.3 Iterated Local Search -- 3.3.4 Variable Neighborhood Search -- References -- Part II Evolutionary Computation Algorithms.

4 Basics of Evolutionary Computation Algorithms -- 4.1 Introduction -- 4.1.1 Biological Evolution -- 4.1.2 Origin of Evolutionary Algorithms -- 4.1.3 Basic Evolutionary Processes -- 4.1.4 Developments -- 4.1.5 Related Resources -- 4.2 Solution Representation -- 4.2.1 Binary Representation -- 4.2.2 Integer Representation -- 4.2.3 Real-Valued Representation -- 4.2.4 Tree Representation -- 4.2.5 The Effect of Representation -- 4.3 Selection -- 4.3.1 Parents Selection -- 4.3.2 Survivor Selection -- 4.3.3 Selection Pressure -- 4.4 Reproduction -- 4.4.1 Mutation -- 4.4.2 Recombination -- References -- 5 Popular Evolutionary Computation Algorithms -- 5.1 Genetic Algorithm -- 5.1.1 Basic Principle and Framework -- 5.1.2 Applications of Genetic Algorithms -- 5.2 Evolutionary Programming -- 5.2.1 The Emergence of Evolutionary Programming -- 5.2.2 The Classical Evolutionary Programming -- 5.2.2.1 Representation -- 5.2.2.2 Mutation -- 5.2.2.3 Selection -- 5.2.3 Framework and Parameter Settings -- 5.2.4 Recent Advances in Evolutionary Programming -- 5.3 Genetic Programming -- 5.3.1 Introduction -- 5.3.2 Genotype-Phenotype Mapping -- 5.3.2.1 Integer String Approach -- 5.3.2.2 Gene Expression Programming -- 5.3.3 Other Genome Structures -- 5.3.3.1 Linear GP -- 5.3.3.2 Graph-Based GP -- 5.3.4 Open Issues -- 5.3.4.1 Epistasis in GP -- 5.3.4.2 Correctness -- 5.3.4.3 All-or-Nothing -- 5.3.4.4 Non-functional Features of Algorithms -- 5.4 Particle Swarm Optimization -- 5.4.1 The Rise of Particle Swarm Optimization -- 5.4.2 Original Particle Swarm Optimization -- 5.4.3 Standard Particle Swarm Optimization -- 5.4.3.1 Initialization -- 5.4.3.2 Population Topology -- 5.4.3.3 Confinement -- 5.4.3.4 Velocity Updating -- 5.4.4 Recent Advances in Particle Swarm Optimization -- 5.4.4.1 Communication Topology -- 5.4.4.2 PSO with Diversity Maintenance -- 5.4.4.3 Adaptive PSO. -- 5.4.4.4 Hybrid PSO -- 5.5 Differential Evolution -- 5.5.1 Introduction of Differential Evolution -- 5.5.1.1 Mutation -- 5.5.1.2 Crossover -- 5.5.1.3 Selection -- 5.5.2 Framework and Parameter Settings -- 5.5.3 Some Advances in Differential Evolution -- 5.5.3.1 Parameter Adaptation -- 5.5.3.2 Adaptation of Mutation Operators -- 5.5.3.3 New Mutation Operators -- 5.6 Evolution Strategy -- 5.6.1 Basic Evolution Strategy Paradigm -- 5.6.1.1 Parent Selection -- 5.6.1.2 Mutation -- 5.6.1.3 Mutation Step Size Control -- 5.6.1.4 Recombination -- 5.6.1.5 Survivor Selection -- 5.6.1.6 Canonical Self-Adaptation Evolution Strategy -- 5.6.2 Covariance Matrix Adaptation Evolution Strategy -- 5.6.2.1 Reproduction with Covariance Matrix -- 5.6.2.2 Covariance Matrix Adaptation -- 5.6.2.3 Complete Process of CMA-ES -- 5.6.2.4 Niching CMA-ES -- 5.7 Estimation of Distribution Algorithm -- 5.7.1 Standard Procedures -- 5.7.2 Discrete Versions -- 5.7.2.1 Univariate Factorizations -- 5.7.2.2 Bivariate Factorizations -- 5.7.2.3 Multivariate Factorizations -- 5.7.3 Continuous Versions -- 5.8 Ant Colony Optimization -- 5.8.1 Biological Inspiration -- 5.8.2 ACO Framework -- 5.8.2.1 Initialization -- 5.8.2.2 Solution Construction -- 5.8.2.3 Local Search -- 5.8.2.4 Pheromone Update -- 5.8.3 ACO Variants -- 5.8.3.1 Set of Update Solutions -- 5.8.3.2 Pheromone Update -- 5.8.4 Recent Advances -- 5.8.4.1 Dynamic Optimization -- 5.8.4.2 Multi-objective Optimization -- 5.8.4.3 Multimodal Optimization -- 5.8.4.4

Parallel ACO Implementations -- References -- Part III Optimization Techniques -- 6 Parameter Control and Policy Control -- 6.1 Parameter Control -- 6.1.1 Unary Parameter Control -- 6.1.1.1 Population Size Control -- 6.1.1.2 Operator Parameter Control -- 6.1.1.3 Problem-Related Parameter Control -- 6.1.2 Multi-parameter Control -- 6.1.3 Discussions -- 6.2 Policy Control. 6.2.1 Operator Selection Control -- 6.2.2 Hyper-heuristics -- 6.2.3 Discussions -- References -- 7 Exploitation Versus Exploration -- 7.1 Introduction -- 7.2 Exploitation and Exploration Methods -- 7.2.1 Iterative Methods -- 7.2.2 Single-Solution Meta-heuristics -- 7.2.3 Population-Based Meta-heuristics -- 7.3 Enhancing Exploration and Exploitation -- 7.3.1 Exploration Enhancement Methods -- 7.3.2 Exploitation Enhancement Methods -- 7.4 Balancing Exploration and Exploitation -- 7.4.1 Explicit Differentiation Methods -- 7.4.2 Population Diversity-Driven Methods -- 7.4.3 Non-overlapping Multi-population Methods -- 7.4.4 Space Partitioning-Based Methods -- 7.5 Discussions -- References -- 8 Multimodal Optimization -- 8.1 Introduction -- 8.2 Niching Methods for Traditional EAs -- 8.2.1 Fitness Sharing -- 8.2.2 Restricted Tournament Selection -- 8.2.3 Clearing -- 8.2.4 Crowding -- 8.3 Niching Methods of Emerging EAs -- 8.3.1 DE with Neighbor Mutation -- 8.3.2 PSO with Restricted Communication Topology -- 8.4 Other Evolutionary Niching Methods -- 8.4.1 Multi-population -- 8.4.2 Multi-objective Selection -- 8.5 Challenges -- References -- Part IV Advanced Topics and Applications -- 9 Multi-objective Optimization -- 9.1 Introduction -- 9.1.1 Basic Concepts -- 9.1.2 Properties of PF -- 9.2 Multi-objective Evolutionary Algorithms -- 9.2.1 Domination-Based Algorithms -- 9.2.2 Indicator-Based Algorithms -- 9.2.3 Decomposition-Based Algorithms -- 9.3 Performance Evaluation -- 9.3.1 C Indicator -- 9.3.2 Generational Distance -- 9.3.3 Maximum Spread -- 9.3.4 Spacing -- 9.3.5 Inverted Generational Distance -- 9.3.6 Hypervolume -- 9.4 Visualization in the Objective Space -- 9.4.1 Visualization Using Original Values -- 9.4.1.1 Scatterplot Matrix -- 9.4.1.2 Parallel Coordinate -- 9.4.1.3 Heat Maps -- 9.4.2 Visualization Using Transformed Values. 9.4.2.1 Radial Coordinate Visualization -- 9.4.2.2 Level Diagrams -- 9.4.2.3 Hyper-radial Visualization -- 9.4.3 Visualizing the Distribution Relation of Solution -- 9.4.3.1 Distance and Distribution Charts -- 9.4.3.2 Hyper-space Diagonal Counting -- 9.5 Challenges -- 9.5.1 Many-objective Test Problems -- 9.5.2 Many-Objective Optimization Algorithms -- 9.5.3 Performance Evaluation Methods -- 9.5.4 Visualization of Many-Objective Optimization -- References -- 10 Constrained Optimization -- 10.1 Introduction -- 10.2 Constraint-Handling Techniques -- 10.2.1 Penalty Function -- 10.2.1.1 Static Penalty Function -- 10.2.1.2 Dynamic Penalty Function -- 10.2.1.3 Adaptive Penalty Function -- 10.2.2 Separation of Objectives and Constraints -- 10.2.2.1 Feasibility Rule -- 10.2.2.2 -Constraint Methods -- 10.2.2.3 Stochastic Ranking -- 10.2.2.4 Multi-objective Methods -- 10.2.3 Ensemble Methods -- 10.3 Challenges and Future Directions -- References -- 11 Dynamic Optimization -- 11.1 Introduction -- 11.1.1 Basics of Changes -- 11.1.2 Characteristics of Changes -- 11.2 Dynamism Handling Methods -- 11.2.1 Difficulties -- 11.2.2 Dynamism Handling Strategies -- 11.3 Benchmark Problems and Metrics for Dynamic Single-Objective Optimization -- 11.3.1 Classical Problem Generators -- 11.3.2 Performance Measures -- 11.4 Benchmark Problems and Metrics for Dynamic Multi-objective Optimization -- 11.4.1 Classical Benchmark Problems -- 11.4.2 Performance Measures -- 11.5 Dynamic Constrained Optimization -- 11.6 Challenges -- References -- 12 Robust Optimization -- 12.1

Introduction -- 12.2 Robust Optimization Algorithms -- 12.2.1
Uncertainties in Decision Variables -- 12.2.1.1 Definition -- 12.2.1.2
Measures -- 12.2.2 Uncertainties in Objective Function -- 12.2.3
Uncertainties in Environments -- 12.2.3.1 Min-Max Optimization
Problem.
12.2.3.2 Coevolution for Min-Max Optimization Problem.
