

# Alexandre GOLDSZTEJN

CNRS Research Associate,  
Head of the team OPTI,  
LINA, University of Nantes

Citizenship: French

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## Education

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2005	<b>PhD</b> in computer science (University of Nice-Sophia Antipolis, Thales Aerospace, Paris).
2000	<b>DEA</b> in computer science (LIFL, Lille) <i>Equivalent to Master of Science.</i>
2000	<b>Engineer</b> in computer science (ISEN, Lille).
1997	<b>License</b> in mathematics (UCL, Lille) <i>Equivalent to Bachelor's degree.</i>

## Professional Experience

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Since 10/2007	<b>CNRS Research Associate</b> (LINA, France).
02/2007–03/2007	<b>Invited professor</b> (Univ. of Nice Sophia Antipolis, France).
08/2006–06/2007	<b>Associate researcher</b> and <b>Lecturer</b> , (Univ. of California Irvine, USA).
01/2006–08/2006	<b>Associate researcher</b> , (Univ. of Central Arkansas, USA).
06/2005–07/2005	<b>Invited researcher</b> , (COPRIN, INRIA).
2001–2004	<b>Engineer</b> , preparation PhD in computer science (Thales Aerospace, Paris).
2001	<b>Engineer</b> , web application development (Skalli & Rein, Paris).

## Teaching Experience

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2009-2012	<b>Lecturer</b> , <i>Operations Research (nonlinear programming)</i> (master ORO, University of Nantes)
2009-2012	<b>TD</b> , <i>Algorithmic</i> (University of Nantes)
2006	<b>Lecturer</b> , <i>Discrete Mathematics for Computer Science</i> (Univ. of California Irvine)
2006	<b>Laboratory</b> , <i>Numerical Analysis</i> (Univ. of Central Arkansas)

## Main research interests

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- Interval analysis, numerical analysis, rigorous global optimization, constraint programming (continuous domains), algebraic extension of intervals and its applications
- Constraints with non-null volume solution set, rigorous resolution of IVP, shadowing ODE

## Awards

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| 2008 | Association for Constraint Programming, best research paper CP 2008, with Laurent Granvilliers.   |
| 2008 | Association for Constraint Programming, best student paper CP 2008, with <i>Jean-Marie Normand</i> , Marc Christie and Frédéric Benhamou. |

## Grants

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| 2011      | PEPS CNRS MANIFOLD (principal investigator). |
| 2008-2011 | ANR SIROPA.                                  |
| 2001-2004 | CIFRE grant (with Thales Aerospace).         |

## Participation in scientific committees

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- JFPC 2012, program committee
- CPAIOR 2012, program committee
- ROADEF 2012, scientific committee
- SWIM 2010, organizing committee
- JFPC 2009, program committee
- CP 2009, program committee
- QiCP 2008, program committee

## PhD student supervision

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2012 Benjamin Martin. PhD thesis: Deterministic algorithms for global optimization of numerical multi-objective problems.

## Student supervision

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2011 Brice Chevalier (Master 2 ORO) at NII, Tokyo, Japan. Master thesis: Global optimization for multiobjective optimization.

2011 Arthur Brunel, Vincent Lara, Milan De Cauwer, Boris Billeveaire, Anthony Le Govic (Master 1 ORO) at University of Nantes, France. "Initiation à la Recherche" module topic: Analyse des orbites priodiques de systmes dynamiques.

2011 Takfarinas Saber (License 3) at University of Nantes, France. Internship topic: Using linear programming for computing the interval Newton operator.

2010 Mikhael Tannous (Master 2, Lebanese University) at IRCCyN, Nantes, France. Master thesis: Sensitivity Analysis of Parallel Manipulators by using Interval Analysys. (*Mikhael Tannous is now PhD student at Ecole Centrale de Nantes, Nantes, France*)

2010 Olivier Mullier (Master 2 ORO) at NII, Tokyo, Japan. Master thesis: Integration of ODE based constraints in the CP framework. (*Olivier Mullier is now PhD student at CEA, Saclay, France*)

2010 Kerstin Muxfeldt (Master 1 ORO) at University of Nantes, France. Internship Topic: Exploring the chaotic behavior of simple steepest descent methods.

2009 Aurélien Lejeune (master 2 ORO) at NII, Tokyo, Japan. Master thesis: Rigorous simulation ODE with constraints (*Aurelien Lejeune is now PhD student at INRETS, Lille, France*).

2009 Thomas Macdonald, Olivier Mullier, Thomas Pierrard, Etienne Storez (Master 1 ORO). "Initiation à la Recherche" topic: Hybridization of a local search in a genetic algorithm dedicated to continuous multiobjective optimization.

2009 Benjamin Gosset, Paul Vaillant (Master 1 ALMA). "Initiation à la Recherche" module Topic: Implementation of a JAVA interface to the C++ library REALPAVER.

## Administration

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2008-2012 CNRS corresponding fellow for LINA employee schooling.

2008-2012 Member of the LINA administrative council.

# Publications

## JOURNALS

- [J9] **A. Goldsztejn**, W. Hayes and P. Collins. Tinkerbell Is Chaotic. *SIAM Journal on Applied Dynamical Systems*, 10(4):1480–1501, 2011.
- [J8] **A. Goldsztejn**, Y. Lebbah, C. Michel and M. Rueher. Capabilities of Constraint Programming in Safe Global Optimization. *Reliable Computing*, 15:47–59, 2011.
- [J7] **A. Goldsztejn** and L. Jaulin. Inner Approximation of the Range of Vector-Valued Functions. *Reliable Computing*, 14:1–23, 2010.
- [J6] J.M. Normand, **A. Goldsztejn**, M. Christie, and Benhamou F. A Branch and Bound Algorithm for Numerical MAX-CSP. *Constraints*, 15(2):213–237, 2010. *This paper is an extended version of [C11]*
- [J5] **A. Goldsztejn** and L. Granvilliers. A New Framework for Sharp and Efficient Resolution of NCSP with Manifolds of Solutions. *Constraints*, 15(2):190–212, 2010. *This paper is an extended version of [C9]*
- [J4] **A. Goldsztejn**, C. Michel, and M. Rueher. Efficient Handling of Universally Quantified Inequalities. *Constraints*, 14(1):117–135, 2008. *This paper is an extended version of [C8]*
- [J3] G. Chabert and **A. Goldsztejn**. Extension of Hansen-Blikie’s Method to Right-Quantified Linear Systems. *Reliable Computing*, 13(4):325–349, 2007.
- [J2] **A. Goldsztejn**. A Comparison of the Hansen-Sengupta and Frommer-Lang-Schnurr Existence Tests. *Computing*, 79(1):53–60, 2007.
- [J1] **A. Goldsztejn**. A Right-Preconditioning Process for the Formal-Algebraic Approach to Inner and Outer Estimation of AE-solution Sets. *Reliable Computing*, 11(6):443–478, 2005.

## INTERNATIONAL CONFERENCES

- [C21] **A. Goldsztejn**, C. Jermann, V. Ruiz de Angulo, and C. Torras. Symmetry Breaking in Numeric Constraint Problems. In *Proceedings of CP 2011*, LNCS 6876 pages 317–324.
- [C20] M. Tannous, S. Caro, and **A. Goldsztejn**. Sensitivity Analysis of Parallel Manipulators Using a Fixed Point Interval Iteration Method. In *The 13th World Congress in Mechanism and Machine Science, Universidad de Guanajuato (UCEA), Mexico*, 2011.
- [C19] **A. Goldsztejn**, O. Mullier, D. Eveillard, and H. Hosobe. Including Ordinary Differential Equations Based Constraints in the Standard CP Framework. In *Proceedings of CP 2010*, LNCS 6308 pages 221–235.
- [C18] N. Berger, R. Soto, **A. Goldsztejn**, S. Caro, and P. Cardou. Finding the Maximal Pose Error in Robotic Mechanical Systems Using Constraint Programming. In *Proceedings of IEA-AIE 2010*, volume 6096 of *LNAI*, pages 82–91, 2010.
- [C17] **A. Goldsztejn** and F. Goualard. Box Consistency through Adaptive Shaving. In *Proc. of ACM SAC 2010*, pages 2049–2054, 2010.
- [C16] D. Ishii, K. Ueda, I. Hosobe, and **A. Goldsztejn**. Interval-based Solving of Hybrid Constraint Systems. In *Proceedings of the 3rd IFAC Conference on Analysis and Design of Hybrid Systems*, pages 144–149, 2009.
- [C15] R. Chenouard, **A. Goldsztejn**, and C. Jermann. Search Strategies for an Anytime Usage of the Branch and Prune Algorithms. In *Proceedings of IJCAI 2009 (to appear)*, 2009.
- [C14] F. Goualard and **A. Goldsztejn**. A Data-Parallel Algorithm to Reliably Solve Systems of Nonlinear Equations. In *Proceedings of PDCAT 2008*, IEEE Computer Society Press, pages 39–46, 2008.
- [C13] P. Collins and **A. Goldsztejn**. The Reach-and-Evolve Algorithm for Reachability Analysis of Nonlinear Dynamical Systems. In *Proceedings of WRP 2008*, volume 233 of *ENTCS*, pages 87–102, 2008.
- [C12] M. Rueher, **A. Goldsztejn**, Y. Lebbah, and C. Michel. Capabilities of Constraint Programming in Rigorous Global Optimization. *Nolta* 2008, 2008.
- [C11] J.-M. Normand, **A. Goldsztejn**, M. Christie, and F. Benhamou. A Branch and Bound Algorithm for Numerical MAX-CSP. In *Proceedings of CP 2008*, volume 5202/2008 of *LNCS*, pages 205–219, 2008. *This paper received the best student paper award*
- [C10] **A. Goldsztejn**, Y. Lebbah, C. Michel, and M. Rueher. Revisiting the upper bounding process in a safe Branch and Bound algorithm. In *Proceedings of CP 2008*, volume 5202/2008 of *LNCS*, pages 598–602, 2008.
- [C9] **A. Goldsztejn** and L. Granvilliers. A New Framework for Sharp and Efficient Resolution of NCSP with Manifolds of Solution. In *Proceedings of CP 2008*, volume 5202/2008 of *LNCS*, pages 190–204, 2008. *This paper received the best research paper award*
- [C8] **A. Goldsztejn**, C. Michel, and M. Rueher. An Efficient Algorithm for a Sharp Approximation of Universally Quantified Inequalities. In *Proc. of ACM SAC 2008*, pages 134–139.
- [C7] **A. Goldsztejn** and W. Hayes. A New Containment Method For Rigorous Shadowing. *International Conference on Scientific Computation And Differential Equations. (SCICADE 2007)*
- [C6] **A. Goldsztejn** and L. Jaulin. Inner and Outer Approximations of Existentially Quantified Equality Constraints. In *the proceedings of the twelfth International Conference on Principles and Practice of Constraint Programming*, volume 4204/2006 of *LNCS*, pages 198–212. (CP 2006)

- [C5] **A. Goldsztejn** and W. Hayes. Reliable inner approximation of the solution set to initial value problems with uncertain initial value. In the IEEE post-proceedings of the *12th GAMM IMACS International Symposium on Scientific Computing, Computer Arithmetic and Validated Numerics*. (SCAN 2006)
- [C4] **A. Goldsztejn** and G. Chabert. On the approximation of linear AE-solution sets. In the IEEE post-proceedings of the *12th GAMM IMACS International Symposium on Scientific Computing, Computer Arithmetic and Validated Numerics*. (SCAN 2006)
- [C3] **A. Goldsztejn** and G. Chabert. A generalized interval LU-decomposition for the solution of interval linear systems. In *the proceedings of the 6th International Conference on Numerical Methods and Applications*, volume 4310/2007 of *LNCS*, pages 312-319. (NMA 2006)
- [C2] C. Grandon and **A. Goldsztejn**. Quantifier Elimination versus Generalized Interval Evaluation: a Comparison on a Specific Class of Quantified Constraint. To appear in the *post-proceedings of the 11th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems*. (IPMU 2006) *This paper is an extended version of [P1]*
- [C1] **A. Goldsztejn**. A branch and prune algorithm for the approximation of non-linear AE-solution sets. In Proceedings of the 2006 ACM symposium on Applied computing, pages 1650–1654, New York, NY, USA, 2006. ACM Press. (ACM-SAC 2006)

#### POSTERS

- [P1] C. Grandon and **A. Goldsztejn**. Inner approximation of distance constraints with existential quantification of parameters. In *SAC '06: Proceedings of the 2006 ACM symposium on Applied computing*, pages 1660–1661, New York, NY, USA, 2006. ACM Press. (SAC 2006)

#### WORKSHOPS

- [W3] **A. Goldsztejn** and W. Hayes. A New Containment Method For Rigorous Shadowing. *French summer meeting Frac*. (FRAC 2007)
- [W2] **A. Goldsztejn**, D. Daney, M. Rueher, and P. Taillibert. Modal intervals revisited: a mean-value extension to generalized intervals. In *First International Workshop on Quantification in Constraint Programming, Barcelona, Spain, 2005*. (QCP 2005)
- [W1] **A. Goldsztejn**. Verified projection of the solution set of parametric real systems. In *2nd International Workshop on Global Constrained Optimization and Constraint Satisfaction, Lausanne, Switzerland, 2003*. (COCOS 2003)

#### THESIS

- [PhD] **A. Goldsztejn**. *Définition et Applications des Extensions des Fonctions Réelles aux Intervalles Généralisés*. PhD thesis, Université de Nice-Sophia Antipolis, 2005.

## Invited Talks

### Working group on set-based methods for automation (GdR MACS)

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- 2010 A Parallelootope Method For the Simulation of Nonlinear Hybrid Systems.
- 2009 On the Interval Matrix Exponentiation.
- 2009 Search Strategies for an Anytime Usage of the Branch and Prune Algorithm.
- 2008 A New Framework for Sharp and Efficient Resolution of NCSP with Manifolds of Solutions.
- 2008 On the Parallelepiped Method and Higher Order Methods.
- 2007 A New Containment Method For Rigorous Shadowing.
- 2006 Inner and Outer Approximations of Existentially Quantified Equality Constraints.
- 2005 Inner approximation of vector valued function ranges.
- 2005 Definition and Application of AE-extensions: The Modal Interval Theory Revisited.
- 2004 Estimation of AE-solution sets of square linear interval systems.
- 2004 Verified Projection of Solution Set of Parametric Systems of Equations.
- 2001 Introduction to Modal Intervals.

## Universities and institutes

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- 2009 Tinkerbell is Chaotic (Waseda University, Tokyo).
- 2007 A New Containment Method For Rigorous Shadowing (CWI, Amsterdam).
- 2007 Interval Analysis: From Theory to Applications (ISTIA, Angers).
- 2005 Definition and Application of AE-extensions: The Modal Interval Theory Revisited (INRIA, Nice).
- 2003 Verified Projection of Solution Set of Parametric Systems of Equations (INRIA, Nice).

## Companies

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- 2007 L'analyse par intervalles, théorie et applications, *CEA-Ecole Polytechnique*.
- 2006 Introduction to Interval Analysis, *Thales Aerospace*.
- 2005 AE-extensions: Theory and Applications, *Dassault Aviation*.

## Workshops and Conferences

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- 2010 Including Ordinary Differential Equations Based Constraints in the Standard CP Framework, SWIM 2010, Nantes, France.
- 2010 Box Consistency Through Adaptive Shaving, SAC 2010, Sierre, Switzerland.
- 2009 Search Strategies for an Anytime Usage of the Branch and Prune Algorithm, SWIM 2009, Lausanne, Switzerland.
- 2008 A New Framework for Sharp and Efficient Resolution of NCSP with Manifolds of Solutions, CP 2008, Sydney, Australia.
- 2007 A New Containment Method For Rigorous Shadowing, FRAC 2007, Nice, France.
- 2007 A New Containment Method For Rigorous Shadowing, SCICADE 2007, St. Malo, France.
- 2006 A branch and prune algorithm for the approximation of non-linear AE-solution sets, ACM-SAC 2006, Dijon, France.
- 2005 Modal intervals revisited: a mean-value extension to generalized intervals, QCP 2005, Stiges, Spain.
- 2003 Verified Projection of Solution Set of Parametric Systems of Equations, *COCOS 2003, Lausanne, Switzerland*.