Furini

Personal information

Current position

From 2013 **Maître de conférences**, *Laboratoire d'Analyse et Modélisation de Systèmes pour l'Aide à la DEcision (LAMSADE), Université Paris-Dauphine, UMR-CNRS 7243.*

Employment summary

2012 - 2013 **Postdoctoral Fellow**, *Laboratoire d'Informatique de Paris-Nord (LIPN), Université Paris 13, UMR-CNRS 7030.*

2011 - 2012 **Postdoctoral Fellow**, University of Bologna, Italie.

2009 - 2012 **Consultant, Ferrovie dello Stato**, Roma.
-Software development on Train Timetabling

2007 **Consultant, Ferrari S.p.A.**, Maranello (MO).
-Warehouse outsourcing project

Education

2017 **HDR: Habilitation à diriger des recherches**, *Reformulations and Decompositions of Mixed Integer Linear and Nonlinear Programs, Université Paris-Dauphine, France, jury: Prof. Mauro Prof. DELL'AMICO, Prof. Martine LABBÉ, Prof. Nelson MACULAN, Prof. Ridha MAHJOUB, Prof. Vangelis PASCOS, Prof. Eduardo UCHOA, Prof. Roberto WOLFLER CALVO.*

2008–2011 **Ph.D. in Control System Engineering and Operational Research**, *"Decomposition and reformulation of integer linear programming problems", http://amsdottorato.cib.unibo.it/3593/, University of Bologna, Italy. Supervisors Prof. Paolo Toth and Prof. Alberto Caprara.*

2005–2007 **Master Degree in Engineering and Industrial Management**, *University of Bologna, Italy.*

2001-2004 **Bachelor Degree in Engineering and Industrial Management**, *University of Bologna, Italy.*

Languages

Italian, French, English

Research interests

Mixed Integer Linear Programming (MILP), *Study and development of algorithms for mixed integer linear programming problems (e.g. Branch and Cut Algorithms).*

Decomposition and Reformulation of MILP, *Study and development of algorithms based on Column Generation (e.g. Dantzig-Wolfe Reformulation, Branch and Price Algorithms).*

Mixed Integer Non Linear Programming, *Study of SDP and perspective relaxations and linearization techniques (e.g. Quadratic Programming).*

Applications, *Train Timetabling, Cutting and Packing, Aircraft Management and operations.*

Metodology, *my research project combines the disciplines of Mathematics, Economics and Information Technology, which are the fundamental subjects that Operational Research is concerned with. I use advanced analytical techniques to arrive at solutions of optimal or near-optimal standard to intricate decision-making problems. Mathematical optimization and modelling methods are used in conjunction with statistical analysis in order to ascertain applicability in industry to calculate such important values as profits, losses, costs and yields. The focus is on achieving operational efficiencies aiming to develop general software, generalizable insights and applications.*

Published papers in international journals

COMPUT OPER RES [21] **An Exact Algorithm for the Partition Coloring Problem**, *F. Furini, E. Malaguti and A. Santini*, Computer & Operations Research, 2018. Elsevier. DOI:10.1016/j.cor.2017.12.019 (12 pages).

OPTIM LETT [20] **On the Product Knapsack Problem**, *C. D'Ambrosio, F. Furini, M. Monaci, E. Traversi*, Optimization Letters, 2018. Springer. DOI:10.1007/s11590-017-1227-5 (22 pages).

OMEGA-INT J MANAGE S [19] **Tighter MIP formulations for Barge Container Ship Routing**, *L. Alfandari, T. Davidovic, F. Furini, I. Ljubic, V. Maras and S. Martin*, Omega, 2018. Elsevier. DOI:10.1016/j.omega.2017.12.002 (35 pages).

COMPUT OPER RES [18] **Exact Approaches for the Knapsack Problem with Setups**, *F. Furini, M. Monaci, E. Traversi*, Computer & Operations Research, 2018. Elsevier. DOI:10.1016/j.cor.2017.09.019 (12 pages).

OPER RES LETT [17] **Improving the Approximated Projected Perspective Reformulation by Dual Information**, *A.Frangioni, F. Furini, C. Gentile*, Operations Research Letters, 2017. Elsevier. DOI:10.1016/j.orl.2017.08.001 (5 pages).

EUR J OPER RES [16] **An effective dynamic programming algorithm for the minimum-cost maximal knapsack packing problem**, *F. Furini, Ivana Ljubić, Markus Sinnl*, European Journal of Operational Research, 2017. Elsevier. DOI: 10.1016/j.ejor.2017.03.061 (10 pages).

NETWORKS [15] **An improved DSATUR-based Branch and Bound for the Vertex Coloring Problem**, *F. Furini, V. Gabrel, I. C. Ternier*, Networks. 2017. Wiley. DOI:10.1002/net.21716 (17 pages).

DISCRETE APPL MATH [14] **Solving Vertex Coloring Problems as Maximum Weight Stable Set Problems**, *D. Cornaz, F. Furini, E. Malaguti*, Discrete Applied Mathematics. 2016. Elsevier. DOI:10.1016/j.dam.2016.09.018 (12 pages).

INFORMS J COMPUT [13] **Modeling Two-Dimensional Guillotine Cutting Problems via Integer Programming**, *F. Furini, E. Malaguti, D. Thomopulos*, INFORMS Journal on Computing. 2016. INFORMS. DOI:10.1287/ijoc.2016.0710 (15 pages).

TRANSPORT RES B-METH [12] **The Time Dependent Traveling Salesman Planning Problem in Controlled Airspace** , *F. Furini, C.A. Persiani, P. Toth*, Transportation Research Part B. 2016. Elsevier. DOI:10.1016/j.trb.2016.04.009 (17 pages).

INFORM PROCESS LETT [11] **Solving the Temporal Knapsack Problem via Recursive Dantzig–Wolfe Reformulation** , *A. Caprara, F. Furini, E. Malaguti, E. Traversi*, Information Processing Letters. 2016. Elsevier. DOI:10.1016/j.ipl.2016.01.008 (7 pages).

COMPUT OPTIM APPL [10] **Approximated Projected Perspective Relaxations**, *A. Frangioni, F. Furini, C. Gentile*, Computational Optimization and Applications. 2016. Springer. DOI:10.1007/s10589-015-9787-8 (30 pages).

OMEGA-INT J MANAGE S [9] **Approaches to a real-world train timetabling problem in a railway node**, *V. Cacchiani, F. Furini and M.P. Kidd*, Omega. 2015. Elsevier. DOI:10.1016/j.omega.2015.04.006 (14 pages).

J. SCHED [8] **Improved Rolling Horizon Algorithms for the Aircraft Sequencing Problem**, *F. Furini, M. P. Kidd, C. Persiani, P. Toth*, Journal of Scheduling. 2015. Springer. DOI:10.1007/s10951-014-0415-8 (13 pages).

INFORMS J COMPUT [7] **Heuristic and exact algorithms for the interval min-max regret knapsack problem**, *F. Furini, M. Iori, S. Martello, M. Yagiura*, INFORMS Journal on Computing, 2015. INFORMS. DOI:10.1287/ijoc.2014.0632 (14 pages).

MATH PROGRAM [6] **Automatic Dantzig-Wolfe Reformulation of Mixed Integer Programs**, *M. Bergner, A. Caprara, A. Ceselli, F. Furini, M. E. Lübbecke, E. Malaguti, E. Traversi*, Mathematical Programming. 2015. Springer. DOI:10.1007/s10107-014-0761-5 (34 pages).

IEEE TRANS SIGNAL PROCESS[5] **Generation of antipodal random vectors with prescribed non-stationary 2-nd order statistics**, *A. Caprara, F. Furini, A Lodi, M Mangia, R Rovatti and G. Setti*, IEEE Transactions on Signal Processing, 2014. IEEE. DOI:10.1109/TSP.2014.2302737 (10 pages).

COMPUT OPER RES [4] **Models for the Two-Dimensional Two-Stage Cutting Stock Problem with Multiple Stock Size**, *F. Furini, E. Malaguti*, Computer & Operations Research, 2013. Elsevier. DOI:10.1016/j.cor.2013.02.026 (10 pages).

INFORMS J COMPUT [3] **Uncommon Dantzig-Wolfe Reformulation for the Temporal Knapsack Problem**, *A. Caprara, F. Furini, E. Malaguti*, INFORMS Journal on Computing, 2012. INFORMS. DOI: 10.1287/ijoc.1120.0521 (12 pages).

EUR J OPER RES [2] **A Column Generation Heuristic for the Two-Dimensional Two-Staged Guillotine Cutting Stock Problem with Multiple Stock Size**, *F. Furini, E. Malaguti, R. Medina Durán, A. Persiani, P. Toth*, European Journal of Operational Research, 2012. Elsevier. DOI: 10.1016/j.ejor.2011.10.018 (10 pages).

DISCRETE OPTIM[1] **Exact Weighted Vertex Coloring via Branch-and-Price**, *F. Furini, E. Malaguti*, Discrete Optimization, 2012. Elsevier. DOI: 10.1016/j.disopt.2012.03.002 (8 pages).

Published papers in conference proceedings

ISCO, 2016, [11] **MIP Formulations for a Rich Real-world Lot-sizing Problem with Setup Carryover**, *F. Focacci, F. Furini, V. Gabrel, D. Godard and X. Shen*, Lecture Notes Computer Science. Springer. DOI: 10.1007/978-3-319-45587-7_11 (12 pages).

MIC, 2015, [10] **Matheuristics for the Temporal Bin Packing Problem**, *F. Furini and X. Shen*, Springer book. ISBN: 978-3-319-58252-8. (13 pages).

CIE, 2015, [9] **A pseudo-polynomial size formulation for 2-stage two-dimensional knapsack problems**, *F. Furini, E. Malaguti*, IEEE Conference. ISBN: 978-1-5108-1745-6 (8 pages).

INOC, 2015, [8] **Lower Bounding Techniques for DSATUR-based Branch and Bound**, *F. Furini, V. Gabrel, I. C. Ternier*, Electronic Notes in Discrete Mathematics. Elsevier. DOI:10.1016/j.endm.2016.03.020 (8 pages).

CPAIOR, 2015,[7] **ILP and CP Formulations for the Lazy Bureaucrat Problem**, *I. Ljubic, F. Furini, M. Sinnl*, Lecture Notes Computer Science. Springer. DOI: 10.1007/978-3-319-18008-3_18 (15 pages).

CODIT, 2014,[6] **Mathematical Formulations for the Balanced Vertex k -Separator Problem**, *D. Cornaz, F. Furini, M. Lacroix, E. Malaguti, A. R. Mahjoub, S. Martin*, IEEE Conference. DOI: 10.1109/CoDIT.2014.6996889 (8 pages).

ISCO, 2014, [5] **State space reduced dynamic programming for the aircraft sequencing problem with constrained position shifting**, *F. Furini , M. P. Kidd, A. Persiani, P. Toth*, Lecture Notes Computer Science. Springer. DOI: 10.1007/978-3-319-09174-7_23. (12 pages).

INOC, 2013, [4] **A fast heuristic approach for train timetabling in a railway node**, *F. Furini, M. P. Kidd*, Electronic Notes in Discrete Mathematics. Elsevier. DOI: 10.1016/j.endm.2013.05.094 (8 pages).

SEA, 2013, [3] **Hybrid SDP Bounding Procedure**, *F. Furini , E. Traversi*, Lecture Notes Computer Science. Springer. DOI: 10.1007/978-3-642-38527-8_23 (12 pages).

ISCO, 2012, [2] **Aircraft Sequencing Problems via a Rolling Horizon Algorithm**, *F. Furini, C. Persiani, P. Toth*, Lecture Notes Computer Science. Springer. DOI: 10.1007/978-3-642-32147-4_25 (12 pages).

IPCO, 2011, [1] **Partial convexification of general MIPs by Dantzig-Wolfe reformulation**, *M. Bergner, A. Caprara, F. Furini, M.E. Lübbecke, E. Malaguti, E. Traversi*, Lecture Notes Computer Science. Springer. DOI: 10.1007/978-3-642-20807-2_4 (12 pages).

Prices and expertises

2018 **Accueil en délégation institutionnelle aux CNRS – Semester of research at Université Pierre et Marie Curie (Paris 6).**

2017-2018 **Editor of the special issue of Annals of Operations Research titled "Recent Advances in Decomposition Methods for hard Optimization Problems".**

From 2014 **Prime d'encadrement doctoral et de recherche (PEDR).**

2014 **Prix Fondation Dauphine de la Publication.**

From 2009 **I am a reviewer for the following international journals**, *INFORMS Journal on Computing - European Journal of Operation Research - Journal of Scheduling - Computers & Operations Research - Journal of Optimization Theory and Applications - Journal of the Operational Research Society - RAIRO - Operations Research - Computational Optimization and Applications - OMEGA International Journal of Management Science - Discrete Optimization - Discrete Applied Mathematics - OR Spectrum - .*

International collaborations

Italy **University of Bologna, University of Modena, University of Padova, University of Pisa, CNR IASI**, *Collaborators and co-authors: P. Toth, E. Malaguti, A. Lodi, S. Martello, V. Cacchiani, M. Iori, M. Monaci, A. Frangioni, C. Gentile.*

Germany **RWTH Aachen University, University of Mainz**, *Collaborators and co-authors: M. Lübbecke, S. Irnich.*

United States **University of Colorado**, *Collaborators and co-authors: Manuel Laguna, Fred Glover.*

Japan **Nagoya University**, *Collaborators and co-authors: M. Yagiura.*

Visiting positions

2014 **University of Vienna**, *Visiting Scientist: Faculty of Business, Economics, and Statistics*, one month of research with professor I. Ljubic.

2012 **University of Colorado**, *Visiting Scientist: Leeds School of Business*, two months of research with professors M. Laguna et F. Glover.

2011 **University of Málaga**, *Visiting Scientist: Group of Multicriteria Analysis*, one month of research with professor M. Laguna.

2010 **Imperial College London**, *Visiting Scientist: Imperial College Business School*, six months of research with professor E. Hadjiconstantinou.

2006 **University College of Dublin**, *Visiting Scientist: Quinn School of Business*, six months of research with professor C. Brugha.

Invited seminars presentations

2016 **BQP formulations, relaxations and formats,**
CNAM, Paris.

2015 **Dantzig-Wolfe Reformulation for Generic MIPs,**
Université de la Lorraine, Metz.

2014 **Selected Topics in Quadratic Programming,**
University of Vienna, Vienna.

2013 **Hybrid LP/SPD Bounding Procedure,**
Ecole Polytechnique, Paris.

2013 **Extended Linear Formulation for Binary Quadratic Problems,**
Université Paris 13, Paris.

2012 **Min-max and min-max regret optimization,**
TU Dortmund.

2010 **Column Generation for Models with a Pseudo-Compact Reformulation,**
Southampton University.

2010 **Decomposition of Integer Linear Programming Problems,**
RTW Aachen University.

2010 **Pseudo Compact Reformulation for the Resource Allocation Problem,**
University of Liège, HEC-Management School.

Selected Conference presentations

2018 **The Maximum Clique Interdiction Game,**
The Aussois Combinatorial Optimization Workshop 2018, Aussois.

2017 **Exact Algorithms for the Knapsack Problem with setups,**
ODS17, Sorrento.

2016 **QPLIB: A Library of Quadratic Programming Instances,**
ICCOPT 2016, Tokyo.

2015 **Extended Formulations for the Graph Partitioning Problems,**
OR 2015, Vienna.

2015 **Approximated Projected Perspective Relaxations,**
ISMP 2015, Pittsburgh.

2015 **Infinite Staged Two-Dimensional Guillotine Problems,**
JPOC 2015, Le Havre.

2015 **Rolling horizon approaches to the aircraft sequencing problem,**
MIC 2015, Agadir.

2015 **MIP Approaches to the Lazy Bureaucrat and Greedy Boss Problems,**
CPAIOR 2015, Barcelona.

2015 **Modeling Two-Dimensional Guillotine Problems via Integer Programming,**
ROADEF 2015, Marseille.

2014 **Efficient exact algorithms for Graph Partitioning Problems,**
PGMO 2014, Paris.

2014 **Two useful computational tricks for Quadratic Programming,**
ROADEF 2014, Bordeaux.

2013 **Local Reoptimization for Bin Packing Related Problems,**
ROADEF 2013, Troyes.

2012 **Robust Unit Commitment Problem With Demand And Market Price Uncertainty,** *AIRO 2012, Vietri.*

2012 **Heuristic and exact algorithms for the interval min-max regret knapsack problem,** *ISMP 2012, Berlin.*

2012 **Aircraft sequencing problems via a rolling horizon algorithm,**
ISCO 2012, Athens University of Economics and Business.

2010 **Column Generation Approach for AGV dispatching problem in port terminal,**
EURO 10, Lisbon .

2009 **Practical solution of the Resource Allocation Problem,**
AIRO 09, Siena.

Research funding and grants

From 2017 **"Rich Graph Coloring Problems with applications to resource allocation"**, *Projet PGMO*, principal investigator.

2016-2017 **"Efficient Quadratic Programming Exact Algorithm mixing Relaxations"**, *PEPS JCJC of CNRS*, principal investigator.

2014-2017 **"QPLIB2014: a Library of Quadratic Programming Instances"**, *Projet PGMO*, principal investigator.

2014-2017 **"Efficient exact algorithms for Graph Partitioning Problems"**, *Projet PGMO.*

2014-2017 **Production planning Software,** *with Decision Brain (`https://www.decisionbrain.com/`).*

2010 - 2012 **Project Rail on Timetabling Optimization Software,** *with Ferrovie dello Stato (italian national railway company).*

Teaching activity

From 2016 **Outils d'optimisation pour les sciences des données et de la décision,** *(cours magistral). LAMSADE, Université Paris-Dauphine.*

From 2013 **Optimisation en finance,** *(cours magistral). LAMSADE, Université Paris-Dauphine.*

2016-2017 **Gestion de la production,** *(cours magistral et travaux dirigés). LAMSADE, Université Paris-Dauphine.*

2014-2015 **Succeeding in decision making,** *(cours magistral). Mastère Spécialisé Leading International Industrial Projects, ESSEC et Ecole Polytechnique.*

2014-2015 **Column generation for hard combinatorial problems,** *(cours de l'école doctorale de Dauphine). Université Paris-Dauphine.*

2014-2016 **Humanitarian logistics,** *(cours magistral). MSO, Université Paris-Dauphine.*

2013-2015 **Résolution de problèmes de grande taille et mise en œuvre informatique,** *(cours magistral). LAMSADE, Université Paris-Dauphine.*

2013-2014 **Applications de l'optimisation combinatoire,** *(cours magistral). LAMSADE, Université Paris-Dauphine.*

2013-2017 **Programmation linéaire,** *(travaux dirigés). LAMSADE, Université Paris-Dauphine.*

2013-2016 **Système de gestion de BDD,** *(travaux dirigés). LAMSADE, Université Paris-Dauphine.*

2013-2014 **Algo et programmation JAVA,** *(travaux dirigés). LAMSADE, Université Paris-Dauphine.*

2012-2013 **Optimization software and MIP solvers,** *(travaux dirigés). Department of Electrical, Electronic and Information Engineering, University of Bologna.*

PhD students and dissertations

Co-Supervisor of 2 PhD Students from 2014 (1 CIFRE), *at LAMSADE (Laboratoire d'Analyse et Modélisation de Systèmes pour l'Aide à la DEcision), of Université Paris-Dauphine.*

Supervision of numerous dissertations of Master, *at LAMSADE of Université Paris-Dauphine.*

Supervision of numerous dissertations of Bachelor and Master, *at Department of Electrical, Electronic and Information Engineering of the University of Bologna.*

Administrative Activities

2015-2017 **Head of Master MIAGE-IF (Informatique pour la Finance)**, *Université Paris-Dauphine, France.*

2014-2016 **Member of the CCR of LAMSADE**, *at Université Paris-Dauphine, France.*