

# Sonia Cafieri

## Professor

École Nationale de l'Aviation Civile (ENAC)

Lab. of Applied Mathematics, Computer Science & Automatics for Aeronautics (MAIAA)

Department of Air Navigation Engineering and Sciences

7 Ave. Edouard Belin, 31055 Toulouse, France

+33 (0)5 62 25 95 11

sonia.cafieri@enac.fr

<http://www.recherche.enac.fr/~cafier>

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## Main research interests

- Global optimization and Mixed-Integer Nonlinear Programming (MINLP).  
Applications to air traffic management, to the design of electrical machines and to bioinformatics.
- Reformulation techniques in mathematical programming.
- Combinatorial optimization: Network Clustering.
- Optimal Control. Application to air traffic management.
- Interior point algorithms for nonlinear programming.
- Numerical linear algebra in constrained optimization: iterative solution of KKT systems, preconditioners.

## Education

- *2013*: On the French National University Council (CNU) **qualification** lists for “Professeur des Universités” in section 26 (applied mathematics) and 27 (computer science).
- *December 2012*: **Habilitation à Diriger des Recherches** (French diploma to supervise research, it must be obtained prior to applying to full professorships in France),  
*From Local to Global and back: A closed walk in Mathematical Programming and its Applications.*  
Université Paul Sabatier, Toulouse, 10 December 2012.  
Jury : E. Carrizosa, Ph. Mahey, P. Pardalos (referees), J-B. Hiriart-Urruty, B. Jouve, F. Messine, M. Mongeau.
- *2009*: On the French National University Council (CNU) **qualification** lists for “Maître de Conférences” in section 26 (applied mathematics) and 27 (computer science).

- **Jan 2006: Ph.D. in Mathematical Sciences,**  
 Thesis title: *On the application of iterative solvers to KKT systems in Interior Point methods for Large-Scale Quadratic Programming problems.*  
 Awarded by: University of Naples “Federico II”, Italy.  
 Awarded on: 10th January 2006.  
 Supervisor: Prof. M. D’Apuzzo.  
 Jury: Prof. M. Marino, Prof. D. Giachetti, Prof. M. Lapegna.
- **Oct 2001: Master in Mathematics,**  
 110/110 cum Laude  
 Thesis title: *Quadratic Optimization: Algorithms and Software for sparse problems.*  
 Awarded by: Second University of Naples, Italy.  
 Awarded on: 30th October 2001.  
 Supervisor: Prof. M. D’Apuzzo.

## Employment History

- *July 2013 - present*  
**Professor**  
 École Nationale de l’Aviation Civile (ENAC) [The French University of Civil Aviation]  
 Department of Air Navigation Engineering and Sciences,  
 Laboratory of Applied Mathematics, Computer Science and Automation for Aeronautics (MAIAA)  
 (MAIAA: Mathématiques Appliquées, Informatique et Automatique pour l’Aérien),  
 Toulouse, France.
- *Dec 2009 - June 2013*  
**Assistant Professor**<sup>1</sup>  
 École Nationale de l’Aviation Civile (ENAC),  
 Department of Air Navigation Engineering and Sciences,  
 Laboratory of Applied Mathematics, Computer Science and Automation for Aeronautics (MAIAA)  
 (Mathématiques Appliquées, Informatique et Automatique pour l’Aérien),  
 Toulouse, France.
- *Mar 2008 - Nov 2009*  
**Post-doc Researcher**  
 Laboratoire d’Informatique (LIX), École Polytechnique, France.  
 Topic: Reformulation techniques in Mathematical Programming.  
 Research advisor: Prof. L. Liberti.
- *Jun 2007 - Feb 2008*  
**Post-doc Researcher**  
 Interdipartimental Research Center Bioagromed, University of Foggia, Italy.  
 Topic: PDE-based mathematical models for food science applications.  
 Research advisor: Prof. M.A. Del Nobile.

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<sup>1</sup> *Enseignant-Chercheur (HDR since Dec.2012)*, equivalent to *Maître de Conférence* in France.

- *Sep 2006 - May 2007*  
**Research Fellow**  
 Department of Mathematics, Second University of Naples, Italy.  
 Topic: Development of software tools for Quadratic Programming.  
 Research advisor: Prof. M. D'Apuzzo.
- *Jun 2001 - Sep 2001*  
**Stage** at Center for Research on Parallel Computing and Supercomputers - CPS/CNR, nowadays  
*Institute for High Performance Computing and Networking - ICAR/CNR - Naples branch.*  
 Topic: Algorithms and software for high performance computing.

## Awards

- **Prix for scientific excellence (highest level) at ENAC**, since 2013.
- *1999/2000:*  
**Second University of Naples Prize**,  
 for the best students during the academic year (1st place).
- *1998/1999:*  
**Second University of Naples Prize**,  
 for the best students during the academic year (2nd place).

## Academic Professional Activities

- **Editorial responsibilities**
  - Associate Editor for *International Transactions in Operational Research* (ITOR) since September 2011.
  - Guest Editor with L. Liberti and F. Messine of a special issue of *Journal of Global Optimization* dedicated to the Toulouse Global Optimization workshop 2010, Volume 56 (3), July 2013.
  - Guest Editor with U. Faigle and L. Liberti of a special issue of *Discrete Applied Mathematics* dedicated to the CTW09 conference, Volume 159 (16), pages 1659-1914, September 2011.

- **Conference and Seminar organization**

### Seminars

Member of the organizing committee of SPOT: Pluridisciplinary Optimization Seminar in Toulouse, since June 2013. This is a monthly seminar, with two speakers per session.

### Conferences

- Program committee member, EUROPT 2017 - 15th EUROPT Workshop on Advances in Continuous Optimization, Montreal, Canada, July 2017.

- Program committee member, LION 11, Learning and Intelligent Optimization Conference, Nizhny Novgorod, Russia, June 2017.
- Program committee member, ROADEF 2017 (French Conference on Operations Research), Metz, France, February 2017.
- Program committee member, EUROPT 2016 - 14th EUROPT Workshop on Advances in Continuous Optimization, Warsaw, Poland, July 2016.
- Scientific committee member, NUMTA 2016: Numerical Computations: Theory and Algorithms, Calabre, Italy, June 2016.
- Local organizing committee member for *journées SMAI-MODE* (Mathematics of Optimization and DEcision) 2016, Toulouse, March 2016.
- Organizing chair of the *Mixed-Integer Nonlinear Programming* stream (3 sessions) at EURO 2015 Conference (European Conference on Operations Research), Glasgow, UK, July 2015.
- Scientific committee member of the 2nd day of the *Working group on Mathematical Programming of the French Operations Research Group*, Dijon, France, June 2015.
- Co-chair, with Ph. Mahey and F. Messine, of the first days of the *Working group on Mathematical Programming of the French Operations Research Group*, Toulouse, France, June 2014.
- Organizing co-chair of the stream *Logistique, localisation, transport et contrôle aérien*, with D. Feillet, C. Prins and R. Wolfer-Calvo, at ROADEF 2014 (French Conference on Operations Research), Bordeaux, France, February 2014.
- Organizing co-chair of the *Mixed-Integer Nonlinear Programming* stream (8 sessions) at EURO-INFORMS 2013 Conference (European Conference on Operations Research), Rome, Italy, July 2013.
- Local organizing committee member in ISIATM 2013 - Interdisciplinary Science for Innovative Air Traffic Management, Toulouse, France, July 2013.
- Session co-chair at ROADEF 2013 (French Conference on Operations Research), Troyes, France, February 2013. Session title “Trafic Aérien et Transport Aérien”.
- Organizing co-chair of the *Mixed-Integer Nonlinear Programming* stream (7 sessions) at EURO 2012 Conference (European Conference on Operations Research), Vilnius, Lithuania, July 2012.
- Scientific committee member in Global Optimization Workshop (GOW’12), Natal, Brasil, June 2012.
- Local organizing committee member in JFPC 2012 (French Conference on Constraint Programming), Toulouse, France, May 2012.
- Session co-chair at ROADEF 2012 (French Conference on Operations Research), Angers, France, April 2012. Session title “Transport et Controle Aérien”.
- Session chair at OR 2011 (International Conference on Operations Research), Zurich, Switzerland, Sept 2011. Session title “Airline, airport and air traffic management”.
- Session co-chair at ROADEF 2011 (French Conference on Operations Research), Saint Etienne, France, March 2011. Session title “Transport et Controle Aérien”.
- Scientific and local organizing committee member in Toulouse Global Optimization workshop (TOGO10) in Toulouse, France, August-September 2010. Co-editor of the Conference Proceedings.

- Session chair within the stream *Mixed-Integer Nonlinear Programming* at EURO 2010 Conference (European Conference on Operations Research), Lisbon, Portugal, July 2010.
  - Local organizing committee member in CTW09 international workshop on Graphs and Combinatorial Optimization in Paris, France, June 2009. Co-editor of the Conference Proceedings.
- **Referee** for
    - international journals:  
Journal Of Global Optimization, Optimization Letters, Computational Optimization and Applications, Journal Of Control, Journal of Computer Mathematics, Information Processing Letters, Discrete Applied Mathematics, SIAM Journal on Optimization, TOPR, Annals of Operations Research, Optimization and Engineering, Optimization, Operations Research, Physica A.
    - international conferences:  
CTW09, TOGO10, SEA2012, GOW'12.
    - grant applications to Natural Sciences and Engineering Research Council of Canada (NSERC).
  - **Membership**
    - ROADEF (French Operations Research Society) since 2009
    - MOS (Mathematical Optimization Society, previously Mathematical Programming Society) since 2010
    - EUROPT (The Continuous Optimization Working Group of EURO), since 2014.  
Member of the **Managing Board** 2014-2016, 2016-2018, editor of the Newsletter.
    - SMAI (French Society of Industrial and Applied Mathematics), since 2014.  
Member of the **committee of the group MODE** 2014-2015, 2016-2017.
    - Member and scientific advisor of the Working group GdR Mathematical Programming.
    - Member of the Working group GdR CNRS MOA (Mathematics of Optimization and Applications).
    - Member of the research group TORO - Toulouse Operations Research and Optimization - which gathers people working on Operation Research and Optimization in research laboratories and Universities in Toulouse, France, since its foundation in 2011: [www.toro-toulouse.fr](http://www.toro-toulouse.fr)

## Grants and Projects

- **Funded projects**
  - *ATOMIC: Air Traffic Optimization via Mixed-Integer Computation*, ANR JCJC Project, funded by ANR (Agence Nationale de la Recherche).  
Principal Investigator (PI), 189 KEUR, 3 years, started Jan 2013.
  - *PhD fellowship funding*, awarded by PRES University of Toulouse.  
PI, 88 KEUR, 3 years, started 2011.

- **Participation in scientific projects**

- 2015-2016  
*ToCoNet - Toulouse Complex Network*, project “Transversality” - IDEX Toulouse.
- 2012-2013  
*ORGE - Optimisation Robuste de dispositifs magnétiques à Grands Entrefers*, BQR project funded by INPT-INSA-ISAE.
- 2009-2012  
*RMNCCO (project on Reformulations in Mathematical Programming)*, funded by Digiteo.
- 2008-2009  
*ARS - Automatic Reformulations Search*, ANR JCJC Project, funded by French 'Agence Nationale de la Recherche' (ANR), (post-doc research activity).
- 2005- 2007  
*Innovative Problems and Methods in Nonlinear Optimization*, PRIN Project, funded by Italian Ministry of University and Research (MIUR).
- 2003- 2006  
*Large Scale Nonlinear Optimization*, FIRB Project, funded by Italian MIUR.

## Publications

- **International Journals**

1. S. Cafieri, D. Rey, *Maximizing the number of conflict-free aircraft using mixed-integer nonlinear programming*, **Computers & Operations Research**, 80: 147-158, 2017, published online Dec 2016 – doi = <http://dx.doi.org/10.1016/j.cor.2016.12.002>, url = [www.sciencedirect.com/science/article/pii/S0305054816303021](http://www.sciencedirect.com/science/article/pii/S0305054816303021)
2. S. Cafieri, R. Omhenni, *Mixed-Integer Nonlinear Programming for Aircraft Conflict Avoidance by sequentially applying velocity and heading angle changes*, **European Journal of Operational Research**, in press, published online Dec 2016 – doi = <http://dx.doi.org/10.1016/j.ejor.2016.12.010>, url = [www.sciencedirect.com/science/article/pii/S0377221716310293](http://www.sciencedirect.com/science/article/pii/S0377221716310293).
3. S. Cafieri, F. Monies, M. Mongeau, C. Bes, *Plunge milling time optimization via mixed-integer nonlinear programming*, **Computers & Industrial Engineering**, 98: 434-445, 2016.
4. S. Cafieri, A. Costa, P. Hansen, *Adding cohesion constraints to models for modularity maximization in networks*, **Journal of Complex Networks**, 3 (3): 388-410, 2015.
5. S. Cafieri, P. Hansen, N. Mladenović, *Edge-ratio network clustering by Variable Neighborhood Search*, **European Physical Journal B**, 87:116, 2014.
6. S. Cafieri, N. Durand, *Aircraft deconfliction with speed regulation: new models from mixed-integer optimization*, **Journal of Global Optimization**, 58(4):613-629, 2014.
7. S. Cafieri, A. Costa, P. Hansen, *Reformulation of a model for hierarchical divisive graph modularity maximization*, **Annals of Operations Research**, 222 (1): 213-226, 2014.
8. S. Cafieri, L. Liberti, F. Messine, B. Nogarede, *Optimal Design of Electrical Machines: Mathematical Programming Formulations*, **COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering**, 32(3):977-996, 2013.

9. S. Cafieri, P. Hansen, L. Liberti, *Improving heuristics for network modularity maximization using an exact algorithm*, **Discrete Applied Mathematics**, DOI 10.1016/j.dam.2012.03.030, in press, 2012.
  10. S. Cafieri, G. Caporossi, P. Hansen, S. Perron, A. Costa, *Finding communities in networks in the strong and almost-strong sense*, **Physical Review E**, 85(4):046113, 2012.
  11. S. Cafieri, P. Hansen, L. Liberti, *Locally optimal heuristic for modularity maximization of networks*, **Physical Review E**, 83(5):056105, 2011.
  12. D. Aloise, S. Cafieri, G. Caporossi, P. Hansen, L. Liberti, S. Perron, *Column generation algorithms for exact modularity maximization in networks*, **Physical Review E**, 82(4):046112, 2010.
  13. S. Cafieri, P. Hansen, L. Liberti, *Loops and multiple edges in modularity maximization of networks*, **Physical Review E**, 81(4):046102, 2010.
  14. S. Cafieri, P. Hansen, L. Liberti, *Edge ratio and community structure in networks*, **Physical Review E**, 81(2):026105, 2010.
  15. S. Cafieri, J. Lee, L. Liberti, *On convex relaxations of quadrilinear terms*, **Journal of Global Optimization**, 47:661–685, 2010.
  16. S. Cafieri, M. Mastromatteo, S. Chillo, M.A. Del Nobile, *Modeling the mechanical properties of pasta cooked at different times*, **Journal of Food Engineering**, 100: 336–342, 2010.
  17. S. Cafieri, S. Chillo, M. Mastromatteo, N. Suriano, M.A. Del Nobile, *A mathematical model to predict the effect of shape on pasta hydration kinetic during cooking and overcooking*, **Journal of Cereal Science**, 48 (3): 857–862, 2008.
  18. S. Cafieri, M. D’Apuzzo, V. De Simone, D. di Serafino, G. Toraldo, *Convergence Analysis of an Inexact Potential Reduction Method for Convex Quadratic Programming*, **Journal of Optimization Theory and Applications**, 135: 355–366, 2007.
  19. S. Cafieri, M. D’Apuzzo, V. De Simone, D. di Serafino, *Stopping criteria for inner iterations in inexact Potential Reduction methods: a computational study*, **Computational Optimization and Applications**, special issue on Linear Algebra issues arising in Interior Point methods, J. Gondzio and G. Toraldo eds., 36 (2): 165-193, 2007.
  20. S. Cafieri, M. D’Apuzzo, V. De Simone, D. di Serafino, *On the Iterative Solution of KKT Systems in Potential Reduction Software for Large Scale Quadratic Problems*, **Computational Optimization and Applications**, special issue on High Performance Algorithms and Software for Nonlinear Optimization, A. Murli and G. Toraldo eds, 38: 27–45, 2007.
  21. S. Cafieri, M. D’Apuzzo, M. Marino, A. Mucherino, G. Toraldo, *Interior Point Solver for Large-Scale Quadratic Programming Problems with Bound Constraints*, **Journal of Optimization Theory and Applications**, 129 (1): 55–75, 2006.
- **Edited volumes and journal issues**
    22. S. Cafieri, L. Liberti, F. Messine (eds.), *Toulouse Global Optimization Workshop 2010*, **special issue of the Journal of Global Optimization** dedicated to the TOGO10 Conference, Volume 56 (3), 2013.
    23. S. Cafieri, U. Faigle, L. Liberti (eds.), *Graphs and Combinatorial Optimization*, **special issue of Discrete Applied Mathematics** dedicated to the CTW09 Conference, Volume 159 (16), pages 1659-1914, 2011.

24. S. Cafieri, B.G. Tóth, E.M.T. Hendrix, L. Liberti, F. Messine (eds.), *Proceedings of the Toulouse Global Optimization workshop (TOGO10)*, Toulouse, 2010.
  25. S. Cafieri, A. Mucherino, G. Nannicini, F. Tarissan, L. Liberti (eds.), *Proceedings of CTW09 Conference on Graphs and Combinatorial Optimization*, Paris, 2009.
- **Book chapters (refereed)**
    26. S. Cafieri, *MINLP in Air Traffic Management: Aircraft conflict avoidance*, in Terlaky, T., Anjos, M., Ahmed, S. (Eds.), *Advances and Trends in Optimization with Engineering Applications. MOS-SIAM Series on Optimization*. SIAM, Philadelphia, 2017.  
print ISBN: 9781611974676, ebook ISBN: 9781611974683.
    27. S. Cafieri, P. Hansen, *Using mathematical programming to refine heuristic solutions for network clustering*, in P. Pardalos, M. Batsyn, V. Kalyagin (Eds.), *Proceedings of the Third International Conference on Network Analysis*, **Series : Springer Proceedings in Mathematics & Statistics**, Vol 104, pp. 9-20, 2014.
    28. S. Cafieri, P. Hansen, N. Mladenović, *Variable Neighborhood Search for Edge-Ratio Network Clustering*, in S. Butenko, L. Pasiliao, V. Shylo (Eds.), *Examining Robustness and Vulnerability of Networked Systems*, **NATO Science for Peace and Security Series - D:Information and Communication Security**, Vol 37, pp. 51-64, IOS press, 2014.
    29. P. Belotti, S. Cafieri, J. Lee, L. Liberti, A. Miller, *On the composition of convex envelopes for quadrilinear terms*, in A. Chinchuluun, P.M. Pardalos, R. Enkhbat and E.N. Pistikopoulos (eds.), *Optimization, Simulation and Control*, **Series : Springer Optimization and its Applications**, Vol. 76, Springer, 2013.
    30. L. Liberti, S. Cafieri, F. Tarissan, *Reformulations in Mathematical Programming: a Computational Approach*, in A. Abraham, A.-E. Hassanien, P. Siarry, and A. Engelbrecht (eds.), *Foundations of Computational Intelligence Vol. 3 (Global Optimization: Theoretical Foundations and Applications)*, **Series: Studies in Computational Intelligence**, 203:153-234, Springer, Berlin, 2009.
  - **International Conference publications (refereed)**
    31. S. Cafieri, E. Carrizosa, *A clustering-based algorithm for aircraft conflict avoidance*, in *Proceedings of Global Optimization Workshop (GOW'16)*, Braga, Portugal, 2016.
    32. S. Cafieri, F. Messine, A. Touhami, *On solving Aircraft Conflict Avoidance using Deterministic Global Optimization (sBB) Codes*, in *Proceedings of Global Optimization Workshop (GOW'16)*, Braga, Portugal, 2016.
    33. J. Zhou, S. Cafieri, D. Delahaye, M. Sbihi, *Optimizing the Design of a Route in Terminal Maneuvering Area Using Branch and Bound*, in *Air Traffic Management and Systems II*, **Lecture Notes in Electrical Engineering**, Springer, to appear.
    34. D. Delahaye, S. Pierre, S. Cafieri, *Aircraft Trajectory Planning with Dynamical Obstacles by Artificial Evolution and Convex Hull Generations*, in *Air Traffic Management and Systems II*, **Lecture Notes in Electrical Engineering**, Springer, to appear.
    35. J. Zhou, S. Cafieri, D. Delahaye, M. Sbihi, *Optimal Design of SIDs/STARs in TMA Using Simulated Annealing*, in *Proceedings of DASC 2016*, 35th Digital Avionics Systems Conference, Sacramento, 2016.



36. L. Houssin, I. Hamaz, S. Cafieri, *The time varying cyclic job shop problem*, in Proceedings of the 15<sup>th</sup> International Conference on Project Management and Scheduling (**PMS 2016**), Valencia, Spain, 2016.
37. S. Cafieri. *Maximizing the number of solved aircraft conflicts through velocity regulation*, in Proceedings of Mathematical and Applied Global Optimization (**MAGO-GOW'14**), Global Optimization Workshop 2014, Malaga, Spain, pp. 129-132, 2014.
38. J. Zhou, S. Cafieri, D. Delahaye, M. Sbihi, *Optimization of Arrival and Departure Routes in Terminal Maneuvering Area*, in Proceedings of **ICRAT 2014** - 6th International Conference on Research in Air Transportation, Istanbul, Turkey, May 2014.
39. L. Cellier, S. Cafieri, F. Messine, *Optimal Control Approaches for Aircraft Conflict Avoidance using Speed Regulation: a Numerical Study*, in Proceedings of the 2nd International Conference on Interdisciplinary Science for Innovative Air Traffic Management (**ISIATM 2013**), Toulouse, 2013.
40. L. Cellier, S. Cafieri, F. Messine, *A Decomposition-based Optimal Control Approach for Aircraft Conflict Avoidance Performed by Velocity Regulation*, in G. Brat et al. (eds.), Proceedings of the 3rd International Conference on Application and Theory of Automation in Command and Control Systems (**ATACCS 2013**), pp. 129-131, Naples, Italy, 2013. ISBN: 978-2-917490-24-2
41. L. Cellier, S. Cafieri, F. Messine, *Hybridizing direct and indirect optimal control approaches for aircraft conflict avoidance*, in Proceedings of the sixth international conference on Advanced Engineering Computing and Applications in Sciences (**ADVCOMP 2012**), pp. 42-45, Barcelone, 2012.
42. S. Cafieri, *Aircraft conflict avoidance: a mixed-integer nonlinear optimization approach*, in Proceedings of Global Optimization Workshop (**GOW'12**), pp. 43-46, Natal, 2012.
43. S. Cafieri, P. Hansen, L. Létocart, L. Liberti, F. Messine, *Compact relaxations for polynomial programming problems*, in R. Klasing (eds.), Experimental Algorithms (Proceedings of **SEA 2012**), **Lecture Notes in Computer Science** 7276:75-86, Springer, Berlin, 2012.
44. P. Belotti, S. Cafieri, L. Liberti, J. Lee, *Feasibility-based bounds tightening via fixed points*, in W. Wu and O. Daescu (eds.), Proceedings of Conference on Combinatorial Optimization and Applications (**COCOA 2010**), **Lecture Notes in Computer Science**, 6508:65-76, 2010.
45. S. Cafieri, L. Liberti, F. Messine, B. Nogarede, *Discussion about formulations and resolution techniques of electrical machine design problems*, in Proceedings of XIX International Conference on Electrical Machines (**ICEM 2010**), **IEEE Xplore**, 2010.
46. S. Cafieri, P. Brisset, N. Durand, *A mixed-integer optimization model for Air Traffic Deconfliction*, in Proceedings of Toulouse Global Optimization workshop (**TOGO 2010**), pp. 27-30, Toulouse, 2010.
47. L. Liberti, S. Cafieri, D. Savourey, *The Reformulation-Optimization Software Engine*, in Komei Fukuda et al. (eds.), International Congress of Mathematical Software (**ICMS 2010**), **Lecture Notes in Computer Science**, 6327:303-314, 2010.
48. S. Cafieri, P. Hansen, L. Liberti, *Improving heuristics for network modularity maximization using an exact algorithm*, **MatHeuristics 2010**, pp. 130-139, Vienna, 2010.
49. P. Belotti, S. Cafieri, J. Lee, L. Liberti, *On the convergence of feasibility based bounds tightening*, in U. Faigle, R. Schrader, D. Herrmann (eds.), Proceedings of **CTW 2010**, 21-24, Köln 2010.

50. S. Cafieri, P. Hansen, L. Létocart, L. Liberti, F. Messine, *Reduced RLT constraints for polynomial programming*, in P. Bonami, L. Liberti, A. Miller, A. Sartenaer, Proceedings of European Workshop on MINLP 2010 (**EWMINLP 2010**), Marseille, 2010.
  51. S. Cafieri, J. Lee, L. Liberti, *Comparison of convex relaxations of quadrilinear terms*, World Congress on Global Optimization, in C. Ma, L. Yu, D. Zhang, Z. Zhou (eds.), Global Optimization: Theory, Methods and Applications I, **Lecture Notes in Decision Sciences**, 12(B):999-1005, Global-Link Publishers, Hong Kong 2009.
  52. S. Cafieri, M. D'Apuzzo, V. De Simone, D. di Serafino, *On the Use of an Approximate Constraint Preconditioner in a Potential Reduction Algorithm for Quadratic Programming*, **SIMAI 2007**, in V. Cutello, G. Fotia and L. Puccio (eds.), Applied and Industrial Mathematics in Italy II, **Series on Advances in Mathematics for Applied Sciences** Vol. 75, World Scientific, 2007.
- **National Conference publications (refereed)**
    53. S. Cafieri, A. Costa, P. Hansen, *Clustering dans les réseaux par maximisation de modularité avec des contraintes de cohésion*, in Proceedings of ROADEF 2015, Marseille, France, 2015.
    54. J. Zhou, S. Cafieri, D. Delahaye, M. Sbihi, *Optimisation des routes de départ et d'arrivée dans la TMA*, in Proceedings of ROADEF 2015, Marseille, France, 2015.
    55. L. Cellier, S. Cafieri, F. Messine, *Combinaison de méthodes de contrôle optimal pour l'évitement de collision dans le trafic aérien*, in Proceedings of ROADEF 2013, Troyes, France, 2013.
    56. L. Cellier, S. Cafieri, F. Messine, *Résolution de conflit aérien par contrôle optimal basé sur la régulation en vitesse*, in Proceedings of ROADEF 2012, Angers, France, 2012.
    57. S. Cafieri, A. Gondran, S.U. Ngueveu, *Un algorithme mémétique pour construire des trajectoires d'aéronefs robustes aux aléas météorologiques*, in Proceedings of ROADEF 2012, Angers, France, 2012.
    58. S. Cafieri, P. Hansen, *Modularity Clustering on Trees*, in Proceedings of ROADEF 2012, Angers, France, 2012.
    59. A. Costa, S. Cafieri, P. Hansen, *Reformulation of a locally optimal heuristic for modularity maximization*, in Proceedings of ROADEF 2012, Angers, France, 2012.
    60. S. Cafieri, P. Hansen, L. Liberti, *Hierarchical clustering for the identification of communities in networks*. Proceedings of ROADEF 2011, Saint Etienne, France, 2011.
    61. D. Aloise, S. Cafieri, G. Caporossi, P. Hansen, L. Liberti, S. Perron, *Algorithms for network modularity maximization*, Proceedings of ROADEF 2010, Toulouse, France, 2010.
    62. L. Liberti, S. Cafieri, J. Lee, *Range reduction using fixed points*, Proceedings of ROADEF 2010, Toulouse, France, 2010.
    63. S. Cafieri, J. Lee, L. Liberti, *Convex relaxations for quadrilinear terms*, Proceedings of ROADEF 09, Nancy, France, 2009.
    64. S. Cafieri, P. Hansen, L. Liberti, *Reformulations between structured global optimization problems and algorithms*, Proceedings of ROADEF 09, Nancy, France, 2009.
  - **Theses**

65. S. Cafieri, *From Local to Global and back: A closed walk in Mathematical Programming and its Applications*, Habilitation à Diriger des Recherches, Université Paul Sabatier de Toulouse, 2012.
66. S. Cafieri, *On the application of iterative solvers to KKT systems in Interior Point methods for Large-Scale Quadratic Programming problems*, Ph.D. Thesis, University of Naples “Federico II”, 2006.
67. S. Cafieri, *Ottimizzazione quadratica: algoritmi e software per problemi sparsi* (in Italian), Tesi di Laurea, Second University of Naples, 2001.

- **Technical Reports and submitted papers**

- S. Cafieri, E. Carrizosa, *Aircraft clustering for conflict avoidance*, submitted, Jan. 2017.
- S. Cafieri, C. D’Ambrosio, *Feasibility Pump for aircraft deconfliction with speed regulation*, submitted, Jan. 2017.
- J. Zhou, S. Cafieri, D. Delahaye, M. Sbihi, *Optimal Design of Departure and Arrival Routes in Terminal Maneuvering Area*, submitted, Jan. 2017.
- S. Cafieri, L. Cellier, F. Messine, R. Omhenni, *Combination of optimal control approaches for aircraft conflict avoidance via velocity regulation*, submitted, Jan. 2017.
- F. Mitjana, S. Cafieri, F. Bugarin, C. Gogu, F. Castanie, *Truss-like structures optimization under buckling constraints using frame elements with anisotropic cross sections*, submitted, Jan. 2017.
- F. Monies, I. Danis, C. Bes, S. Cafieri, M. Mongeau, *A new machining strategy for roughing deep pockets of magnesium-rare earth alloys*, submitted, Jan. 2017.
- P. Belotti, S. Cafieri, J. Lee, L. Liberti, *On feasibility based bounds tightening*, Optimization Online preprint n.3325, Jan 2012.
- A. Mucherino, S. Cafieri, *A New Heuristic for Feature Selection by Consistent Biclustering*, arXiv e-print, arXiv:1003.3279v1, March 2010.

## Conferences and Workshops presentations

- GOW’16 - Global Optimization Workshop, Braga, Portugal, September 1-4, 2016.  
“A clustering-based algorithm for aircraft conflict avoidance.”
- EUROPT 2016 - Workshop on Advances in Continuous Optimization, Warsaw, July 1-2, 2016.  
“Solving aircraft conflicts by continuous optimization”.
- NUMTA 2016 - *Numerical Computations: Theory and Algorithms*, Pizzo Calabro, Italy, June 19-25, 2016.  
“Solving aircraft conflicts by continuous optimization and mixed-integer nonlinear programming”.
- Workshop Advanced Mathematics for Network Analysis, Luchon, France, May 1-4 2016.  
“Optimization of Network Clustering”. (**Invited speaker**).

- EIWAC 2015 - The 4<sup>th</sup> ENRI International Workshop on ATM/CNS, Tokyo, Japan, November 17-19, 2015. “Optimizing the Design of a Route in Terminal Maneuvering Area Using Branch and Bound” (speaker: J. Zhou).
- EURO XXVIII - *European conference on Operations Research*, Glasgow, UK, July 12-15, 2015. “Maximizing the number of conflict-free aircraft using Mixed-Integer Nonlinear Programming”.
- EUROPT 2015 - Workshop on Advances in Continuous Optimization, Edinburgh, UK, July 8-10, 2015. “Modularity maximization clustering with cohesion conditions”.
- MINLP 2015 - *Mixed-Integer Nonlinear Programming 2015*, Universidad de Sevilla, Spain, March 30-April 1, 2015. (**Invited speaker**). “MINLP in Air Traffic Management”.
- ROADEF’15, Marseille, France, Feb 2015. “Clustering dans les réseaux par maximisation de modularité avec des contraintes de cohésion”.
- ROADEF’15, Marseille, France, Feb 2015. “Optimisation des routes de départ et d’arrivée dans la TMA” (speaker: J. Zhou).
- Workshop on Clustering and Search techniques in large scale networks, Nizhny Novgorod, Russia, November 3-8, 2014. (**Plenary speaker**). “On Network Clustering by Modularity Maximization with Cohesion Conditions”.
- MAGO-GOW’14 - *Mathematical and Applied Global Optimization 2014*, Malaga, Spain, Sept 1-4, 2014. “Maximizing the number of solved aircraft conflicts through velocity regulation”.
- MINLP 2014 - *Mixed-Integer Nonlinear Programming 2014*, Carnegie Mellon University, Pittsburgh, USA, June 2-5, 2014. (**Invited speaker**). “MINLP emerging applications in Air Traffic Management”.
- ROADEF’14, Bordeaux, France, Feb 2014. “Régulation en vitesse pour un problème d’évitement de conflit aérien : combinaison des résolutions directe et indirecte de contrôle optimal” (speaker: L. Cellier).
- CWMINLP 2013 - *COST Workshop on Mixed Integer Nonlinear Programming*, Paris, France, Sept 30 - Oct 2, 2013 (**Invited speaker**). “MINLP formulations for the Aircraft Conflict Avoidance problem”.
- ICCOPT 2013 - *4th International Conference on Continuous Optimization*, Lisbon, Portugal, July 27-Aug 1, 2013. “Aircraft conflict avoidance by mixed-integer nonlinear optimization models combining turn and velocity change maneuvers”. “Combining direct and indirect methods to solve aircraft conflict avoidance problems” (speaker: L. Cellier).
- ISIATM 2013 - *2nd International Conference on Interdisciplinary Science for Innovative Air Traffic Management*, Toulouse, France, July 8-11, 2013. “Optimal control approaches for aircraft conflict avoidance using speed regulation : a numerical study” (speaker: L. Cellier).

- EURO XXVI - *European conference on Operations Research*, Rome, Italy, July 1-4, 2013.  
“Optimal Design of Electrical Machines: Mathematical Programming Formulations”.
- NET 2013 - *3rd International Conference on Network Analysis*, Nizhny Novgorod, Russia, May 20-22, 2013 (**Plenary speaker**).  
“On exact methods for network clustering”.
- Summer School on Operational Research and Applications, Nizhny Novgorod, Russia, May 15-18, 2013 (**Invited speaker**).  
“Network clustering: from models to methods”.
- EUROmC-VNS - *EURO Mini Conference XXVIII on Variable Neighbourhood Search*, Herceg Novi, Montenegro, Oct. 4-7, 2012.  
“Variable Neighborhood Search for edge-ratio network clustering”.
- EURO XXV - *European conference on Operations Research*, Vilnius, Lithuania, July 8-11, 2012.  
“Aircraft conflict avoidance: a mixed-integer nonlinear optimization approach”.
- GOW’12 - *Global Optimization Workshop*, Natal, Brazil, June 25-29, 2012.  
“Aircraft conflict avoidance: a mixed-integer nonlinear optimization approach”.
- ROADEF’12, Angers, France, avril 2012.  
“Modularity Clustering on Trees”.  
“Reformulation of a locally optimal heuristic for modularity maximization” (speaker: A. Costa).  
“Résolution de conflit aérien par contrôle optimal basé sur la régulation en vitesse” (speaker: L. Cellier).  
“Un algorithme mémétique pour construire des trajectoires d’aéronefs robustes aux aléas météorologiques (speaker: A. Gondran).
- AFG’11 - *15th Austrian-French-German conference on Optimization*, Toulouse, France, Sept 19-23, 2011.  
“Reduced RLT compact relaxations for polynomial programming”.
- OR 2011 - *International Conference on Operations Research*, Zurich, Switzerland, Aug 30-Sept 2, 2011.  
“Aircraft deconfliction: a heuristic based on local exact solutions”.
- IFORS 2011 - *Conference of the International Federation of Operations Research Societies*, Melbourne, Australia, July 10-15, 2011.  
“Hierarchical Network Clustering”.
- ROADEF’11, Saint Etienne, France, March 2011.  
“Hierarchical clustering for the identification of communities in networks”.
- ICEM 2010 - *XIX International Conference on Electrical Machines*, Rome, Italy, Sept 6-8, 2010.  
“Discussion about formulations and resolution techniques of electrical machine design problems”.
- TOGO10 - *Toulouse Global Optimization workshop*, Toulouse, France, Aug 31-Sept 3, 2010.  
“A mixed-integer optimization model for Air Traffic Deconfliction”.
- COSC10 - *International Conference on Optimization, Simulation and Control*, Ulan Baatar, July 25-28, 2010.  
“On the composition of convex envelopes for quadrilinear terms”.

- EURO XXIV - *European conference on Operations Research*, Lisbon, Portugal, July 11-14, 2010.  
“Reduced Reformulation-Linearization Technique for Polynomial Programs”.
- *MatHeuristics 2010*, Vienna, Austria, June 27-30, 2010.  
“Improving heuristics for network modularity maximization using an exact algorithm”.
- EWMINLP - *European Workshop on MINLP*, Marseille, France, March 2010.  
“Reduced RLT constraints for polynomial programming”.
- ROADEF10, Toulouse, France, February 2010.  
“Algorithms for network modularity maximization”.
- Colloque ANR STIC, Paris, France, January 2010.  
“Automatic Reformulation Search”.
- ISMP09 - *The 20th International Symposium of Mathematical Programming*, Chicago, USA, August 2009.  
“Comparing convex relaxations of quadrilinear terms”.
- WCGO09 - *1st World Congress on Global Optimization in Engineering and Science*, Hunan, China, June 2009. “Comparison of convex relaxations of quadrilinear terms”.
- CIMINLP - *Computational Issues in MINLP*, Bordeaux, France, March 19-20, 2009 (**Invited speaker**).  
“Comparing convex relaxations of quadrilinear terms”.
- ROADEF09, Nancy, France, Feb 10-12 2009.  
“Convex relaxations for quadrilinear terms”.
- ARS08 - *first ANR Automatic Reformulation Search Project Workshop*, École Polytechnique, Palaiseau, France, Oct 31st 2008.  
“Rose: Reformulation/Optimization Software Engine”; “Convex relaxations for quadrilinear terms”.
- *Journée Optimeo*, Versailles, France, June 11 2008.  
“Linear Algebra issues in Interior Point solvers for Quadratic Programming”.
- *IMA Conference on Numerical Linear Algebra and Optimisation*, Birmingham, UK, Sept 13-15 2007.  
“Approximate Constraint Preconditioners for KKT Systems arising in Interior Point Methods”.
- *Conference of the Italian MIUR FIRB project “Large Scale Nonlinear Optimization”*, Capri, Italy, Apr 19-20 2007.  
“Sviluppo di software Interior Point per problemi di Ottimizzazione Quadratica”.
- SIMAI06 - *8th Congress of the Italian Society for Applied and Industrial Mathematics*, Ragusa, Italy, May 22-26 2006.  
“On the use of Constraint Preconditioners in Potential Reduction methods”.
- IFIP TC 7 *Conference on System Modeling and Optimization*, Torino, Italy, July 18-22 2005.  
“A Potential Reduction Solver for Large-Scale Quadratic Programming Problems”.
- AIRO04 - *35th Annual Conference of the Italian Operations Research Society*, Lecce, Italy, Sept 7-10 2004.  
“On Linear Algebra Solvers in Potential Reduction Software for Large Scale Quadratic Problems”.

- *Large Scale Nonlinear Optimization*, Erice, Italy, June 22-July 1 2004.  
“Linear Algebra Issues in Developing Potential Reduction Software for Large Scale Quadratic Programs”.
- *Numerical Methods for Local and Global Optimization: Sequential and Parallel Algorithms*, Cortona, Italy, July 14-20 2003.  
“An Interior Point Solver for Large-Scale Quadratic Programs”.

## Conferences attendance without contribution

- EUROPT 2014 - 12th Workshop on Advances in Continuous Optimization, Perpignan, France, July 10-12, 2014.
- *Recent Advances on Optimization*, Toulouse, France, July 24-26 2013.
- META-CDM workshop - Multimodal, Efficient Transportation in Airports and Collaborative Decision Making, London Heathrow, Jan. 14-16 2013.
- 7me Journée du GT Transport et Logistique, LAAS-CNRS, Toulouse, France, Dec. 5 2011.
- *The First SESAR Innovation Days* - conference of the European project SESAR on Air Traffic Management, ENAC, Toulouse, France, Nov 29-Dec 1, 2011.
- MARAMI 2010 - conference on models and analysis of networks, Toulouse, France, Oct. 11-12 2010.
- *Advanced Methods and Perspectives in Nonlinear Optimization and Control*, Toulouse, France, Feb. 3-5 2010.
- Forum Digiteo 2009, École Polytechnique Paris, France, Oct. 21 2009.
- 5ème Journée Optimeo, Supélec, France, Oct. 1 2009.
- JSPOC5 - *5th Polyhedra and Combinatorial Optimization Workshop*, Institut Henri Poincaré Paris, Apr. 7-9 2009.
- Meeting on “Modélisation, optimisation et analyse statique”. CIRM, Marseille, France, Mar. 10-12 2009.
- 3ème Journée Optimeo, LRI Université Paris-Sud XI Orsay, France, Nov. 21 2008.
- 1ère Journée Optimeo, École Polytechnique Paris, France, Apr. 4 2008.

## Visiting terms and seminars

- ONERA Toulouse, France, June 2015. Invited by F. Boniol.  
Seminar: *Mixed-Integer Nonlinear Programming for Aircraft Conflict Avoidance (ATOMIC)*.

- Université de Limoges, France, December 2013. Invited by equipe MOD.  
Seminar: *MINLP formulations for the Aircraft Conflict Avoidance problem.*  
Lectures pour le Master2 ACSYON : *Mixed Integer Nonlinear Programming and Applications.* Invited by P. Armand.
- LAAS-CNRS, Toulouse, November 2013. Invited by equipe ROC.  
Seminar: *Modèles d'optimisation mixte en nombres entiers pour des problèmes d'évitement des conflits d'aéronefs.*
- Summer School on Operational Research and Applications, Nizhny Novgorod, Russia, May 2013.  
Lectures: *Network clustering: from models to methods*  
Seminar: *Mathematical Programming reformulations in modularity maximizing graph clustering.*  
Invited by Laboratory of Algorithms and Technologies for Networks Analysis.
- Universidad Rey Juan Carlos, Madrid. Visiting professor (4 days), February 2013.  
Invited by L.F. Escudero.
- Séminaire Pluridisciplinaire d'Optimisation de Toulouse (SPOT)/ Pluridisciplinary Optimization Seminar in Toulouse, 7 January 2013.  
Seminar: *Deterministic conflict resolution for air traffic management.*
- INRA (French Institute for Agricultural Research) Toulouse. March 2012.  
Invited by unité de Biométrie et Intelligence Artificielle.  
Seminar: *Clustering dans les réseaux basé sur la maximisation de la modularité.*
- Institut de Mathématiques de Toulouse. May 2011.  
Invited by equipe MIP (Mathématiques pour l'Industrie et la Physique).  
Seminar: *Résoudre les conflits aériens par l'optimisation non-linéaire en variables mixtes.*
- GERAD, HEC Montréal. March 2011. Visiting Researcher, 2 weeks, 1 seminar.  
Invited by P. Hansen.  
Seminar: *Mixed-Integer Optimization for Air Traffic Deconfliction.*
- GERAD, HEC Montréal. July 2009. Visiting Researcher, 1 month, 1 seminar.  
Invited by P. Hansen.  
Seminar: *Convex relaxations in Branch and Bound global optimization methods: quadrilinear terms.*
- LRI, Université Paris XI. 2009, invited by A. Lissier.  
Seminar: *Convex relaxations in Branch and Bound global optimization methods: quadrilinear terms.*
- Lamsade, Université Paris Dauphine. 2009, invited by R. Mahjoub.  
Seminar: *Convex relaxations in Branch and Bound global optimization methods: quadrilinear terms.*
- Center for Applied Optimization, University of Florida, Gainesville. March 2007. Visiting Scholar, 3 weeks. 1 seminar. Invited by P.M. Pardalos.  
Seminar: *On the development of Interior Point Software for Quadratic Programming.*



## Teaching experience

*Note:* Some didactic material for the courses can be downloaded from <http://www.recherche.enac.fr/~cafieri/teaching.html>

- **Numerical Analysis.**  
Referent Professor. ENAC, 2014/2015, 2nd semester; 2015/2016, 2016/2017 1st semester.  
*Syllabus:* floating-point arithmetic and round-off errors, solution of linear systems by direct and iterative methods, solution of nonlinear equations (Newton and secants methods), methods of Euler and Runge-Kutta, polynomial interpolation.  
20 students per group, 2 groups, 18 h×2 cours.  
Course level: first year engineers ENAC.
- **Deterministic Global Optimisation.**  
ENAC, 1st semester 2014/2015, 2015/2016, 2016/2017.  
*Syllabus:* mixed-integer nonlinear programming.  
(around) 15 students, 6 h cours.  
Cours level: Master 2  
in the Toulousian (IMT-IRIT-LAAS-ENAC-ISAE) research master on Operations Research (M2RIT-RO).
- **Combinatorial Optimisation.**  
ENAC, 2nd semester 2014/2015, 2015/2016.  
*Syllabus:* Simplex method, linear integer programming, graphs (spanning tree, shortest paths, flows,...).  
20 students per group, 2 groups, 24 h×2 cours.  
Course level: first year engineers ENAC.
- **Operations Research for Air Transportation.**  
ENAC, 2nd semester 2015/2016.  
*Syllabus:* problems of operations research that arise in air transportation (fleet assignment, aircraft routing,...).  
10 h.  
Course level: second year engineers ENAC.
- **Decision support for air operations.**  
ENAC, 2nd semester 2015/2016.  
*Syllabus:* mentored project on a problem arising in air operations.  
10 h.  
Course level: second year engineers ENAC.
- **Operations Research.**  
ENAC, 2nd semester 2013/2014.  
*Syllabus:* linear Programming, graphs (spanning tree, shortest paths, flow,...).  
20 students per group, 2 groups, 14h×2.  
Course level: first year engineers ENAC.
- **Differential Calculus and Optimization.**  
ENAC, 1st semester 2011/2012, 2012/2013 and 2013/2014.

*Syllabus*: basic concepts and results of Differential Calculus and Nonlinear Optimization.  
 20 students per group, 36 h lectures, 4h computer labs in 2011/12 (1 group), 36 h×2 lectures, 4 h computer labs (2 groups) in 2012/2013 and 2013/2014.  
 Course level: first year engineers ENAC.

- **Discrete Optimization.**  
 ENSEEIHT (École Nationale Supérieure d'Electrotechnique, Electronique, Informatique, Hydraulique et Télécommunications).  
 1st semester 2011/12 – 2016/2017.  
*Syllabus*: introduction to Discrete Optimization, classical problems, branch-and-bound.  
 10-18 students, 8 h lectures + 2 h computer labs.  
 Course level: third year engineers ENSEEIHT.
- Short course: **Mixed Integer Nonlinear Programming and Applications**,  
 University of Limoges, France, in Master 2 ACSYON (module: Combinatorial Optimization).  
 3 h, 1 computer exercise. December 2013 and 2014.  
 Cours level: Master 2.
- Short course: **Network clustering: from models to methods**,  
 in Summer School on Operational Research and Applications,  
 Laboratory of Algorithms and Technologies for Networks Analysis (LATNA), Nizhny Novgorod, Russia.  
 6 h lectures, May 2013.
- **Programming and Algorithms .**  
 ENAC, 2nd semester 2009/10, 2010/2011 and 2011/2012.  
 35 students. 50 h computer labs.  
*Syllabus*: introduction to development of algorithms and programming in C and Caml languages.  
 Course level: first year engineers ENAC.
- **Constraint Programming.**  
 ENAC, 1st semester 2010/2011.  
 16 students, 20h computer labs.  
*Syllabus*: introduction to constraint programming, use of the software ILOG Solver.  
 Course level: third year engineers ENAC.
- **Operations Research: Modelling and Software.**  
 École Polytechnique, 1st semester 2008/09 and 2009/2010.  
 Approximately 15 students, 2 h of lectures, 16 h of computer labs.  
*Syllabus*: the language of mathematical programming, choice of solution algorithms, basic reformulations, complex applications.  
 Course level: M.Sc.
- **Introduction to C++.**  
 École Polytechnique, 1st semester 2009/2010.  
 Approximately 25 students, 6 hours computer labs.  
 Course level: M.Sc.
- **Informatics.**  
 Responsible of the cours.

Second University of Naples, for students of *Biology*, 2nd semester 2005/2006.

300 students, 40 hours lectures, 20 hours computer labs.

*Syllabus*: fundamentals of computer organization and architecture, introduction to the development of algorithms, use of Microsoft Office and basic use of Matlab for visualization and analysis of biological data.

Course level: B.Sc.

- **Informatics**

Second University of Naples, for students of *Biology*, 2nd semester 2002/2003, 2003/2004 and 2004/2005.

*Syllabus*: fundamentals of computer organization and architecture, introduction to the development of algorithms, use of Microsoft Office and basic use of Matlab for visualization and analysis of biological data.

Course level: B.Sc.

- **Introduction to Numerical Methods for Optimization.**

Second University of Naples, for students of *Mathematics* and *Mathematics and Informatics*, 2nd semester 2005/2006.

10 students, 8 hours of lectures.

*Syllabus*: methods for solving unconstrained optimization problems.

Course level: M.Sc.

- **Parallel Computing.**

Second University of Naples, for students of *Mathematics* and *Mathematics and Informatics*, 1st semester, from 2002/03 to 2005/06,

20 students, 10 hours lectures, 10 hours computer labs.

*Syllabus*: methods and strategies for developing parallel software procedures for MIMD computers.

Course level: B.Sc.

- **Numerical Computations.**

Second University of Naples, for students of *Mathematics* and *Mathematics and Informatics*, 2nd semester, from 2002/03 to 2005/06.

50 students, 10 hours lectures, 20 hours of computer labs.

*Syllabus*: solution of linear systems by direct and iterative methods, data representation and interpolation, quadrature formulas, the C programming language.

Course level: B.Sc.

- **Introduction to Programming.**

Second University of Naples, for students of *Mathematics* and *Mathematics and Informatics*, 2nd semester, from 2002/03 to 2005/06.

100 students, 10 hours lectures, 20 hours of computer labs.

*Syllabus*: floating-point arithmetic, round-off errors and basic matrix computation.

Course level: B.Sc.

- **Introduction to Informatics.**

Second University of Naples, for students of *Mathematics* and *Mathematics and Informatics*, 1st semester from 2002/03 to 2005/06,

100 students, 10 hours lectures, 20 hours of computer labs and 10 hours.

*Syllabus*: basic informatics concepts and introduction to Fortran.

Course level: B.Sc.

- **Introduction to HTML.**

Second University of Naples, 2003/04, 2004/05 and 2005/2006.

20 students, 8 hours lectures (mini-cours).

*Syllabus*: introduction to the development of simple web pages by HTML.

- **Computational Mathematics.**

Second University of Naples, for students of *Mathematics*, 1st semester 2002/03 and 2003/04.

20 students, 10 hours lectures, 10 hours computer labs.

*Syllabus*: methods and strategies for developing parallel software procedures for MIMD computers.

Course level: M.Sc.

- **Programming and Numerical Computations.**

Second University of Naples, for students of *Mathematics*, 2nd semester 2002/03 and 2003/04.

30 students, 6 hours lectures, 10 hours computer labs.

*Syllabus*: data representation, interpolation, quadrature formulas, direct and iterative methods for linear systems, solution of nonlinear equations, the C programming language, introduction to Matlab.

Course level: M.Sc.

- **Numerical Analysis.**

Second University of Naples, for students of *Mathematics*, 1st semester, from 2002/03 to 2004/05.

30 students, 6 hours lectures, 10 hours computer labs.

*Syllabus*: computer architecture, floating-point arithmetic, round-off errors, basic linear algebra and introduction to Fortran.

Course level: M.Sc.

- Presentation of the organization of undergraduated courses of the Second University of Naples (2002 to 2006).

## Supervisioning and tutoring

- **Post-doctoral Researchers**

- Jan 2015 - Jan 2016 : Riadh Omheni

- Topic: mixed-integer nonlinear optimisation applied to Air Traffic Management problems (within ATOMIC project).

- Aug 2014 - Feb 2015 & Sept 2013 - Feb 2014: Ahmed Touhami

- Topic: Deterministic Global Optimization applied to Air Traffic Management problems (within ATOMIC project).

- **Doctoral Students**

- Since October 2015 : Ahmed Khassiba, PhD student in Applied Mathematics and Computer Science.

- Topic: Aircraft sequencing under uncertainty.

- (co-supervision with Marcel Mongeau, ENAC, and Fabian Bastin, CIRRELT Montreal).

- Since October 2015 : Idir Hamaz, PhD student in Conception, Analysis, Control and Organization of Systems.  
Topic: Optimization methods for robust cyclical scheduling problems.  
(co-supervision with L. Houssin, LAAS-CNRS).
  - Since February 2015: Florian Mitjana, PhD student in Applied Mathematics and Computer Science.  
Topic: Topology Optimization for the design of aeronautical structures.  
“CIFRE” PhD, funded by Avantis group. (co-supervision with Florian Bugarin).
  - Since October 2013: Jun Zhou, PhD student in Applied Mathematics and Computer Science.  
Topic: Optimal design of departure and arrival SID/STAR routes in Terminal Maneuvering Areas.  
(co-supervision with Mohammed Sbihi).
  - Oct. 2011 - Sept. 2015: Loïc Cellier, PhD student in Applied Mathematics and Computer Science.  
Topic: Optimal Control approaches for Aircraft Conflict avoidance.  
(co-supervision with Frédéric Messine).
- **Undergraduate Students (internships and engineering students)**
    - Jan - March 2015: supervision of an engineering industrial-like project by 5 students, 3rd year engineers ENSEEIHT.  
Topic: Column generation and applications.  
(co-supervision with Sandrine Mouysset).
    - Dec. 2013 - Jun 2014: supervision of the internship of Emmanuel Bigeon, 3rd year engineering student at ENSEEIHT.  
Topic: Development of an AMPL-like interface for a deterministic global optimization solver.  
(co-supervision with Frédéric Messine and Ahmed Touhami).
    - 2011: Supervision of 2 mini-projects on development of C and Caml code by 4 students (each project is developed by 2 students), 1st year engineers ENAC.
    - 2010: Supervision of a mini-project (implementation in Java) by 4 students, second year engineers ENAC. Topic: Analysis of air traffic network.
    - 2010: Supervision of 4 mini-projects on development of C code by 8 students (each project is developed by 2 students), 1st year engineers ENAC.
  - **(past) Master Students, up to 2006**
    - 2006: Co-supervision (with M. D’Apuzzo) of the M.Sc. thesis of A. Aldanese.  
Second University of Naples. Topic: Software for linear programming problems.
    - 2006: Co-supervision (with D. di Serafino) of the M.Sc. thesis of E. Giannelevigna.  
Second University of Naples. Topic: A Potential Reduction method for quadratic optimization.
    - 2004: Co-supervision (with M. D’Apuzzo) of the M.Sc. thesis of L. Minicucci.  
Second University of Naples. Topic: Interior Point methods for quadratic optimization.
  - **Other**
    - Personal tutor for students of Second University of Naples, Italy, every academic year from 2003/2004 to 2005/2006.

## Computer-related skills

- Programming Languages: C, C++, Fortran77/90, Matlab, Perl.
- Operating Systems: Unix, Linux, Windows.
- Linear Algebra Packages: BLAS, LAPACK, ICFS, HSL.
- Optimization Systems and Software: AMPL, IPOPT, SNOPT, CPLEX, COUENNE and others, both commercial and free.
- Parallel Computing Packages: MPI, SCALAPACK.

## Developed Software

- PRQP (*Potential Reduction for Quadratic Programming*)  
solves convex quadratic problems with linear constraints
  - primal-dual infeasible PR method, feasible whenever possible;
  - different solvers for the KKT system: direct, CG, SQMR;
  - exact and reused constraint preconditioner, limited-memory ICF for bound constrained problems;
  - MA27 routine by the HSL library for sparse  $LDL^T$  computation;
  - custom SQMR and sparse matrix-vector products;
  - AMPL and SIF interfaces;
  - Fortran77, C drivers.
- PR-BCQP  
solves convex quadratic problems with only bounds on the variables; it is currently part of PRQP, but can be used as stand-alone software.
- ROSE (*Reformulation/Optimization Software Engine*)  
software framework for automatic reformulations of mathematical programming problems.  
Co-developer, mainly working on
  - reformulators able to automatically provide convex relaxations of non-convex nonlinear problems.
  - data format translators.in COIN-OR: <https://projects.coin-or.org/ROSE>
- Contribution to COUENNE,  
an exact solver for nonconvex MINLPs, in COIN-OR: <https://projects.coin-or.org/Couenne>

## Languages

- Italian: mother tongue.
- French.
- English.