

Giacomo Nannicini

Born: 7th November 1982, Prato, Italy

Citizenship: Italian

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Research interests:

- *Computational Optimization*: methodologies and software for the solution of optimization problems, in particular: linear and nonlinear integer programming problems, network optimization.
- *Applications*: applications in transportation, health care management, engineering, and other areas of business.

Work experience:

- July 2011 - now: visiting scholar at *Sloan School of Management*, Massachusetts Institute of Technology, 77 Massachusetts Ave, Cambridge, MA.
- July 2011 - now: assistant professor at *Singapore University of Technology and Design*, 20 Dover Dr, Singapore.
- September 2009 - June 2011: research fellow at *Tepper School of Business*, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA.
- November 2006 - September 2009: researcher at *Mediamobile*, 27 boulevard Hypolite Marquès, Ivry sur Seine, France.

Education:

- November 2006 - June 2009: Ph.D. in Computer Science at *Ecole Polytechnique*, Paris, France. Final mark: *très honorable*¹.
- September 2004 - September 2006: M.Sc. in Computer Engineering (“Ingegneria Informatica”) at *Università degli studi di Firenze*, Florence, Italy. Final mark: 110/110 summa cum laude.
- September 2001 - September 2004: B.Sc. in Computer Engineering (“Ingegneria Informatica”) at *Università degli studi di Firenze*, Florence, Italy. Final mark: 110/110 cum laude.

Details of education:

- Ph.D. thesis: *Point-to-Point Shortest Paths on Dynamic Time-Dependent Road Networks*. Supervisors: L. Liberti, P. Baptiste, D. Krob. Defence: 18th June 2009.

¹Highest mark awarded by Ecole Polytechnique

- M.Sc. dissertation²: *Global optimization of black-box functions with high evaluation cost* (in Italian). Supervisors: F. Schoen, P. Cappanera. Defence: 26th September 2006.
- B.Sc. dissertation²: *Prediction of cysteine bonding status with machine learning methods* (in Italian). Supervisors: P. Frascioni, A. Passerini. Defence: 15th September 2004.

Publications:

REFEREED JOURNALS:

- G. Nannicini and L. Liberti. Shortest paths on dynamic graphs. *International Transactions in Operational Research*, 15:1-13, 2008.
- G. Nannicini, P. Baptiste, G. Barbier, D. Kroh, and L. Liberti. Fast paths in large-scale dynamic road networks. *Computational Optimization and Applications*, 45(1):143–158, 2010.
- G. Nannicini. Point-to-Point Shortest Paths on Dynamic Time-Dependent Road Networks (Ph.D. thesis abstract). *4OR*, 8(3):327–330, 2010.
- G. Cornuéjols, L. Liberti and G. Nannicini. Improved strategies for branching on general disjunctions. *Mathematical Programming A*, 130(2):225–247, 2011.
- G. Nannicini, D. Delling, D. Schultes and L. Liberti. Bidirectional A* search on time-dependent road networks. *Networks*, accepted for publication, 2010.
- D. Delling and G. Nannicini. Core routing on dynamic time-dependent road networks. *INFORMS Journal on Computing*, accepted for publication, 2010.
- G. Cornuéjols and G. Nannicini. Practical strategies for generating rank-1 split cuts in mixed-integer linear programming. *Mathematical Programming Computation*, 3(4):281–318, 2011.
- L. Liberti, N. Mladenović and G. Nannicini. A recipe for finding good solutions to MINLPs. *Mathematical Programming Computation*, 3(4):349–390, 2011.
- G. Nannicini and P. Belotti. Rounding-based heuristics for nonconvex MINLPs. *Mathematical Programming Computation*, published *Online First*, 2011.

REFEREED JOURNALS (UNDER REVIEW)

- G. Cornuéjols, C. Michini, G. Nannicini. How tight is the corner relaxation?. *Discrete Optimization*, under review after major revision. Submitted in 2011, revised 2011.
- E. Balas, G. Cornuéjols, T. Kis and G. Nannicini. Combining Lift-and-Project and Reduce-and-Split. *INFORMS Journal on Computing*, under review after minor revision. Submitted in 2010, revised 2011 and 2012.

BOOK CHAPTERS:

- L. Liberti, G. Nannicini and N. Mladenović. A good recipe for solving MINLPs. *MATHEURISTICS: Hybridizing metaheuristics and mathematical programming*, volume 10 of Annals of Information Systems, pages 231-245. Springer, 2009.

²In the Italian education system, a thesis must be discussed after each course of study.

- P. Belotti, L. Liberti, A. Lodi, G. Nannicini and A. Tramontani. Disjunctive inequalities: applications and extensions. *Encyclopedia of Operations Research and Management Science*, J. Cochran et al. (eds.), Wiley, Hoboken, to appear. Accepted 2010.
- G. Nannicini, G. Cornuéjols, M. Karamanov and L. Liberti. Branching on split disjunctions. *Combinatorial Optimization: Methods and Applications*, V. Chvátal (ed.), pages 164-182. IOS Press, 2011.

REFEREED CONFERENCES:

- G. Nannicini, P. Belotti, J. Lee, J. Linderoth, F. Margot, A. Wächter. A probing algorithm for MINLP with failure prediction by SVM. *Proceedings of CPAIOR 2011*. To appear.
- G. Nannicini, P. Baptiste, D. Kroh, and L. Liberti. Fast point-to-point shortest path queries on dynamic graphs with interval data. *Proceedings of CTW 2007*, Enschede, 2007.
- G. Nannicini, P. Baptiste, D. Kroh, and L. Liberti. Fast paths in dynamic road networks. *Proceedings of ROADEF 08 (long papers)*, Clermont-Ferrand, 2008.
- G. Nannicini, D. Delling, L. Liberti, D. Schultes. Bidirectional A* on time-dependent graphs. *Proceedings of CTW 2008*, Milan, 2008.
- G. Nannicini, D. Delling, L. Liberti, D. Schultes. Bidirectional A* search for time-dependent fast paths. *Proceedings of WEA 2008*, volume 5038 of Lecture Notes in Computer Science, pages 334-346. Springer, 2008.
- G. Nannicini, P. Baptiste, D. Kroh, and L. Liberti. Fast computation of point-to-point paths on time-dependent road networks. *Proceedings of COCOA 08*, volume 5165 of Lecture Notes in Computer Science, pages 225-234. Springer, 2008.
- D. Delling, G. Nannicini. Bidirectional core-based routing in dynamic time-dependent road networks. *Proceedings of ISAAC 08*, volume 5369 of Lecture Notes in Computer Science, pages 813-824. Springer, 2008.
- G. Nannicini, D. Delling. Core Routing on Time-Dependent Networks. *Proceedings of ROADEF 09*, Nancy, 2009.
- G. Cornuéjols, L. Liberti and G. Nannicini. Improved strategies for branching on general disjunctions. *Proceedings of CTW 09*, Paris, 2009.
- G. Nannicini and P. Belotti. Rounding-based heuristics for nonconvex MINLPs. *Proceedings of EWMINLP*, Marseille, 2010.

PATENTS:

- G. Nannicini. *Estimation de trafic dans un réseau routier* (in French), French patent FR0756225 and European patent 08104580.9–1248. 2009.
- G. Nannicini. *Estimation de plus court chemin dépendant du temps dans un réseau routier* (in French), French patent FR0800366 and European patent 09704762.6–1236. 2009.
- G. Nannicini, D. Delling and D. Schultes. *Estimation de plus court chemin dépendant du temps dans un réseau routier* (in French), French patent FR0851725, under review as European patent. 2009.

EDITED BOOKS:

- S. Caferri, A. Mucherino, G. Nannicini, F. Tarissan, L. Liberti (eds.). *Proceedings of CTW09 Conference*, Paris, 2009.

THESES:

- G. Nannicini. *Point-to-Point Shortest Paths on Dynamic Time-Dependent Road Networks*, Ph.D. thesis. LIX, Ecole Polytechnique, 18 June 2009.

TECHNICAL REPORTS:

- G. Nannicini, P. Belotti, J. Lee, J. Linderoth, F. Margot, A. Wächter. A probing algorithm for MINLP with failure prediction by SVM. IBM Report RC25103, 2011.
- G. Nannicini, P. Belotti and L. Liberti. A local branching heuristic for MINLPs. 2008. Available at: *arXiv*, paper 0812.2188 (<http://arxiv.org/abs/0812.2188>).

Prizes and awards:

- Second prize at *Prix de l'innovation de l'Ecole Polytechnique*, 2009.
- Travel award for the following conferences: MIP 2009, MIP 2010, MIP 2011, SIAM Conference on Optimization 2011.

Software projects:

Main author:

- **V-tactic**, route planner for <http://www.v-traffic.com>: high-performance parallel software for time-dependent shortest paths computations on large dynamic graphs. Released. Not publicly available.
- **COIN-OR CglRedSplit2**: Reduce-and-Split and Lift-and-Project + Reduce-and-Split cut generator for MILPs. Submitted to COIN-OR in 2011. Open-source.
- **COIN-OR Coupe**: high-throughput parallel solver for nonconvex MINLPs. Open-source.

Contributor:

- **COIN-OR Couenne**: contributor of primal heuristics (**CouenneIterativeRounding**) and bound tightening techniques (**CouenneAggrProbing**) for a Branch-and-Bound solver for nonconvex MINLPs. Released. Open-source.

Plenary talks:

- Invited talk at the Spring Workshop on Computational Issues in Mixed Integer Nonlinear Programming. Université Bordeaux 1, Bordeaux, France, 2009.
- Invited talk at the Workshop on Multiple Row Cuts in Integer Programming. Bertinoro, Italy, 2009.

- Invited talk at the workshop in Mixed Integer Programming (MIP 2011). Waterloo, ON, Canada, 2011.

Conferences with contributed talks:

- CTW 07, Twente, The Netherlands, 2007.
- CAL 08, Paris, France, 2007.
- INFORMS 07 Annual Meeting, Seattle (WA), USA, 2007.
- ROADEF 08, Clermont-Ferrand, France, 2008.
- CTW 08, Milan, Italy, 2008.
- WEA 08, Cape Cod (MA), USA, 2008.
- MATHEURISTICS 08, Bertinoro, Italy, 2008.
- COCOA 08, St. John's, Canada, 2008.
- Workshop on Combinatorial Optimization, Aussois, France, 2009.
- ROADEF 09, Nancy, France, 2009.
- CTW 09, Paris, France, 2009.
- IFIP 09, Buenos Aires, Argentina, 2009.
- ISMP 09, Chicago (IL), USA, 2009.
- Workshop on Combinatorial Optimization, Aussois, France, 2010.
- European Workshop on MINLP, Marseille, France, 2010.
- SIAM 10 Annual Meeting, Pittsburgh (PA), USA, 2010.
- MOPTA 10, Bethlehem (PA), USA, 2010.
- INFORMS 10, Austin (TX), USA, 2010.
- Workshop on Combinatorial Optimization, Aussois, France, 2011.
- SIAM Conference on Optimization, Darmstadt, Germany, 2011.
- Workshop on Hybrid Methods for Nonlinear Combinatorial Optimization, Berlin, Germany, 2011.
- CPAIOR 11, Berlin, Germany, 2011.
- Workshop on Combinatorial Optimization, Aussois, France, 2012.

Other presentations:

- Talk at T. J. Watson IBM Research Center, Yorktown Heights (NY), USA, 2008.
- Talk at the Automatic Reformulation Search workshop. Ecole Polytechnique, Paris, France, 2008.

- Poster at the IMA workshop: Mixed Integer Nonlinear Optimization, Algorithmic Advances and Applications. Minneapolis (MN), USA, 2008.
- Poster at MIP 2009. University of California at Berkeley, Berkeley (CA), USA, 2009.
- Poster at MIP 2010. Georgia Institute of Technology, Atlanta (GA), USA, 2010.

Seminars:

- Seminar at Università degli studi di Modena e Reggio Emilia, Modena, Italy, 2007. Invited by Daniele Pretolani.
- Seminar at Polytech'Tours, Tours, France, 2008. Invited by Emmanuel Neron.
- Seminar at Università degli studi di Firenze, Firenze, Italy, 2009. Invited by Marco Sciandrone.
- Seminar at Carnegie Mellon University, Pittsburgh (PA), USA, 2009. Invited by Gerard Cornuéjols.
- Seminar at Université Paris Dauphine, Paris, France, 2010. Invited by Vangelis Paschos.

Teaching:

- Introduction to C++ (2006/2007, II sem). 16 hours, teaching assistant. *Ecole Polytechnique*, Paris.
- Introduction to Computer Science (2006/2007, II sem). 20 hours, teaching assistant. *Ecole Polytechnique*, Paris.
- Introduction to C++ (2007/2008, I sem). 20 hours, teaching assistant. *Ecole Polytechnique*, Paris.
- Operations Research (MISIC 2007/2008, I sem). 2 hours, teaching assistant. *Ecole Polytechnique*, Paris.
- Introduction to C++ (2007/2008, II sem). 16 hours, teaching assistant. *Ecole Polytechnique*, Paris.
- Introduction to Computer Science (2007/2008, II sem). 40 hours, teaching assistant. *Ecole Polytechnique*, Paris.
- Introduction to C++ (2008/2009, I sem). 12 hours, teaching assistant. *Ecole Polytechnique*, Paris.
- Mathematical Programming: Modeling and Applications (2008/2009, I sem). 18 hours, teaching assistant. *Ecole Polytechnique*, Paris.
- Introduction to C++ (2008/2009, II sem). 6 hours, teaching assistant. *Ecole Polytechnique*, Paris.

- Optimization methods for Operations Research (2011/2012, Spring term). Teaching associate (in charge of recitations, problem sets, quizzes and midterms, and contributing to lecture development). *MIT Sloan*, Cambridge, MA.

Organization activities:

- Member of the local organizing committee of CTW 2009
- Member of the local organizing committee of TOGO 2010
- Member of the program committee of ATMOS 2012

Computer skills:

PROGRAMMING LANGUAGES: Excellent knowledge of C, C++, AMPL. Good knowledge of Python, Linux Bash shell, R. Basic knowledge of Java.

OPERATING SYSTEMS: Good knowledge of UNIX and Windows operating systems.

OPTIMIZATION SOFTWARE: Excellent knowledge of COIN-OR Cbc, COIN-OR Cgl, COIN-OR Bonmin, COIN-OR Couenne, Cplex callable library.

Languages:

ITALIAN: mothertongue.

ENGLISH: excellent written and verbal skills.

FRENCH: excellent written and verbal skills.

Additional information:

Status: unmarried.

European driving license B (car).

MA State driving license (car).

Interests: playing drums (I am a dedicated musician!).