PUBLICATIONS

In the course of my research career, I authored more than 20 peer-reviewed scientific articles collaborating with over 20 international researchers. The statistics below summarise my contributions as reported by Google Scholar and, in parentheses, by Scopus.

Number of publications	22 (16)
Number of citations	187 (53)
H-index	9 (4)
i10-index	7 (-)

Following is a detailed description of my publications, organised by venue type.

journal articles

January 2016

Constraints

Fleet Design Optimisation From Historical Data Using Constraint Programming and Large Neighbourhood Search

We present an original approach to compute efficient mid-term fleet configurations at the request of a Queensland-based long-haul trucking carrier. Our approach considers one year's worth of demand data, and employs a constraint programming (CP) model and an adaptive large neighbourhood search (LNS) strategy to solve the underlying multi-day multi-commodity split delivery capacitated vehicle routing problem.

Authors: Philip Kilby · Tommaso Urli
Journal: Constraints (Springer), Vol. 21 Num. 1, pp 2–21

Computers & Operations Research

Feature-Based Tuning of Simulated Annealing Applied to the Curriculum-Based Course Timetabling Problem

We consider the curriculum-based course timetabling problem (CB-CTT). We propose a robust single-stage simulated annealing method for solving the problem, and we design an extensive and statistically-principled methodology for the parameter tuning procedure. The outcome of this analysis is a methodology for automatically setting the parameters for unseen instances on the basis of a simple inspection of the instance itself.

Authors: R. Bellio · S. Ceschia · L. Di Gaspero · A. Schaerf · T. Urli
Journal: Computers & Operations Research (Pergamon), Vol. 65, pp 83–92

November 2015

Annals of Operations Research

Feature-Based Tuning of Single-Stage Simulated Annealing for Examination Timetabling

We propose a simulated annealing approach for the examination timetabling problem. We apply a single-stage procedure in which unfeasible solutions are included in the search space and dealt with using suitable penalties. We perform a statistically-principled experimental analysis to understand the effect of parameter selection on the performance of our algorithm, and to devise a feature-based parameter tuning strategy, which can achieve better generalization on unseen instances with respect to a one-fits-all parameter setting.

Authors: Michele Battistutta · Andrea Schaerf · Tommaso Urli
Journal: Annals of Operations Research (Springer), 2016, pp 1–16

April 2015

Evolutionary Computation

On the Performance of Different Genetic Programming Approaches for the SORTING Problem

We analyze different single- and multi-objective algorithms on the sorting problem, a problem that typically lacks independent and additive fitness structures. We complement the theoretical results with comprehensive experiments to indicate the tightness of existing bounds, and to indicate bounds where theoretical results are missing.

Authors: Markus Wagner · Frank Neumann · Tommaso Urli
Journal: Evolutionary Computation (MIT Press), Vol. 23 Num. 4, pp 583-609

Constraints

Balancing Bike Sharing Systems with Constraint Programming

Bike sharing systems need to be properly rebalanced to meet the demand of users and to operate successfully. However, the problem of Balancing Bike Sharing Systems (BBSS) is a demanding task: it requires the design of optimal tours and operating instructions for relocating bikes among stations to maximally comply with the expected future bike demands. In this paper, we tackle the BBSS problem by means of Constraint Programming (CP).

Authors: Luca Di Gaspero · Andrea Rendl · Tommaso Urli
Journal: Constraints (Springer), Vol. 21 Num. 2, pp 318–348

December 2013

IEEE Transactions on Visualization and Computer Graphics

Improving the Efficiency of Viewpoint Composition

In this paper, we describe a state-of-the art Particle Swarm Optimization (PSO) approach for finding the viewpoint that best satisfies a set of visual composition properties in a 3D scene. Furthermore, we describe a statistically sound tuning technique for the PSO parameters, and a novel strategy to initialize the PSO particles, which greatly improves the performance of the approach.

Authors: Roberto Ranon · Tommaso Urli
Journal: IEEE TVCG (IEEE), Vol. 20 Num. 5, pp 795–807

conference articles

February 2017

MIC'17

Scheduling a large fleet of rental vehicles using multi-neighbourhood local search

In this paper we investigate a multi-neighbourhood local search approach based on simulated annealing to solve the rental fleet scheduling problem (RVSP). This problem arises in the context of the rental of recreational vehicles (RVs). The problem consists of scheduling a set of bookings and other collateral activities on a heterogeneous fleet of recreational vehicles, so that the overall operational costs are minimised.

Authors: T. Urli · P. Kilby
Conference: 12th Metaheuristics International Conference (MIC 2017)

July 2016

IJCAI'16

Fleet Design Optimisation from Historical Data Using Constraint Programming and Large Neighbourhood Search

We present an original approach to compute efficient mid-term fleet configurations at the request of a Queensland-based long-haul trucking carrier. Our approach considers one year's worth of demand data, and employs a constraint programming (CP) model and an adaptive large neighbourhood search (LNS) scheme to solve the underlying multiday multi-commodity split delivery capacitated vehicle routing problem.

Authors: T. Urli · P. Kilby
Conference: 25th International Joint Conference on Artificial Intelligence

Note: Invited submission *Best Papers in Sister Conferences* track; adaptation of the Best Application Paper at CP'15.

GECCO'16 — *Intelligent Habitat Restoration Under Uncertainty*

In this paper we present an original formulation of the habitat restoration planning (HRP) problem, which captures some of the decisions and constraints faced by conservation managers in the insular Great Barrier Reef (QLD) and Pilbara (WA) regions of Australia. In addition to the problem formulation, we propose an optimisation solver for the HRP based on genetic algorithms (GA).

Authors: J. Brotánková · T. Urli · P. Kilby
Conference: Genetic and Evolutionary Computation Conference (GECCO 2016)

February 2016

AAAI'16 — *Intelligent Habitat Restoration Under Uncertainty*

Conservation is an ethic of sustainable use of natural resources which focuses on the preservation of biodiversity, i.e., the degree of variation of life. In this paper we present an intelligent system to assist conservation managers in planning habitat restoration actions. We propose a constrained optimisation formulation of the habitat restoration planning (HRP) problem, capturing aspects such as population dynamics and uncertainty. We show that the HRP is NP-hard, and develop a constraint programming (CP) model and a large neighbourhood search (LNS) procedure to generate activity plans under budgeting constraints in a reasonable amount of time.

Authors: T. Urli · J. Brotánková · P. Kilby · P. Van Hentenryck
Conference: 30th AAAI Conference on Artificial Intelligence (AAAI-16)

June 2015

CP'15 — *Long-Haul Fleet Mix and Routing Optimisation with CP and LNS*

We present an original approach to compute efficient mid-term fleet configurations, at the request of a Queensland-based long-haul trucking carrier. Our approach considers one year's worth of demand data, and employs a constraint programming (CP) model and an adaptive large neighbourhood search (LNS) strategy to solve the underlying multi-day multi-commodity split delivery capacitated vehicle routing problem.

Authors: Philip Kilby · Tommaso Urli
Conference: 21st International Conference on Principles and Practice of Constraint Programming (CP 2015)
Notes: Best Application Paper Award 2015

MIC'15 — *A General Local Search Solver for FlatZinc*

In this work, we describe an on-going project consisting in the implementation of a FlatZinc solver based on local search. The solver makes use of the framework EasyLocal++, which provides an abstract implementation of local search techniques.

Authors: Sara Ceschia · Luca Di Gaspero · Andrea Schaerf · Tommaso Urli
Conference: 11th Metaheuristics International Conference (MIC 2015)

April 2014

HM'14 — *A CP/LNS approach for Multi-day Homecare Scheduling Problems*

Homecare, i.e., supportive care provided at the patients' homes, is a prevalent alternative to unnecessary hospitalization or institutional care (e.g., in a rest home or a nursing home). These activities are provided either by healthcare professional or by non medical caregivers, depending on the patient's needs. In this paper, we consider the problem of scheduling homecare activities for a local company, with a CP-based Large Neighbourhood Search approach.

Authors: Luca Di Gaspero · Tommaso Urli
Conference: 9th International Workshop on Hybrid Metaheuristics (HM 2014)

September 2013

CP'13

Constraint-Based Approaches for Balancing Bike Sharing Systems

In order to meet the users' demand, bike sharing systems must be regularly rebalanced. In this paper we propose two novel Constraint Programming (CP) models for the Balancing Bike Sharing Systems (BBSS) problem and a Large Neighborhood Search (LNS) approach based on constraint propagation to tackle large instances from the CityBike Vienna system.

Authors: Luca Di Gaspero · Andrea Rendl · Tommaso Urli
Conference: 19th International Conference on Principles and Practice of Constraint Programming (CP 2013)

September 2013

CP'13 Doctoral Program

Hybrid CP+LNS for the Curriculum-Based Course Timetabling Problem

Curriculum-Based Course Timetabling (CB-CTT) is a popular combinatorial optimization problem, which deals with generating university timetables by scheduling weekly lectures, subject to conflicts and availability constraints. In this paper we propose a Constraint Programming (CP) model for the CB-CTT problem and a Large Neighborhood Search (LNS) approach for the resolution of large real-world instances.

Author: Tommaso Urli Conference: 19th International Conference on Principles and Practice of Constraint Programming (CP 2013)
Note: Doctoral Program

May 2013

HM'13

A Hybrid ACO+CP for Balancing Bicycle Sharing Systems

In order to meet the users' demand, bike sharing systems must be regularly rebalanced. In this paper we propose a Constraint Programming (CP) models for the Balancing Bike Sharing Systems (BBSS) problem and an Ant Colony Optimization (ACO) approach based on this model to tackle instances from the CityBike Vienna system.

Authors: Luca Di Gaspero · Andrea Rendl · Tommaso Urli Conference: 8th International Workshop on Hybrid Metaheuristics (HM 2013)

January 2013

FOGA'13

Single- and Multi-Objective GP: New Bounds for Weighted Order and Majority

We investigate, from a theoretical perspective, the expected performance of various single- and multi-objective Genetic Programming (GP) algorithms on two popular study problems in the community of Evolutionary Computation.

Authors: Anh Quang Nguyen · Tommaso Urli · Markus Wagner
Conference: XII Workshop on Foundations of Genetic Algorithms (FOGA 2013)

September 2012

PPSN'12

Experimental Supplements to the Computational Complexity Analysis of Genetic Programming for Problems Modelling Isolated Program Semantics

We investigate, from an experimental perspective, the expected performance of various single- and multi-objective Genetic Programming (GP) algorithms on two popular study problems in the community of Evolutionary Computation.

Authors: Tommaso Urli · Markus Wagner · Frank Neumann
Conference: XII International Conference on Parallel Problem Solving from Nature (PPSN 12)

January 2012

LION 7

Evaluation of a Family of Reinforcement Learning Cross-Domain Heuristics for Optimization

We test various memory models and learning algorithms to improve the Reinforcement Learning (RL)-based algorithm we presented at the Cross-Domain Heuristic Search Challenge (CHeSC'11).

Authors: Luca Di Gaspero · Tommaso Urli
Conference: Learning and Intelligent Optimization Conference (LION 7)

August 2011

MIC'11

A Reinforcement Learning approach for the Cross-Domain Heuristic Search Challenge

We present a hyper-heuristic method based on Reinforcement Learning (RL) to participate in the first Cross-Domain Heuristic Search Challenge (CHeSC'11).

Authors: Luca Di Gaspero · Tommaso Urli
Conference: 9th Metaheuristics International Conference (MIC 2011)

March 2010

SmartGraphics'10

Accurately Measuring the Satisfaction of Visual Properties in Virtual Camera Control

We design and develop a language to reason about pixels in an image, with the aim to measure the satisfaction of visual properties from off-screen GPU renderings of a 3D scene.

Authors: Roberto Ranon · Marc Christie · Tommaso Urli
Conference: 10th International Symposium on Smart Graphics (Smart Graphics 2010)

conference abstracts

March 2017

GECCO'17

A Model-Based Genetic Algorithm Framework for Constrained Optimisation Problems

Two major challenges are presented when applying genetic algorithms (GAs) to constrained optimisation problems: modelling the problem, and handling the constraints of the problem. The field of constraint programming (CP) has enjoyed extensive research in both of these areas. Our work aims to combine the modelling and constraint handling of a state-of-the-art CP framework with the efficient population-based search of a GA. The efficacy of this framework as a general heuristic for constrained optimisation problems is demonstrated through experimental results on a variety of classical combinatorial optimisation problems commonly found in the literature.

Authors: M. Lawrenson · T. Urli · P. Kilby
Conference: Genetic and Evolutionary Computation Conference (GECCO 2017)

June 2016

TRISTAN'16

A Constraint Programming Approach to Fleet Design in Split-Delivery Multi-Compartment Vehicle Routing

Multi-compartment vehicle routing problems arise daily in food logistics and fuel distribution. Split-delivery vehicle routing is a relaxation of the classic vehicle routing problem in which the demand of a customer can be cumulatively satisfied by multiple vehicles. In this paper, we present a constraint programming (CP) model for a multi-compartment split-delivery vehicle routing problem with time windows and compatibility constraints. The aim of this project is to provide insight on what is the best fleet for an oil company to replenish a set of petrol stations in the long term. For this reason, we model the problem in a multi-day perspective, so as to identify a fleet that works over a given planning horizon

Authors: T. Urli · P. Kilby
Conference: 9th Triennial Symposium on Transportation Analysis (TRISTAN 16)

VeRoLog'16

A general and scalable fleet design approach for rich vehicle routing problems

In this paper we consider the problem of designing a feasible and efficient fleet to carry out the daily activities of a freight company over an extensive planning horizon, e.g., one year. In our approach, every single-day problem is solved individually, and the solutions are used to generate a new fleet that is guaranteed to be feasible in the multi-day context. Our approach is independent of the underlying RVRP problem, provided that a suitable solver is available, and has shown encouraging scalability properties.

Authors: F. Bertoli · T. Urli · P. Kilby
Conference: 5th meeting of the EURO Working Group on Vehicle Routing and Logistics optimization (VeRoLog 16)

VeRoLog'16

Fleet size and mix split-delivery vehicle routing: a study of MIP formulations

In this paper we benchmark various Mixed Integer Programming (MIP) models for a real-world daily delivery problem arising in Queensland, Australia. Our client is faced with the task of satisfying the demand of ambient and refrigerated goods to be delivered at often remote grocery stores. This study has been carried out in the context of a tender for the delivery of goods called by a large grocery stores chain.

Authors: A. Maheo · T. Urli · P. Kilby
Conference: 5th meeting of the EURO Working Group on Vehicle Routing and Logistics optimization (VeRoLog 16)

June 2015

VeRoLog'15

There's more than one way to solve a long-haul transportation problem

It is said that there is more than one way to skin a cat. The same is true of solving long-haul transportation problems. We explore seven different approaches for solving a real-world multi-commodity long-haul transportation problem. Among the explored approaches are: an educated random sampling coupled with a nearest-neighbour heuristic, a step-based constraint programming approach, a route selection approach which relies on a custom pre-processing phase, an answer set programming formulation, a large neighbourhood search approach based on the classic vehicle routing formulation, an integer linear-programming method based on a set covering formulation, and an AI planning formulation.

Authors: P. Kilby · I. Abio · D. Guimarans · D. Harabor · P. Haslum · V. Mayer-Eichberger · F. H. Siddiqui · S. Thiebaux · T. Urli
Conference: 4th meeting of the EURO Working Group on Vehicle Routing and Logistics optimization (VeRoLog 15)

August 2014

PATAT'14

Feature-Based Tuning of Single-Stage Simulated Annealing for Examination Timetabling

We propose a single-stage Simulated Annealing procedure for the Examination Timetabling problem. We perform a statistically principled experimental analysis, in order to understand the effect of parameters and to devise a feature-based parameter tuning strategy.

Authors: Michele Battistutta · Andrea Schaerf · Tommaso Urli
Conference: 10th International Conference on the Practice and Theory of Automated Timetabling (PATAT 2014)

August 2013

MISTA'13 *A Simulated Annealing Approach to the Curriculum-Based Course Timetabling Problem*

In this paper we propose a Simulated Annealing (SA) approach to the Curriculum-Based Course Timetabling (CB-CTT) problem, which deals with scheduling weekly lectures based on the enrolment data of students to curricula. The main contribution of this paper is the specific SA variant, together with the extensive tuning process.

Authors: R. Bellio · S. Ceschia · L. Di Gaspero · A. Schaerf · T. Urli
Conference: Multidisciplinary International Scheduling Conference: Theory and Applications (MISTA 2013)

technical reports (non-peer reviewed)

December 2013

arXiv.org *Balancing Bike Sharing Systems (BBSS): Instance Generation from CitiBike NYC data*

Over the last few years, balancing bike sharing systems (BBSS) has become increasingly studied in optimization. As such, generating meaningful instances to serve as a benchmark for the proposed approaches is an important goal. In this technical report we describe the procedure we used to generate BBSS problem instances from data of the CitiBike NYC bike sharing system.

Authors: Tommaso Urli

May 2013

arXiv.org json2run*: A Tool for Experiment Design & Analysis*

json2run is a tool to automate the running, storage and analysis of experiments. Its main advantage is that it allows to describe a set of experiments concisely as a JSON-formatted parameter tree. It also supports parallel execution of experiments, automatic parameter tuning through the F-Race framework and storage and analysis of experiments with MongoDB and R.

Authors: Tommaso Urli

July 11, 2017