

Curriculum Vitae

Last name : Ganty
First name : Pierre
Date and place of birth: March 17, 1980; Braine-le-Comte, Belgium
Nationality: Belgian
Address: Fundación IMDEA Software
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Research Interests (no order)

Algorithmic verification techniques: design, complexity study and implementation. Verification of software systems with infinitely many states: unbounded control and/or data. Algorithmic model based bug finding techniques. Abstract Interpretation. Automatic refinement of abstract domains. Automata theory and Formal Languages. Petri nets.

Academic Employment

09/2009 – present : Research Scientist (tenure-track) at IMDEA Software, Madrid, Spain.

01/2008 – 08/2009 : Postdoc Employee at University of Los Angeles, California, USA.

2003 – 2007 : FRIA research fellow at the Computer Science Department, Université Libre de Bruxelles, Belgium.

2002 – 2003 : CALCULEMUS research fellow at the Dipartimento di Informatica, Sistemistica e Telematica, Università degli Studi di Genova, Italy.

2000 – 2001 : Student assistant, Université Libre de Bruxelles, Belgium.

Education

- Ph.D. in Computer Science, Université Libre de Bruxelles, September 2007.
- DEA in Computer Science, Université Libre de Bruxelles, June 2004.
- Master in Computer Science, *Grande Distinction* (High Honours), Université Libre de Bruxelles, September 2002.

Award

Nomination for the UCLA Chancellor's Award for Postdoctoral Research, 2009.
(15 nominees/1089 postdoctoral scholars)

Researchstays

- 2007: two-months research stay at the University of California, Los Angeles (USA), in the group of Prof. Rupak Majumdar.
- 2004: three-months research stay at the Universität Stuttgart (Germany), in the group of Prof. Javier Esparza.
- 2001: five-months research stay at the Università degli Studi di Genova (Italy), in the group of Prof. Giorgio Delzanno.

Theses

- “The Fixpoint Checking Problem: An Abstraction Refinement Perspective”, Ph.D. thesis, Université Libre de Bruxelles, September 2007.
Jury : Patrick Cousot, Francesco Ranzato, Jean-François Raskin (supervisor), Giorgio Delzanno (co-supervisor), Alessandro Armando (co-supervisor), Laurent Van Begin and Thierry Massart.
- “Symbolic Methods for Automatically Proving Secrecy and Authentication in Infinite-state Models of Cryptographic Protocols”, DEA thesis (mémoire du diplôme d’études approfondies en sciences), Université Libre de Bruxelles, June 2004. Jury: T. Massart, J-F Raskin, R. Devillers.
- “Algorithmes et structures de données efficaces pour la manipulation de contraintes sur les intervalles”, Master Thesis granted with *Grande Distinction*, Université Libre de Bruxelles, September 2002.
Jury : G. Delzanno, J. Cardinal, T. Massart, L. Van Begin.

Selected Publications

Conference & Workshop papers (refereed)

- [1] Pierre Ganty, Radu Iosif, and Filip Konečný. Underapproximation of procedure summaries for integer programs. In *TACAS '13: Proc. 19th Int. Conf. on Tools and Algorithms for the Construction and Analysis of Systems*, LNCS. Springer, 2013.
- [2] Javier Esparza, Pierre Ganty, and Rupak Majumdar. A perfect model for bounded verification. In *LICS '12: Proc. 27th Annual ACM/IEEE Symp. on Logic in Computer Science*, pages 285–294. IEEE Computer Society Press, 2012.
- [3] Mohamed Faouzi Atig and Pierre Ganty. Approximating petri net reachability along context-free traces. In *FSTTCS '11: Proc. 31st IARCS Annual Conf. on Foundation of Software Technology and Theoretical Computer Science*, volume 13 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 152–163. Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, 2011.
- [4] Laura Bozzelli and Pierre Ganty. Complexity analysis of the backward coverability algorithm for vass. In *RP '11: Proc. 5th Workshop on Reachability Problems*, volume 6945 of LNCS, pages 96–109. Springer, 2011.
- [5] Javier Esparza and Pierre Ganty. Complexity of pattern-based verification for multithreaded programs. In *POPL '11: Proc. 38th ACM SIGACT-SIGPLAN Symp. on Principles of Programming Languages*, pages 499–510. ACM Press, 2011.
- [6] Pierre Ganty, Benjamin Monmege, and Rupak Majumdar. Bounded underapproximations. In *CAV '10: Proc. 20th Int. Conf. on Computer Aided Verification*, volume 6174 of LNCS, pages 600–614. Springer, 2010.
- [7] Pierre Ganty and Rupak Majumdar. Analyzing real-time event-driven programs. In *FORMATS '09: Proc. 7th Int. Conf. on Formal Modelling and Analysis of Timed Systems*, volume 5813 of LNCS, pages 164–178. Springer, 2009.
- [8] Pierre Ganty, Nicolas Maquet, and Jean-François Raskin. Fixpoint guided abstraction refinement for alternating automata. In *CIAA '09: Proc. 14th Int. Conf. on Implementation and Application of Automata*, volume 5642 of LNCS, pages 155–164. Springer, 2009.
- [9] Pierre Ganty, Rupak Majumdar, and Andrey Rybalchenko. Verifying liveness for asynchronous programs. In *POPL '09: Proc. 36th ACM SIGACT-SIGPLAN Symp. on Principles of Programming Languages*, pages 102–113. ACM Press, 2009.
- [10] Patrick Cousot, Pierre Ganty, and Jean-François Raskin. Fixpoint-guided abstraction refinements. In *SAS '07: Proc. 14th Int. Static Analysis Symp.*, volume 4634 of LNCS, pages 333–348. Springer, 2007.

- [11] Pierre Ganty, Jean-François Raskin, and Laurent Van Begin. From many places to few: Automatic abstraction refinement for Petri nets. In *ICATPN '07: Proc. of 28th Int. Conf. on Application and Theory of Petri Nets and Other Models of Concurrency*, volume 4546 of *LNCS*, pages 124–143. Springer, 2007.
- [12] Pierre Ganty, Jean-François Raskin, and Laurent Van Begin. A complete abstract interpretation framework for coverability properties of WSTS. In *VMCAI '06: Proc. 7th Int. Conf. on Verification, Model Checking and Abstract Interpretation*, volume 3855 of *LNCS*, pages 49–64. Springer, 2006.
- [13] Javier Esparza, Pierre Ganty, and Stefan Schwoon. Locality-based abstractions. In *SAS '05: Proc. 12th Int. Static Analysis Symp.*, volume 3672 of *LNCS*, pages 118–134. Springer, 2005.
- [14] Giorgio Delzanno and Pierre Ganty. Automatic verification of time sensitive cryptographic protocols. In *TACAS '04: Proc. 11th Int. Conf. on Tools and Algorithms for the Construction and Analysis of Systems*, volume 2988 of *LNCS*, pages 342–356. Springer, 2004.
- [15] Pierre Ganty and Laurent Van Begin. Non Deterministic Automata for the Efficient Representation of Infinite-state Systems. In *CP+CV '04: Proc. 1st workshop on Constraint Programming and Constraints for Verification*, 2004.
- [16] Giorgio Delzanno and Pierre Ganty. Symbolic methods for automatically proving secrecy and authentication in infinite-state models of cryptographic protocols. In *WISP '03: Proc. 1st Int. Workshop on Issues in Security and Petri Nets*, pages 85–99, 2003.
- [17] Alessandro Armando, Luca Compagna, and Pierre Ganty. SAT-based model-checking of security protocols using planning graph analysis. In *FM '03: Proc. 12th Int. Formal Methods Europe Symp.*, volume 2805 of *LNCS*, pages 875–893. Springer, 2003.
- [18] Pierluigi Ammirati, Giorgio Delzanno, Pierre Ganty, Gilles Geeraerts, Jean-François Raskin, and Laurent Van Begin. Babylon: An integrated tool for the specification and verification of parametrized systems. In *SAVE '02: Proc. 2nd Workshop on Specification, Analysis and Validation for Emerging technologies*, 2002.

Journal

- [1] Pierre Ganty and Rupak Majumdar. Algorithmic verification of asynchronous programs. *ACM Trans. Program. Lang. Syst.*, 34(1):6:1–6:48, 2012.
- [2] Pierre Ganty, Rupak Majumdar, and Benjamin Monmege. Bounded underapproximations. *Formal Methods in System Design*, 40(2):206–231, 2012.
- [3] Javier Esparza, Pierre Ganty, Stefan Kiefer, and Michael Luttenberger. Parikh’s theorem: A simple and direct automaton construction. *Information Processing Letters*, 111:614–619, 2011.
- [4] Pierre Ganty, Nicolas Maquet, and Jean-François Raskin. Fixed point guided abstraction refinement for alternating automata. *Theor. Comput. Sci.*, 411(38-39):3444–3459, 2010.
- [5] Pierre Ganty, Gilles Geeraerts, Jean-François Raskin, and Laurent Van Begin. Le problème de couverture pour les réseaux de Petri: résultats classiques et développements récents. *Techniques et Sciences Informatiques*, 28(9):1107–1142, 2009.
- [6] Pierre Ganty, Jean-François Raskin, and Laurent Van Begin. From many places to few: Automatic abstraction refinement for Petri nets. *Fundamenta Informaticae*, 88(3):275–305, 2008.

Other papers (non-refereed)

- [1] Pierre Ganty, Radu Iosif, and Filip Konečný. Underapproximation of procedure summaries for integer programs. *CoRR*, abs/1210.4289, 2012.

- [2] Javier Esparza, Pierre Ganty, and Rupak Majumdar. A perfect model for bounded verification. *CoRR*, abs/1201.3194, 2012.
- [3] Mohamed Faouzi Atig and Pierre Ganty. Approximating petri net reachability along context-free traces. *CoRR*, abs/1105.1657, 2011.
- [4] Javier Esparza, Pierre Ganty, Stefan Kiefer, and Michael Luttenberger. Parikh’s theorem: A simple and direct automaton construction. *CoRR*, abs/1006.3825, 2010.
- [5] Pierre Ganty and Rupak Majumdar. Algorithmic verification of asynchronous programs. *CoRR*, abs/1011.0551, 2010.
- [6] Pierre Ganty, Rupak Majumdar, and Benjamin Monmege. Bounded underapproximations. *CoRR*, abs/0809.1236, 2009.
- [7] Pierre Ganty, Cédric Meuter, Giorgio Delzanno, Gabriel Kalyon, Jean-François Raskin, and Laurent Van Begin. Symbolic data structure for sets of k -uples. Technical Report 570, Université Libre de Bruxelles, Belgium, 2007.

Projects

- *PARAN ’10: Verificación Parametrizada de Sistemas Informáticos (TIN2010-20639)*
Funded by the Spanish Science and Innovation Ministry
Starting/ending dates: Jan, 1 2011 ; Dec 31, 2012
Principal Investigator: Pierre Ganty.
- *Numeric and Symbolic Abstractions for Software*
Funded Danish Research Council for Nature and Universe
Starting/ending dates: Jan, 1 2011 ; Dec 31, 2013
Principal Investigator: John Gallagher.

Software

- **MIST**: Algorithmic analyses of counter systems. All the analyses in MIST rely on a symbolic data structure called Interval Sharing Trees. Main contributor: Pierre Ganty. (See <http://software.imdea.org/~pierreganty/ist.html> for the code and more details)
- **VANOCCA**: Pattern-based verification of multithreaded programs. Algorithmic analysis of shared-memory multithreaded programs. It implements the pattern-based verification technique described in [5]. Main contributor: Tomáš Poch. (See <http://software.imdea.org/~pierreganty/vanocka.html> for the code and more details)
- **ABP2NTS**: A translator from asynchronous boolean programs to Petri Nets expressed in the NTS language. Main contributor: Bishesh Adhikari. Available on request.

Talks

At Seminars:

- “Underapproximation of Concurrent Systems” at the Dagstuhl seminar 09361, Design and Validation of Concurrent Systems, Germany, September 2009.

At Universities or Research Institutes:

- “A Perfect Model for Bounded Verification” at Verimag, May 2012.
- “Approximating Petri Net Reachability Along Context-free Traces” at the Computer Science Seminars, CS Department, Université Libre de Bruxelles, June 2011.
- “Pattern-based Verification for Multithreaded Programs” at “Séminaire du LSV”, Laboratoire Spécification et Vérification, École Normale Supérieure de Cachan, April 2011, at the Seminar of the “Centre Fédéré en Vérification”, June 2011, at the Upmarc Seminar, Uppsala University, June 2011, at the “Séminaire Verimag”, July 2011.
- “Petri Nets and Finite Index Context-Free Languages” at Laboratoire d’Informatique Algorithmique: Fondements et Applications, Université Paris 7, April 2011.

- “Verification of systems with infinitely many states: underapproximations and overapproximations” at the Departamento de Sistemas Informáticos y Computación, Facultad de Informática, Universidad Complutense de Madrid, January 2011.
- “Bounded Underapproximations” at the Dipartimento di Informatica e Scienze dell’Informazione, Università degli Studi di Genova, February 2010.
- “What’s decidable for asynchronous programs ?” at “Séminaire du LSV”, Laboratoire Spécification et Vérification, École Normale Supérieure de Cachan, March 2009 and at Laboratoire Bordelais de Recherche en Informatique, May 2009.
- “Parikh-equivalent Bounded Under-approximations” at Laboratoire d’Informatique Algorithmique: Fondements et Applications, Université Paris 7 and at the Computer Science Seminars, CS Department, Université Libre de Bruxelles, September 2008.
- “Abstract fixpoint checking” at the Southern California Workshop on Programming Languages and Systems (SoCal), Pomona College, February 2008.
- “The Fixpoint Checking Problem: An Abstraction Refinement Perspective” at the contact day of the Graduate School in Computing Science (GRASCOMP), Facultés Universitaires de Namur, October 2007.
- “From Many Places to Few: Automatic Abstraction Refinement for Petri Nets” at “Séminaire du LSV”, Laboratoire Spécification et Vérification, École Normale Supérieure de Cachan, May 2007 and Dipartimento di Informatica e Scienze dell’Informazione, Università degli Studi di Genova, December 2006.
- “Locality-based Abstractions” at the Dipartimento di Informatica e Scienze dell’Informazione, Università degli Studi di Genova, December 2005.
- “A Complete Abstract Interpretation Framework for Coverability Properties of WSTS” at the “Journée du FNRS”, October 2005.

Committees	<p>Workshops: INFINITY ’12 (PC member), BYTECODE ’11 (PC co-chair), APNOC ’10 (PC member)</p> <p>Conference: VMCAI ’13 (PC member)</p>
Referee work	<p>Conferences: TACAS ’04, FORMATS ’04, ARSPA ’04, TACAS ’05, CONCUR ’05, CONCUR ’06, POPL ’07, VMCAI ’07, ICATPN ’07, CAV ’08, SPIN ’08, VMCAI ’09, HSCC ’09, FOSSACS ’09, TACAS ’09, LATA ’09, ICATPN ’09, SAS ’09, ATVA ’09, FSTTCS ’09, VMCAI ’10, TLDI ’10, FOSSACS ’10, HSCC ’10, LICS ’10, FAST ’10, POPL ’11, VMCAI ’11, STACS ’11, TACAS ’11, FOSSACS ’11, HSCC ’11, ESOP ’11, ICALP ’11, SAS ’11, QEST ’11, FSTTCS ’11, STACS ’12, TACAS ’12, CAV ’12, ICALP ’12, CONCUR ’12, MFCS ’12, APLAS ’12, FSTTCS ’12, ICSE ’13, FOSSACS ’13, LATA ’13.</p> <p>Journals: Journal of Automated Reasoning, Theoretical Computer Science, RAIRO – Theoretical Informatics and Application, Formal Methods in System Design (2011, 2012), Logical Methods in Computer Science.</p> <p>Others: MOVEP ’04 (summer school).</p>
Supervision	<p>Spring 2012, supervision of Lucio Nardelli, intern at the IMDEA software institute: theoretical and practical aspects of parametrized systems with linear topology.</p> <p>Spring 2012, supervision of Agustin Romano, intern at the IMDEA software institute: multihead pushdown automata for bounded verification.</p> <p>Fall 2011, supervision of Bishesh Adhikari intern at the IMDEA software institute: implementation of ABP2NTS.</p> <p>Spring 2011, supervision of Clementina Latanzi, intern at the IMDEA software institute: abstractions for parameterized systems with linear topology.</p> <p>Fall 2010, supervision of Tomáš Poch, intern at the IMDEA software institute: implementation of VANOCKA.</p>

Teaching

2011–2013 Formal Methods for Concurrent and Reactive Systems (course in the UPM / IMDEA Track in Software Development through Rigorous Methods part of the UPM Master on Software and Systems)

2005–2006 Practical part of *Logique Informatique* (logic in computer science) at the Université Libre de Bruxelles (30h each year for two years).

2004 Practical part of *Langage de programmation usuel* (fortran 77) at the Université Libre de Bruxelles (15h).

2001 Assistance for *Algorithmes et structures de données* (algorithms and data structures) at the Université Libre de Bruxelles (30h).

Languages

French (fluent), Italian (fluent), English (fluent), Spanish (fluent).