

# CURRICULUM VITAE

Roberto Bagnara

## Posizione accademica

**Settore Concorsuale:** 01/B1 - INFORMATICA

**Settore Scientifico Disciplinare:** INF/01 - INFORMATICA

**Qualifica:** Professore Ordinario

**Anzianità nel ruolo di professore di I fascia:** 01/11/2012

**Sede universitaria:** Università di Parma

**Dipartimento:** Dipartimento di Matematica e Informatica

**Posizioni ricoperte precedentemente nel medesimo ateneo o in altri:**

dal 01/11/1997 - Ricercatore Universitario - Università di Parma

dal 16/12/2001 - Professore II Fascia - Università di Parma

dal 01/11/2012 - Professore I Fascia - Università di Parma

## Pubblicazioni scientifiche

### Pubblicazioni principali

- [1] BAGNARA, R. A unified proof for the convergence of Jacobi and Gauss-Seidel methods. *SIAM Review* 37, 1 (1995), 93–97.
- [2] BAGNARA, R. A hierarchy of constraint systems for data-flow analysis of constraint logic-based languages. *Science of Computer Programming* 30, 1–2 (1998), 119–155.
- [3] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Set-sharing is redundant for pair-sharing. *Theoretical Computer Science* 277, 1–2 (2002), 3–46.
- [4] HILL, P. M., BAGNARA, R., AND ZAFFANELLA, E. Soundness, idempotence and commutativity of set-sharing. *Theory and Practice of Logic Programming* 2, 2 (2002), 155–201.
- [5] ZAFFANELLA, E., HILL, P. M., AND BAGNARA, R. Decomposing non-redundant sharing by complementation. *Theory and Practice of Logic Programming* 2, 2 (2002), 233–261.
- [6] HILL, P. M., ZAFFANELLA, E., AND BAGNARA, R. A correct, precise and efficient integration of set-sharing, freeness and linearity for the analysis of finite and rational tree languages. *Theory and Practice of Logic Programming* 4, 3 (2004), 289–323.



- [7] BAGNARA, R., GORI, R., HILL, P. M., AND ZAFFANELLA, E. Finite-tree analysis for constraint logic-based languages. *Information and Computation* 193, 2 (2004), 84–116.
- [8] BAGNARA, R., ZAFFANELLA, E., AND HILL, P. M. Enhanced sharing analysis techniques: A comprehensive evaluation. *Theory and Practice of Logic Programming* 5, 1&2 (2005), 1–43.
- [9] MESNARD, F., AND BAGNARA, R. cTI: A constraint-based termination inference tool for ISO-Prolog. *Theory and Practice of Logic Programming* 5, 1&2 (2005), 243–257.
- [10] BAGNARA, R., HILL, P. M., RICCI, E., AND ZAFFANELLA, E. Precise widening operators for convex polyhedra. *Science of Computer Programming* 58, 1–2 (2005), 28–56.
- [11] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Not necessarily closed convex polyhedra and the double description method. *Formal Aspects of Computing* 17, 2 (2005), 222–257.
- [12] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Widening operators for powerset domains. *Software Tools for Technology Transfer* 8, 4/5 (2006), 449–466.
- [13] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. The Parma Polyhedra Library: Toward a complete set of numerical abstractions for the analysis and verification of hardware and software systems. *Science of Computer Programming* 72, 1–2 (2008), 3–21.
- [14] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Applications of polyhedral computations to the analysis and verification of hardware and software systems. *Theoretical Computer Science* 410, 46 (2009), 4672–4691.
- [15] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Weakly-relational shapes for numeric abstractions: Improved algorithms and proofs of correctness. *Formal Methods in System Design* 35, 3 (2009), 279–323.
- [16] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Exact join detection for convex polyhedra and other numerical abstractions. *Computational Geometry: Theory and Applications* 43, 5 (2010), 453–473.
- [17] BAGNARA, R., MESNARD, F., PESCE, A., AND ZAFFANELLA, E. A new look at the automatic synthesis of linear ranking functions. *Information and Computation* 215 (2012), 47–67.
- [18] COVINGTON, M. A., BAGNARA, R., O’KEEFE, R. A., WIELEMAKER, J., AND PRICE, S. Coding guidelines for Prolog. *Theory and Practice of Logic Programming* 12, 6 (2012), 889–927.

*Roberto Beynon*

## Altre Pubblicazioni

- [1] PERRIN, Y., BAGNARA, R., BERNERS-LEE, T. J., CARENA, W., DIVIA, R., PARKMAN, C., PETERSEN, J., TREMBLET, L., AND WESSELS, B. The VALET-PLUS embedded into large physics experiments. In *Proceedings of the "VMEbus in Research International Conference"* (Zürich, Oct. 1988), C. Eck and C. Parkman, Eds., Elsevier Science Publishers B.V. (North-Holland), Amsterdam, pp. 59–68.
- [2] HEYES, G., WESSELS, B., PERRIN, Y., BAGNARA, R., BERNERS-LEE, T. J., CARENA, W., DIVIA, R., PARKMAN, C., PETERSEN, J., AND TREMBLET, L. The integration of VAX and VALET-PLUS data acquisition software. Contribution to the "Sixth Conference on Real-Time Computer Applications in Nuclear, Particle, and Plasma Physics" (Williamsburg, VA, May 1989). *IEEE Transactions on Nuclear Science* 36, 5 (1989), 1572–1576.
- [3] BAGNARA, R., GIACOBAZZI, R., AND LEVI, G. An application of constraint propagation to data-flow analysis. In *Proceedings of "The Ninth Conference on Artificial Intelligence for Applications"* (Orlando, Florida, March 1993), IEEE Computer Society Press, Los Alamitos, CA, pp. 270–276.
- [4] BAGNARA, R. A reactive implementation of *Pos* using ROBDDs. In *Programming Languages: Implementations, Logics and Programs, Proceedings of the Eighth International Symposium* (Aachen, Germany, 1996), H. Kuchen and S. D. Swierstra, Eds., vol. 1140 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 107–121.
- [5] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Set-sharing is redundant for pair-sharing. In *Static Analysis: Proceedings of the 4th International Symposium* (École Normale Supérieure, Paris, France, 1997), P. Van Hentenryck, Ed., vol. 1302 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 53–67.
- [6] HILL, P. M., BAGNARA, R., AND ZAFFANELLA, E. The correctness of set-sharing. In *Static Analysis: Proceedings of the 5th International Symposium* (Pisa, Italy, 1998), G. Levi, Ed., vol. 1503 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 99–114.
- [7] BAGNARA, R., AND SCHACHTE, P. Factorizing equivalent variable pairs in ROBDD-based implementations of *Pos*. In *Proceedings of the "Seventh International Conference on Algebraic Methodology and Software Technology (AMAST'98)"* (Amazonia, Brazil, 1999), A. M. Haeberer, Ed., vol. 1548 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 471–485.
- [8] ZAFFANELLA, E., BAGNARA, R., AND HILL, P. M. Widening Sharing. In *Principles and Practice of Declarative Programming* (Paris, France, 1999), G. Nadathur, Ed., vol. 1702 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 414–431.
- [9] ZAFFANELLA, E., HILL, P. M., AND BAGNARA, R. Decomposing non-redundant sharing by complementation. In *Static Analysis: Proceedings*

- of the 6th International Symposium (Venice, Italy, 1999), A. Cortesi and G. Filé, Eds., vol. 1694 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 69–84.
- [10] BAGNARA, R., ZAFFANELLA, E., AND HILL, P. M. Enhanced sharing analysis techniques: A comprehensive evaluation. In *Proceedings of the 2nd International ACM SIGPLAN Conference on Principles and Practice of Declarative Programming* (Montreal, Canada, 2000), M. Gabbriellini and F. Pfenning, Eds., Association for Computing Machinery, pp. 103–114.
  - [11] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Efficient structural information analysis for real CLP languages. In *Proceedings of the 7th International Conference on Logic for Programming and Automated Reasoning (LPAR 2000)* (Reunion Island, France, 2000), M. Parigot and A. Voronkov, Eds., vol. 1955 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 189–206.
  - [12] BAGNARA, R., GORI, R., HILL, P. M., AND ZAFFANELLA, E., Finite-tree analysis for constraint logic-based languages, In *Static Analysis: Proceedings of the 8th International Symposium (SAS 2001)*, (Paris, France, 2001), P. Cousot, Ed., vol. 2126 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 165–184.
  - [13] BAGNARA, R., ZAFFANELLA, E., GORI, R., AND HILL, P. M. Boolean functions for finite-tree dependencies. In *Proceedings of the 8th International Conference on Logic for Programming, Artificial Intelligence and Reasoning (LPAR 2001)* (Havana, Cuba, 2001), R. Nieuwenhuis and A. Voronkov, Eds., vol. 2250 of *Lecture Notes in Artificial Intelligence*, Springer-Verlag, Berlin, pp. 575–589.
  - [14] BAGNARA, R., RICCI, E., ZAFFANELLA, E., AND HILL, P. M. Possibly not closed convex polyhedra and the Parma Polyhedra Library. In *Static Analysis: Proceedings of the 9th International Symposium* (Madrid, Spain, 2002), M. V. Hermenegildo and G. Puebla, Eds., vol. 2477 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 213–229.
  - [15] BAGNARA, R., HILL, P. M., RICCI, E., AND ZAFFANELLA, E. Precise widening operators for convex polyhedra. In *Static Analysis: Proceedings of the 10th International Symposium* (San Diego, California, USA, 2003), R. Cousot, Ed., vol. 2694 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 337–354.
  - [16] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Widening operators for powerset domains. In *Proceedings of the Fifth International Conference on Verification, Model Checking and Abstract Interpretation (VMCAI 2004)* (Venice, Italy, 2003), B. Steffen and G. Levi, Eds., vol. 2937 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 135–148.
  - [17] BAGNARA, R., HILL, P. M., MAZZI, E., AND ZAFFANELLA, E. Widening operators for weakly-relational numeric abstractions. In *Static Analysis: Proceedings of the 12th International Symposium* (London, UK, 2005), C. Hankin and I. Siveroni, Eds., vol. 3672 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 3–18.

- [18] BAGNARA, R., RODRÍGUEZ-CARBONELL, E., AND ZAFFANELLA, E. Generation of basic semi-algebraic invariants using convex polyhedra. In *Static Analysis: Proceedings of the 12th International Symposium* (London, UK, 2005), C. Hankin and I. Siveroni, Eds., vol. 3672 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 19–34.
- [19] BAGNARA, R., DOBSON, K., HILL, P. M., MUNDELL, M., AND ZAFFANELLA, E. Grids: A domain for analyzing the distribution of numerical values. In *Logic-based Program Synthesis and Transformation, 16th International Symposium* (Venice, Italy, 2007), G. Puebla, Ed., vol. 4407 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 219–235.
- [20] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. An improved tight closure algorithm for integer octagonal constraints. In *Verification, Model Checking and Abstract Interpretation: Proceedings of the 9th International Conference (VMCAI 2008)* (San Francisco, USA, 2008), F. Logozzo, D. Peled, and L. Zuck, Eds., vol. 4905 of *Lecture Notes in Computer Science*, Springer-Verlag, Berlin, pp. 8–21.
- [21] BAGNARA, R., CARLIER, M., GORI, R., AND GOTLIEB, A. Symbolic path-oriented test data generation for floating-point programs. In *Proceedings of the 6th IEEE International Conference on Software Testing, Verification and Validation* (Luxembourg City, Luxembourg, 2013), IEEE Press.
- [22] BAGNARA, R., AND MESNARD, F. Eventual linear ranking functions. In *Proceedings of the 15th International Symposium on Principles and Practice of Declarative Programming (PPDP 2013)* (Madrid, Spain, 2013), ACM Press, pp. 229–238.
- [23] BAGNARA, R., GIACOBAZZI, R., AND LEVI, G. Static analysis of CLP programs over numeric domains. In *Actes “Workshop on Static Analysis ’92”* (Bordeaux, September 1992), M. Billaud, P. Castéran, M. Corsini, K. Musumbu, and A. Rauzy, Eds., vol. 81–82 of *Bigre*, Atelier Irisa, IRISA Campus de Beaulieu, pp. 43–50.
- [24] BAGNARA, R. On the detection of implicit and redundant numeric constraints in CLP programs. In *Proceedings of the “1994 Joint Conference on Declarative Programming (GULP-PRODE’94)”* (Peñíscola, Spain, September 1994), M. Alpuente, R. Barbuti, and I. Ramos, Eds., pp. 312–326.
- [25] BAGNARA, R. Constraint systems for pattern analysis of constraint logic-based languages. In *Proceedings of the “1995 Joint Conference on Declarative Programming (GULP-PRODE’95)”* (Marina di Vietri, Italy, September 1995), M. Alpuente and M. I. Sessa, Eds., pp. 581–592.
- [26] BAGNARA, R. Straight ROBDDs are not the best for *Pos*. In *Proceedings of the “1996 Joint Conference on Declarative Programming (APPIA-GULP-PRODE’96)”* (Donostia-San Sebastián, Spain, 1996), Lucio, P., Martelli, M., and Navarro, M., Eds., pp. 493–496.

*Roberto Bagnara*

- [27] BAGNARA, R., COMINI, M., SCOZZARI, F., AND ZAFFANELLA, E. The AND-compositionality of CLP computed answer constraints. In *Proceedings of the "1996 Joint Conference on Declarative Programming (APPIA-GULP-PRODE'96)"* (Donostia-San Sebastián, Spain, 1996), Lucio, P., Martelli, M., and Navarro, M., Eds., pp. 355–366.
- [28] BAGNARA, R. Structural information analysis for CLP languages. In *Proceedings of the "1997 Joint Conference on Declarative Programming (APPIA-GULP-PRODE'97)"* (Grado, Italy, 1997), Falaschi, M., Navarro, M., and Policriti, A., Eds., pp. 81–92.
- [29] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. Sharing revisited. In *Proceedings of the "1997 Joint Conference on Declarative Programming (APPIA-GULP-PRODE'97)"* (Grado, Italy, 1997), Falaschi, M., Navarro, M., and Policriti, A., Eds., pp. 69–80.
- [30] BAGNARA, R., AND SCHACHTE, P. Factorizing equivalent variable pairs in ROBDD-based implementations of *Pos*. In *Proceedings of the "1998 Joint Conference on Declarative Programming (APPIA-GULP-PRODE'98)"* (A Coruña, Spain, 1998), Freire-Nistal, J. L., Falaschi, M., and Vilares-Ferro, M., Eds., pp. 227–239.
- [31] HILL, P. M., BAGNARA, R., AND ZAFFANELLA, E. The correctness of set-sharing. In *Proceedings of the "1998 Joint Conference on Declarative Programming (APPIA-GULP-PRODE'98)"* (A Coruña, Spain, 1998), Freire-Nistal, J. L., Falaschi, M., and Vilares-Ferro, M., Eds., pp. 255–267.
- [32] BAGNARA, R., ZAFFANELLA, E., AND HILL, P. M. Enhancing Sharing for precision. In *Proceedings of the "APPIA-GULP-PRODE'99 Joint Conference on Declarative Programming"* (L'Aquila, Italy, 1999), Meo, M. C., and Ferro, M. V., Eds., pp. 213–227.
- [33] ZAFFANELLA, E., BAGNARA, R., AND HILL, P. M. Widening Sharing. In *Proceedings of the "APPIA-GULP-PRODE'99 Joint Conference on Declarative Programming"* (L'Aquila, Italy, 1999), Meo, M. C., and Ferro, M. V., Eds., pp. 559–573.
- [34] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. A new encoding of not necessarily closed convex polyhedra. In *Proceedings of the 1st CoLogNet Workshop on Component-based Software Development and Implementation Technology for Computational Logic Systems* (Madrid, Spain, 2002), M. Carro, C. Vacheret, and K.-K. Lau, Eds., pp. 147–153. Published as TR Number CLIP4/02.0, Universidad Politécnica de Madrid, Facultad de Informática.
- [35] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. A new encoding and implementation of not necessarily closed convex polyhedra. In *Proceedings of the 3rd Workshop on Automated Verification of Critical Systems* (Southampton, UK, 2003), M. Leuschel, S. Gruner, and S. Lo Presti, Eds., pp. 161–176. Published as TR Number DSSE-TR-2003-2, University of Southampton.

Roberto Bagnara

- [36] BAGNARA, R., HILL, P. M., PESCE, A., AND ZAFFANELLA, E. Verification of C programs via natural semantics and abstract interpretation. In *Proceedings of the C/C++ Verification Workshop* (Oxford, UK, 2007), H. Tews, Ed., pp. 75–80. Extended abstract. Published as Technical Report ICIS-R07015, Institute for Computing and Information Sciences (iCIS), Radboud University Nijmegen, Nijmegen, The Netherlands.
- [37] BAGNARA, R., HILL, P. M., AND ZAFFANELLA, E. A Prolog-based environment for reasoning about programming languages. Tech. Rep. arXiv:cs.PL/0711.0345, Dipartimento di Matematica, Università di Parma, Italy, 2007. Extended abstract. Contribution to the *17th International Workshop on “Logic-based methods in Programming Environments”* (WLPE’07, Porto, Portugal, September 13, 2007). Available from <http://arxiv.org/>.
- [38] ALEZAN, A., BAGNARA, R., MESNARD, F., AND PAYET, E. Détection des fonctions de rang linéaires à terme. In *Actes des Neuvièmes Journées Francophones de Programmation par Contraintes (JFPC 2013)* (Aix-en-Provence, France, 2013), pp. 11–20. In French.

## Titoli

**Responsabilità scientifica per progetti di ricerca internazionali e nazionali, ammessi al finanziamento sulla base di bandi competitivi che prevedano la revisione tra pari**

1. Nell’ambito delle *Azioni Integrate Italia-Spagna 2001* coordina, per la parte italiana, il progetto biennale dal titolo “Ambienti avanzati per lo sviluppo di programmi logici” (IT229). Coordinatore per la parte spagnola: Prof. Germán Puebla Sánchez, *Facultad de Informática, Universidad Politécnica de Madrid*.
2. Partecipa, come responsabile dell’unità di Parma al programma di ricerca cofinanziato dal MURST intitolato “Verifica di sistemi reattivi basata su vincoli” (2002–2004, coordinatore nazionale: Prof. Maurizio Gabbrielli, Università di Bologna).
3. Partecipa, come coordinatore per l’Italia, al *Royal Society International Joint Project 2004/R1 Europe (ESEP) “Automatic Detection of Unstable Numerical Computations”* (2004–2006, coordinatore principale: Dr Patricia M. Hill, University of Leeds, Regno Unito).
4. Partecipa, come responsabile dell’unità di Parma al programma di ricerca cofinanziato dal MIUR intitolato “AIDA — Interpretazione Astratta: Progettazione e Applicazioni” (2004–2006, coordinatore nazionale: Prof. Roberto Giacobazzi, Università di Verona).
5. Nell’ambito del programma ITEA (*Information Technology for European Advancement*), è responsabile dell’unità di Parma del progetto GlobalGCC (GGCC), il cui obiettivo è quello di estendere la *GNU Compiler Collection* (GCC) con tecniche di analisi statica globale.

6. Partecipa, come responsabile dell'unità di Parma al programma di ricerca cofinanziato dal MIUR intitolato "AIDA2007 — Interpretazione Astratta: Progettazione e Applicazioni" (2008-2010, coordinatore nazionale: Prof. Francesco Ranzato, Università di Padova).

**Partecipazione a comitati editoriali di riviste, collane editoriali, enciclopedie e trattati di riconosciuto prestigio**

1. Dal 2000 al 2008, *Implementation Area Editor* e curatore della sezione *Net Talk* per l'*ALP newsletter*, il bollettino della *Association for Logic Programming*.

**Attribuzione di incarichi di insegnamento o di ricerca (fellowship) ufficiale presso atenei e istituti di ricerca, esteri e internazionali, di alta qualificazione**

1. *Technical Student Fellow* presso il *CERN* (European Organization for Nuclear Research) di Ginevra (Svizzera), dall'1 gennaio al 30 settembre 1988.
2. *Consultant* presso il *CERN* (European Organization for Nuclear Research), Geneva, Switzerland, mesi di luglio e agosto 1989.
3. *Visiting researcher* presso il *Department of Computer Science* della *Monash University* di Melbourne (Australia), dal 14 gennaio al 16 febbraio 1995.
4. *Research fellow* presso la *School of Computer Studies* della *University of Leeds* (Inghilterra), dall'1 gennaio al 31 ottobre 1997.
5. *Visiting scientist* presso il *Laboratoire d'Informatique* della *École Polytechnique* (LIX, Parigi) dal 15 giugno al 15 luglio 2008.
6. *Professeur invité* presso il *Département de Mathématiques et Informatique* della *Université de La Réunion*, S<sup>t</sup> Denis (Oceano Indiano, Francia), per i mesi di maggio 2002, giugno 2005, maggio 2006, maggio 2007 e marzo 2010
7. incarico di insegnamento: *Algorithmique*, Licence de mathématiques, Université de la Réunion, a.a. 2006-2007.
8. incarico di insegnamento: *Réécriture et Sémantique*, Master Sciences et Technologies, Mention Informatique et Mathématiques, Spécialité STIC, Université de la Réunion, a.a. 2009-2010.

**Risultati ottenuti nel trasferimento tecnologico in termini di partecipazione alla creazione di nuove imprese (spin off), sviluppo, impiego e commercializzazione di brevetti**

1. costituzione dello *spin-off* universitario BUGSENG srl nel dicembre 2010. Dalla fondazione della società è presidente ed amministratore delegato di BUGSENG srl.

12 dicembre 2014

Pagina 8 di 8

Firma

