Lecture Notes in Computer Science 10079

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison
Lancaster University, Lancaster, UK
Takeo Kanade
Carnegie Mellon University, Pittsburgh, PA, USA
Josef Kittler
University of Surrey, Guildford, UK
Jon M. Kleinberg
Cornell University, Ithaca, NY, USA
Friedemann Mattern
ETH Zurich, Zurich, Switzerland
John C. Mitchell
Stanford University, Stanford, CA, USA
Moni Naor
Weizmann Institute of Science, Rehovot, Israel
C. Pandu Rangan
Indian Institute of Technology, Madras, India
Bernhard Steffen
TU Dortmund University, Dortmund, Germany
Demetri Terzopoulos
University of California, Los Angeles, CA, USA
Doug Tygar
University of California, Berkeley, CA, USA
Gerhard Weikum
Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at http://www.springer.com/series/7407

Paola Festa · Meinolf Sellmann
Joaquin Vanschoren (Eds.)

Learning and Intelligent Optimization

10th International Conference, LION 10
Ischia, Italy, May 29 – June 1, 2016
Revised Selected Papers

Springer

Editors
Paola Festa
University of Naples Federico II
Naples
Italy

Joaquin Vanschoren
Eindhoven University of Technology
Eindhoven
The Netherlands

Meinolf Sellmann
Thomas J. Wastson Research Center
Yorktown Heights, NY
USA

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-319-50348-6 ISBN 978-3-319-50349-3 (eBook)
DOI 10.1007/978-3-319-50349-3

Library of Congress Control Number: 2016958517

LNCS Sublibrary: SL1 – Theoretical Computer Science and General Issues

© Springer International Publishing AG 2016
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The large variety of heuristic algorithms for hard optimization problems raises numerous interesting and challenging issues. Practitioners are confronted with the burden of selecting the most appropriate method, in many cases through an expensive algorithm configuration and parameter tuning process, and subject to a steep learning curve. Scientists seek theoretical insights and demand a sound experimental methodology for evaluating algorithms and assessing strengths and weaknesses. A necessary prerequisite for this effort is a clear separation between the algorithm and the experimenter, who, in too many cases, is "in the loop" as a crucial intelligent learning component. Both issues are related to designing and engineering ways of "learning" about the performance of different techniques, and ways of using past experience about the algorithm behavior to improve performance in the future. This is the scope of the Learning and Intelligent Optimization (LION) conference series.

This volume contains the papers presented at LION 10: Learning and Intelligent Optimization, held during May 29 – June 1, 2016 in Ischia, Italy. This meeting, which continues the successful series of LION events (see LION 5 in Rome, Italy; LION 6 in Paris, France; LION 7 in Catania, Italy; LION 8 in Gainesville, USA; and LION 9 in Lille, France), explores the intersections and uncharted territories between machine learning, artificial intelligence, mathematical programming, and algorithms for hard optimization problems. The main purpose of the event is to bring together experts from these areas to discuss new ideas and methods, challenges, and opportunities in various application areas, general trends, and specific developments. The International Conference on Learning and Optimization is proud to be the premier conference in the area.

A total of 47 papers were submitted to LION 10: 28 submissions of long papers, 13 submissions of short papers, and six abstracts for oral presentation only. Each manuscript was independently reviewed by at least three (usually four) members of the Program Committee. The final decision was made based on a meta-reviewing phase where each manuscript's reviews were shown to five other members of the Program Committee, who then voted to either accept or reject the manuscript. Only long papers that received four or five votes in favor were accepted as long papers. Papers that received at least three votes in favor were accepted as short papers (papers submitted as long papers had to be shortened).

In total, 14 long papers and nine short papers were accepted. The selection rate for long papers was 34%.

These proceedings also contain two papers submitted to the generalization-based contest in global optimization (GENOPT). These were reviewed independently by the GENOPT Organizing Committee.

During the conference, the keynote talk was delivered by Bistra Dilkina, on "Learning to Branch in Mixed Integer Programming."

In addition, we were pleased to have two tutorial talks:

- "Learning Algorithms and Bioinformatics," by Giovanni Felici and Emanuel Weitschek
- "Automatic Algorithm Configuration," by Meinolf Sellmann

Finally, we gratefully acknowledge the support of our sponsors and partners in organizing this conference:

- IBM Research
- University of Naples Federico II, Italy
- Department of Mathematics and Applications "R. Caccioppoli", University of Naples Federico II, Italy

We hope that these proceedings may serve you well in your endeavors in learning and intelligent optimization.

May 2016

Paola Festa
Meinolf Sellmann
Joaquin Vanschoren

Organization

Program Committee

Carlos Ansótegui	Universitat de Lleida, Spain
Bernd Bischl	LMU Munich, Germany
Christian Blum	IKERBASQUE, Basque Foundation for Science, Spain
Mauro Brunato	University of Trento, Italy
André Carvalho	University of São Paulo, Brazil
John Chinneck	Carleton University, Ottawa, Canada
Andre Cire	University of Toronto Scarborough, Canada
Luca Di Gaspero	University of Udine, Italy
Bistra Dilkina	Georgia Institute of Technology, USA
Paola Festa (Co-chair)	University of Naples Federico II, Italy
Tias Guns	K.U. Leuven, Belgium
Frank Hutter	University of Freiburg, Germany
Eyke Hüllermeier	Philipps-Universität Marburg, Germany
George Katsirelos	INRA, Toulouse, France
Lars Kotthoff	University of British Columbia, Canada
Dario Landa-Silva	The University of Nottingham, UK
Hoong Chuin Lau	Singapore Management University, Singapore
Jimmy Lee	The Chinese University of Hong Kong, SAR China
Marie-Eléonore Marmion	Université Lille 1, France
George Nemhauser	Georgia Tech/School of ISyE, USA
Barry O'Sullivan	4C, University College Cork, Ireland
Claude-Guy Quimper	Université Laval, Canada
Helena Ramalhinho Lourenço	UPF, Spain
Francesca Rossi	University of Padova, Italy and Harvard University, USA
Ashish Sabharwal	AI2, USA
Horst Samulowitz	IBM Research, USA
Marc Schoenauer	Projet TAO, Inria Saclay Île-de-France, France
Meinolf Sellmann (Co-chair)	IBM Research, USA
Bart Selman	Cornell University, USA
Yaroslav Sergeyev	University of Calabria, Italy
Peter J. Stuckey	University of Melbourne, Australia
Thomas Stützle	Université Libre de Bruxelles (ULB), Belgium
Eric D. Taillard	University of Applied Science Western Switzerland, HEIG-Vd, Switzerland

Michael Trick	Carnegie Mellon, USA
Joaquin Vanschoren (Co-chair)	Eindhoven University of Technology, The Netherlands
Petr Vilím	IBM Czech, Czech Republic

Additional Reviewers

Akgun, Ozgur	Lindauer, Marius	Misir, Mustafa
Cardonha, Carlos	Lindawati, Lindawati	Teng, Teck-Hou
Gunawan, Aldy	Mayer-Eichberger, Valentin	Yap, Roland
Khalil, Elias		
Klein, Aaron	Meseguer, Pedro	

Contents

Full Papers

Learning a Stopping Criterion for Local Search 3
Alejandro Arbelaez and Barry O'Sullivan

Surrogate Assisted Feature Computation for Continuous Problems 17
Nacim Belkhir, Johann Dréo, Pierre Savéant, and Marc Schoenauer

MO-ParamILS: A Multi-objective Automatic Algorithm Configuration Framework. 32
Aymeric Blot, Holger H. Hoos, Laetitia Jourdan, Marie-Éléonore Kessaci-Marmion, and Heike Trautmann

Evolving Instances for Maximizing Performance Differences of State-of-the-Art Inexact TSP Solvers 48
Jakob Bossek and Heike Trautmann

Extreme Reactive Portfolio (XRP): Tuning an Algorithm Population for Global Optimization 60
Mauro Brunato and Roberto Battiti

Bounding the Search Space of the Population Harvest Cutting Problem with Multiple Size Stock Selection 75
Laura Climent, Barry O'Sullivan, and Steven D. Prestwich

Designing and Comparing Multiple Portfolios of Parameter Configurations for Online Algorithm Selection 91
Aldy Gunawan, Hoong Chuin Lau, and Mustafa Mısır

Portfolios of Subgraph Isomorphism Algorithms 107
Lars Kotthoff, Ciaran McCreesh, and Christine Solnon

Structure-Preserving Instance Generation 123
Yuri Malitsky, Marius Merschformann, Barry O'Sullivan, and Kevin Tierney

Feature Selection Using Tabu Search with Learning Memory: Learning Tabu Search 141
Lucien Mousin, Laetitia Jourdan, Marie-Eléonore Kessaci Marmion, and Clarisse Dhaenens

The Impact of Automated Algorithm Configuration on the Scaling Behaviour of State-of-the-Art Inexact TSP Solvers 157
Zongxu Mu, Holger H. Hoos, and Thomas Stützle

Requests Management for Smartphone-Based Matching Applications Using a Multi-agent Approach 173
Gilles Simonin and Barry O'Sullivan

Self-organizing Neural Network for Adaptive Operator Selection in Evolutionary Search. 187
Teck-Hou Teng, Stephanus Daniel Handoko, and Hoong Chuin Lau

Quantifying the Similarity of Algorithm Configurations 203
Lin Xu, Ashiqur R. KhudaBukhsh, Holger H. Hoos, and Kevin Leyton-Brown

Short Papers

Neighborhood Synthesis from an Ensemble of MIP and CP Models 221
Tommaso Adamo, Tobia Calogiuri, Gianpaolo Ghiani, Antonio Grieco, Emanuela Guerriero, and Emanuele Manni

Parallelizing Constraint Solvers for Hard RCPSP Instances. 227
Roberto Amadini, Maurizio Gabbrielli, and Jacopo Mauro

Characterization of Neighborhood Behaviours in a Multi-neighborhood Local Search Algorithm 234
Nguyen Thi Thanh Dang and Patrick De Causmaecker

Constraint Programming and Machine Learning for Interactive Soccer Analysis 240
Robinson Duque, Juan Francisco Díaz, and Alejandro Arbelaez

A Matheuristic Approach for the *p*-Cable Trench Problem 247
Eduardo Lalla-Ruiz, Silvia Schwarze, and Stefan Voß

An Empirical Study of Per-instance Algorithm Scheduling 253
Marius Lindauer, Rolf-David Bergdoll, and Frank Hutter

Dynamic Strategy to Diversify Search Using a History Map in Parallel Solving. 260
Seongsoo Moon and Mary Inaba

Faster Model-Based Optimization Through Resource-Aware Scheduling Strategies. 267
Jakob Richter, Helena Kotthaus, Bernd Bischl, Peter Marwedel, Jörg Rahnenführer, and Michel Lang

Risk-Averse Anticipation for Dynamic Vehicle Routing 274
Marlin W. Ulmer and Stefan Voß

GENOPT Papers

Solving GENOPT Problems with the Use of ExaMin Solver 283
Konstantin Barkalov, Alexander Sysoyev, Ilya Lebedev, and Vladislav Sovrasov

Hybridisation of Evolutionary Algorithms Through Hyper-heuristics for Global Continuous Optimisation 296
Eduardo Segredo, Eduardo Lalla-Ruiz, Emma Hart, Ben Paechter, and Stefan Voß

Subject Index 307

Author Index 309