

# Table of Contents

## Invited Talks

|                                                                                                                                      |    |
|--------------------------------------------------------------------------------------------------------------------------------------|----|
| The Evolution of Optimality: De Novo Programming<br><i>Milan Zeleny</i> .....                                                        | 1  |
| Many-Objective Optimization: An Engineering Design Perspective<br><i>Peter J. Fleming, Robin C. Purshouse, Robert J. Lygoe</i> ..... | 14 |

## Tutorial

|                                                                                                                                                                                            |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1984-2004 – 20 Years of Multiobjective Metaheuristics. But What About the Solution of Combinatorial Problems with Multiple Objectives?<br><i>Xavier Gandibleux, Matthias Ehrgott</i> ..... | 33 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|

## Algorithm Improvements

|                                                                                                                                                     |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Omni-optimizer: A Procedure for Single and Multi-objective Optimization<br><i>Kalyanmoy Deb, Santosh Tiwari</i> .....                               | 47  |
| An EMO Algorithm Using the Hypervolume Measure as Selection Criterion<br><i>Michael Emmerich, Nicola Beume, Boris Naujoks</i> .....                 | 62  |
| The Combative Accretion Model – Multiobjective Optimisation Without Explicit Pareto Ranking<br><i>Adam Berry, Peter Vamplew</i> .....               | 77  |
| Parallelization of Multi-objective Evolutionary Algorithms Using Clustering Algorithms<br><i>Felix Streichert, Holger Ulmer, Andreas Zell</i> ..... | 92  |
| An Efficient Multi-objective Evolutionary Algorithm: OMOEA-II<br><i>Sanyou Zeng, Shuzhen Yao, Lishan Kang, Yong Liu</i> .....                       | 108 |
| Path Relinking in Pareto Multi-objective Genetic Algorithms<br><i>Matthieu Basseur, Franck Seynhaeve, El-Ghazali Talbi</i> .....                    | 120 |

Dynamic Archive Evolution Strategy for Multiobjective Optimization  
*Yang Shu Min, Shao Dong Guo, Luo Yang Jie* ..... 135

Searching for Robust Pareto-Optimal Solutions in Multi-objective Optimization  
*Kalyanmoy Deb, Himanshu Gupta* ..... 150

Multi-objective MaxiMin Sorting Scheme  
*E.J. Solteiro Pires, P.B. de Moura Oliveira, J.A. Tenreiro Machado* ..... 165

Multiobjective Optimization on a Budget of 250 Evaluations  
*Joshua Knowles, Evan J. Hughes* ..... 176

Initial Population Construction for Convergence Improvement of MOEAs  
*Christian Haubelt, Jürgen Gamenik, Jürgen Teich* ..... 191

Multi-objective Go with the Winners Algorithm: A Preliminary Study  
*Carlos A. Brizuela, Everardo Gutiérrez* ..... 206

**Incorporation of Preferences**

Exploiting Comparative Studies Using Criteria: Generating Knowledge from an Analyst's Perspective  
*Daniel Salazar, Néstor Carrasquero, Blas Galván* ..... 221

A Multiobjective Evolutionary Algorithm for Deriving Final Ranking from a Fuzzy Outranking Relation  
*Juan Carlos Leyva-Lopez, Miguel Angel Aguilera-Contreras* ..... 235

**Performance Analysis and Comparison**

Exploring the Performance of Stochastic Multiobjective Optimisers with the Second-Order Attainment Function  
*Carlos M. Fonseca, Viviane Grunert da Fonseca, Luís Paquete* ..... 250

Recombination of Similar Parents in EMO Algorithms  
*Hisao Ishibuchi, Kaname Narukawa* ..... 265

A Scalable Multi-objective Test Problem Toolkit  
*Simon Huband, Luigi Barone, Lyndon While, Phil Hingston* ..... 280

|                                                                                                                                                                            |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Extended Multi-objective fast messy Genetic Algorithm Solving<br>Deception Problems<br><i>Richard O. Day, Gary B. Lamont</i> .....                                         | 296 |
| Comparing Classical Generating Methods with an Evolutionary<br>Multi-objective Optimization Method<br><i>Pradyumn Kumar Shukla, Kalyanmoy Deb, Santosh Tiwari</i> .....    | 311 |
| A New Analysis of the LebMeasure Algorithm for Calculating<br>Hypervolume<br><i>Lyndon While</i> .....                                                                     | 326 |
| Effects of Removing Overlapping Solutions on the Performance of the<br>NSGA-II Algorithm<br><i>Yusuke Nojima, Kaname Narukawa, Shiori Kaige,<br/>Hisao Ishibuchi</i> ..... | 341 |
| Selection, Drift, Recombination, and Mutation in Multiobjective<br>Evolutionary Algorithms on Scalable MNK-Landscapes<br><i>Hernán E. Aguirre, Kiyoshi Tanaka</i> .....    | 355 |
| Comparison Between Lamarckian and Baldwinian Repair on<br>Multiobjective 0/1 Knapsack Problems<br><i>Hisao Ishibuchi, Shiori Kaige, Kaname Narukawa</i> .....              | 370 |
| The Value of Online Adaptive Search: A Performance Comparison of<br>NSGAII, $\epsilon$ -NSGAII and $\epsilon$ MOEA<br><i>Joshua B. Kollat, Patrick M. Reed</i> .....       | 386 |
| <b>Uncertainty and Noise</b>                                                                                                                                               |     |
| Fuzzy-Pareto-Dominance and Its Application in Evolutionary<br>Multi-objective Optimization<br><i>Mario Köppen, Raul Vicente-Garcia, Bertram Nickolay</i> .....             | 399 |
| Multi-objective Optimization of Problems with Epistemic Uncertainty<br><i>Philipp Limbourg</i> .....                                                                       | 413 |
| <b>Alternative Methods</b>                                                                                                                                                 |     |
| The Naive MIDEA: A Baseline Multi-objective EA<br><i>Peter A.N. Bosman, Dirk Thierens</i> .....                                                                            | 428 |

|                                                                                                                                                                                                            |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| New Ideas in Applying Scatter Search to Multiobjective Optimization<br><i>Antonio J. Nebro, Francisco Luna, Enrique Alba</i> .....                                                                         | 443 |
| A MOPSO Algorithm Based Exclusively on Pareto Dominance Concepts<br><i>Julio E. Alvarez-Benitez, Richard M. Everson, Jonathan E. Fieldsend</i> .....                                                       | 459 |
| Clonal Selection with Immune Dominance and Anergy Based<br>Multiobjective Optimization<br><i>Licheng Jiao, Maoguo Gong, Ronghua Shang, Haifeng Du, Bin Lu</i> ...                                          | 474 |
| A Multi-objective Tabu Search Algorithm for Constrained Optimisation<br>Problems<br><i>Daniel Jaeggi, Geoff Parks, Timoleon Kipouros, John Clarkson</i> .....                                              | 490 |
| Improving PSO-Based Multi-objective Optimization Using Crowding,<br>Mutation and $\epsilon$ -Dominance<br><i>Margarita Reyes Sierra, Carlos A. Coello Coello</i> .....                                     | 505 |
| DEMO: Differential Evolution for Multiobjective Optimization<br><i>Tea Robič, Bogdan Filipič</i> .....                                                                                                     | 520 |
| <b>Applications</b>                                                                                                                                                                                        |     |
| Multi-objective Model Selection for Support Vector Machines<br><i>Christian Igel</i> .....                                                                                                                 | 534 |
| Exploiting the Trade-Off — The Benefits of Multiple Objectives in<br>Data Clustering<br><i>Julia Handl, Joshua Knowles</i> .....                                                                           | 547 |
| Extraction of Design Characteristics of Multiobjective Optimization –<br>Its Application to Design of Artificial Satellite Heat Pipe<br><i>Min Joong Jeong, Takashi Kobayashi, Shinobu Yoshimura</i> ..... | 561 |
| Gray Coding in Evolutionary Multicriteria Optimization: Application<br>in Frame Structural Optimum Design<br><i>David Greiner, Gabriel Winter, José M. Emperador, Blas Galván</i> ....                     | 576 |
| Multi-objective Genetic Algorithms to Create Ensemble of Classifiers<br><i>Luiz S. Oliveira, Marisa Morita, Robert Sabourin, Flávio Bortolozzi</i> ..                                                      | 592 |
| Multi-objective Model Optimization for Inferring Gene Regulatory<br>Networks<br><i>Christian Spieth, Felix Streichert, Nora Speer, Andreas Zell</i> .....                                                  | 607 |

|                                                                                                                                                                                                   |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| High-Fidelity Multidisciplinary Design Optimization of Wing Shape for Regional Jet Aircraft<br><i>Kazuhisa Chiba, Shigeru Obayashi, Kazuhiro Nakahashi, Hiroyuki Morino</i> .....                 | 621 |
| Photonic Device Design Using Multiobjective Evolutionary Algorithms<br><i>Steven Manos, Leon Poladian, Peter Bentley, Maryanne Large</i> .....                                                    | 636 |
| Multiple Criteria Lot-Sizing in a Foundry Using Evolutionary Algorithms<br><i>Jerzy Duda, Andrzej Osyczka</i> .....                                                                               | 651 |
| Multiobjective Shape Optimization Using Estimation Distribution Algorithms and Correlated Information<br><i>Sergio Iuvan Valdez Peña, Salvador Botello Rionda, Arturo Hernández Aguirre</i> ..... | 664 |
| Evolutionary Multi-objective Environmental/Economic Dispatch: Stochastic Versus Deterministic Approaches<br><i>Robert T.F. Ah King, Harry C.S. Rughooputh, Kalyanmoy Deb</i> .....                | 677 |
| A Multi-objective Approach to Integrated Risk Management<br><i>Frank Schlottmann, Andreas Mitschele, Detlef Seese</i> .....                                                                       | 692 |
| An Approach Based on the Strength Pareto Evolutionary Algorithm 2 for Power Distribution System Planning<br><i>Francisco Rivas-Dávalos, Malcolm R. Irving</i> .....                               | 707 |
| Proposition of Selection Operation in a Genetic Algorithm for a Job Shop Rescheduling Problem<br><i>Hitoshi Iima</i> .....                                                                        | 721 |
| A Two-Level Evolutionary Approach to Multi-criterion Optimization of Water Supply Systems<br><i>Matteo Nicolini</i> .....                                                                         | 736 |
| Evolutionary Multi-objective Optimization for Simultaneous Generation of Signal-Type and Symbol-Type Representations<br><i>Yaochu Jin, Bernhard Sendhoff, Edgar Körner</i> .....                  | 752 |
| A Multi-objective Memetic Algorithm for Intelligent Feature Extraction<br><i>Paulo V.W. Radtke, Tony Wong, Robert Sabourin</i> .....                                                              | 767 |

Solving the Aircraft Engine Maintenance Scheduling Problem Using a Multi-objective Evolutionary Algorithm  
*Mark P. Kleeman, Gary B. Lamont* ..... 782

Finding Pareto-Optimal Set by Merging Attractors for a Bi-objective Traveling Salesmen Problem  
*Weiqi Li* ..... 797

Multiobjective EA Approach for Improved Quality of Solutions for Spanning Tree Problem  
*Rajeev Kumar, P.K. Singh, P.P. Chakrabarti* ..... 811

Developments on a Multi-objective Metaheuristic (MOMH) Algorithm for Finding Interesting Sets of Classification Rules  
*Beatriz de la Iglesia, Alan Reynolds, Vic J Rayward-Smith* ..... 826

Preliminary Investigation of the ‘Learnable Evolution Model’ for Faster/Better Multiobjective Water Systems Design  
*Laetitia Jourdan, David Corne, Dragan Savic, Godfrey Walters* ..... 841

Particle Evolutionary Swarm for Design Reliability Optimization  
*Angel E. Muñoz Zavala, Enrique R. Villa Diharce, Arturo Hernández Aguirre* ..... 856

Multiobjective Water Pinch Analysis of the Cuernavaca City Water Distribution Network  
*Carlos E. Mariano-Romero, Víctor Alcocer-Yamanaka, Eduardo F. Morales* ..... 870

Multi-objective Vehicle Routing Problems Using Two-Fold EMO Algorithms to Enhance Solution Similarity on Non-dominated Solutions  
*Tadahiko Murata, Ryota Itai* ..... 885

Multi-objective Optimisation of Turbomachinery Blades Using Tabu Search  
*Timoleon Kipouros, Daniel Jaeggi, Bill Dawes, Geoff Parks, Mark Savill* ..... 897

Author Index ..... 911