

Curriculum Vitae

Paolo Bientinesi, born on October 27 1973, in Livorno, ITALY. Unmarried.

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PROFESSIONAL EXPERIENCE:

- July 2008 - present: **Junior Professor:** Algorithm Oriented Code Generation for High-Performance Architectures. Computer Science Department, RWTH Aachen.
- June 2008 - present: **Junior Research Group Leader,** Aachen Institute for Advanced Study in Computational Engineering Science (AICES), RWTH Aachen.
- September 2006 - May 2008: **Research Associate,** Department of Computer Science, Duke University. Topics: Digital Signal Processing algorithms targeting the Cell Broad-band processor and other emerging architectures. Sparse direct solvers for linear systems arising in *hp*-adaptive Finite Element Methods.
- Fall 2002 - Summer 2006: **Research Assistant.** Department of Computer Sciences, The University of Texas at Austin. Supervisor: Prof. Robert van de Geijn. Subject: High-performance dense linear algebra. Tools and theory for mechanical derivation of algorithms. Systematic error analysis. Member of the Formal Linear Algebra Method Environment (FLAME) research project.
- Fall 2000 - Spring 2002: **Assistant Instructor** on Scientific Computing for undergraduates in mechanical engineering. Teaching Assistant for various courses related to Numerical Methods and High-Performance Parallel Computing. Department of Computer Sciences, The University of Texas at Austin.
- Summer 2001: **Summer Intern.** The Institute for Computational Mathematics of the National Research Council, Pisa. Supervisor: Dr. Marco Pellegrini. Topic: A Randomized Geometric Approach for Linear Programming Problems.
- January 2000 - June 2000: **Visiting Scholar.** Center for Computational Visualization, The Texas Institute for Computational and Applied Mathematics. Supervisor: Prof. Chandrajit Bajaj. Experience with SMP supercomputers.
- September 1998 - December 1999: Served as **Naval Officer** in the Italian Navy. Ranked first of my class (170 cadets). Head trainer of a new class of 160 Navy officer cadets (draftees with college degrees). Responsible for the database and system administration for the NT-network at the Italian Naval Academy.
- May 1998 - July 1998: **System administrator** for Unix network. Institute for Computational Mathematics of the National Research Council, Pisa.

EDUCATION:

- August 2000 – August 2006:
Ph.D. in Computer Sciences, University of Texas at Austin.
Advisor: Prof. Robert van de Geijn. Dissertation: “*Mechanical Derivation and Systematic Analysis of Correct Linear Algebra Algorithms*”.
- September 1992 – April 1998:
Laurea Degree (equiv. to M.S.). *Summa Cum Laude*. Department of Computer Science, University of Pisa, Italy. Thesis: “*Computational Geometry Techniques for Approximating Electrostatic Forces*”. Supervised by Dr. Marco Pellegrini at the Institute for Computational Mathematics of the Italian National Research Council.
- Advanced Training:
 - June 2008: Mathematics Research Communities (American Mathematical Society): Workshop on Scientific Computing and Advanced Computation, Snowbird, Utah. Prof. Randy LeVeque, Dr. Juan Meza, Dr. John Bell.
 - August 2001: Summer school on Sparse Matrix Computation; Technical University of Denmark. Profs. Iain S. Duff and Henk A. van der Vorst.
 - July 1999: International Summer Course in Advanced Mathematics - Cortona, IT. Attended class: Numerical Analysis. Profs. Mario Arioli and Eugene Tyrtyshnikov.
 - August 1998: International Summer Course in Advanced Mathematics - Perugia, IT. Attended classes: Numerical Analysis, Complex Analysis.

HONORS:

- Recipient of the 2009 Karl Arnold Prize from the North Rhine-Westphalian Academy of Sciences and Humanities for outstanding research work of a young scientist.
- Recipient of the J. Tinsley Oden Faculty Research Fellowship for research collaboration with the Institute for Computational Engineering and Sciences at the University of Texas at Austin. March 2009.
- Ph.D. dissertation: Finalist for the Householder Award for the best dissertation in numerical linear algebra of the years 2006-2008. Householder XVII Symposium on Numerical Linear Algebra.
- Ph.D. dissertation: Selected as the UTCS candidate for the 2006 ACM Doctoral Dissertation Award (Department of Computer Sciences, University of Texas at Austin).
- VIP guest at the Householder XVI Symposium on Numerical Linear Algebra. May 2005.
- Finalist for the Wilkinson Fellowship in Scientific Computing (Argonne National Laboratory). March 2005.
- Best graduate naval officer of the year (among 500 officers). May 1999.

JOURNAL PUBLICATIONS:

- *Sparse Direct Factorizations through Unassembled Hyper-Matrices*. Paolo Bientinesi, Victor Eijkhout, Kyungjoo Kim, Jason Kurtz and Robert van de Geijn. Computer Methods in Applied Mechanics and Engineering. Accepted for publication.
- *Families of Algorithms Related to the Inversion of a Symmetric Positive Definite Matrix*. P. Bientinesi, B. Gunter and R. van de Geijn. ACM Transactions on Mathematical Software, 35(1), July 2008.
- *Scalable Parallelization of FLAME Code via the Workqueuing Model*. P. Bientinesi, T. Meng Low, R. van de Geijn and F. Van Zee. ACM Transactions on Mathematical Software, 34(2), March 2008.

- *A Parallel Eigensolver for Dense Symmetric Matrices Based on Multiple Relatively Robust Representations.* P. Bientinesi, I. Dhillon, R. van de Geijn. SIAM Journal on Scientific Computing, 27(1), 43-66, 2005.
- *Representing Linear Algebra Algorithms in Code: The FLAME APIs.* P. Bientinesi, E. Quintana-Ortí and R. van de Geijn. ACM Transactions on Mathematical Software, 31(1), March 2005.
- *The Science of Deriving Dense Linear Algebra Algorithms.* P. Bientinesi, J. Gunnels, M. Myers, E. Quintana-Ortí and R. van de Geijn. ACM Transactions on Mathematical Software, 31(1), March 2005.
- *On Numerical Approximation of Electrostatic Energy in 3D.* D. Finocchiaro, M. Pellegrini and P. Bientinesi. Journal of Computational Physics 146/2, 707-725, 1998.

Submitted:

- *A Goal-Oriented and Modular Approach to Stability Analysis.* P. Bientinesi and R. van de Geijn. Submitted to SIAM Journal on Matrix Analysis and Applications.

PEER REVIEWED CONFERENCE PUBLICATIONS:

- *On Parallelizing the MRRR Algorithm for Data-Parallel Coprocessors.* C. Lessig and P. Bientinesi. PPAM 2009, Eighth International Conference on Parallel Processing and Applied Mathematics. Accepted for publication.
- *Reduction to Condensed Forms for Symmetric Eigenvalue Problems on Multi-core Architectures.* P. Bientinesi, F. Igual, D. Kressner and E. Quintana-Ortí. PPAM 2009, Eighth International Conference on Parallel Processing and Applied Mathematics. Accepted for publication.
- *Can Cloud Computing Reach the Top500?* J. Napper and P. Bientinesi. Proceedings of the Workshop on UnConventional High Performance Computing, in conjunction with The 2009 ACM International Conference on Computing Frontiers, 18-20 May, 2009.
- *Multi-dimensional Array Operations for Signal Processing Algorithms.* P. Bientinesi, N. Pitsianis and X. Sun. Proceedings of PARA 2008: 9th International Workshop on State-of-the-Art in Scientific and Parallel Computing.
- *Fast Computation of Local Correlation Coefficients.* P. Bientinesi, N. Pitsianis and X. Sun. SPIE Advanced Signal Processing Algorithms, Architectures, and Implementations 2008.
- *SuperMatrix: a Multithreaded Runtime Scheduling System for Algorithms-by-Blocks.* P. Bientinesi, E. Chan, E. Quintana-Ortí, G. Quintana-Ortí, R. van de Geijn and F. Van Zee. Proceedings of ACM SIGPLAN 2008 Symposium on Principles and Practice of Parallel Programming (PPoPP'08), February 20-23, 2008.
- *Unassembled Hyper-Matrices for hp-adaptive FEM Problems.* P. Bientinesi, V. Eijkhout, J. Kurtz and R. van de Geijn. Proceedings of the International Congress on Industrial and Applied Mathematics (ICIAM'07), July 16-20, 2007.
- *Formal Correctness and Stability of Dense Linear Algebra Algorithms.* P. Bientinesi and R. van de Geijn. In Proceedings of 17th IMACS World Congress: Scientific Computation, Applied Mathematics and Simulation, 2005.
- *Automatic Derivation of Linear Algebra Algorithms with Application to Control Theory.* P. Bientinesi, S. Kolos and R. van de Geijn. Proceedings of PARA'04 State-of-the-Art in Scientific Computing, June 20-23, 2004.

- *Rapid Development of High-Performance Linear Algebra Libraries*. P. Bientinesi, J. Gunnels, F. Gustavson, G. Henry, M. Myers, E. Quintana-Ortí and R. van de Geijn. Proceedings of PARA'04 State-of-the-Art in Scientific Computing, June 20-23, 2004.
- *The Science of Programming High-Performance Linear Algebra Libraries*. P. Bientinesi, J. Gunnels, F. Gustavson, G. Henry, M. Myers, E. Quintana-Ortí and R. van de Geijn. Proceedings of Performance Optimization for High-Level Languages and Libraries (POHLL-02), a workshop in conjunction with the 16th Annual ACM International Conference on Supercomputing (ICS'02), June 21, 2002.

SELECTED TECHNICAL REPORTS:

- *Formal Derivation of Krylov Methods*. Texas Advanced Computing Center (TACC) TR-09-03. March 2009.
- *The Science of Deriving Stability Analyses*. Aachen Institute for Computational Engineering Science, RWTH Aachen. AICES-2008-7. November 2008.
- *Automation in Dense Linear Algebra*. Aachen Institute for Computational Engineering Science, RWTH Aachen. AICES-2008-2. October 2008.
- *Sparse Direct Factorizations through Unassembled Hyper-Matrices*. Texas Advanced Computing Center (TACC) TR-07-02. October 2007.
- *Parallel 2D FFTs on the Cell Broadband Engine*. Department of Computer Science, Duke University. CS-2007-03. April 2007.
- *Mechanical Derivation and Systematic Analysis of Correct Linear Algebra Algorithms*. The University of Texas at Austin, Department of Computer Sciences. TR-06-46. September 2006. (Ph.D. Dissertation).
- *Representing Dense Linear Algebra Algorithms: A Farewell to Indices*. FLAME Working Note #17. The University of Texas at Austin, Department of Computer Sciences. TR-2006-10. February 2006.
- *A Parallel Eigensolver for Dense Symmetric Matrices Based on Multiple Relatively Robust Representations*. The University of Texas at Austin, Department of Computer Sciences. TR-03-26. September 2002.
- *Electrostatic fields without singularities: implementation and experiments*. Institute for Computational Mathematics, TR-B4-16-97. 1997.

SERVICE:

- Organizer:
 - Symposium on High-Performance Computing and Numerical Linear Algebra within the 7th International Conference of Numerical Analysis and Applied Mathematics (ICNAAM 2009).
 - Workshop on Scientific Writing, with Prof. G. Gopen (Duke University). RWTH Aachen, July 2009.
- Editorial Board: Scientific Programming (special issue on High Performance Computing on Cell B.E. Processors).
- Journal Reviewer: BIT, SIAM Journal on Matrix Analysis and Applications, ACM Transactions on Mathematical Software, Numerical Algorithms, Parallel Computing, Journal of Computational and Applied Mathematics, Parallel Algorithms, Advances in Engineering Software Journal, ACM Journal on Experimental Algorithmics.
- Conference Referee: SC09, IPDPS 2009, PARA'08, PARA'06.

STUDENTS:

- Matthias Petschow — Parallel Eigensolvers
- Roman Iakymchuk — Performance Prediction
- Diego Fabregat — Automatic Algorithm Generation
- Stefan Feuerriegel

TEACHING:

- Summer '09: Automatic generation and analysis of algorithms.
- MIT–RWTH Spring school '09: Dense linear algebra on multi-core architectures.
- Winter '08-'09: Languages for scientific computing.

SELECTED TALKS:

- *Numerical Methods for Large Linear Systems.*
3rd LHC Detector Alignment Workshop. CERN, Geneva, Switzerland. June 15, 2009.
- *Computational Mathematics.*
Woche zu Italien. RWTH Aachen, Germany. March 23, 2009.
- *Multi-dimensional Array Memory Accesses for FFTs on Parallel Architectures.*
PARA 2008: 9th International Workshop on State-of-the-Art in Scientific and Parallel Computing. Trondheim, Norway. May 15th, 2008.
- *Generation of dense linear algebra software for shared memory and multicore architectures.*
 - Microsoft Corporation, April '08, Redmond, WA. Host: Laurent Visconti.
 - Workshop on Automating the Development of Scientific Computing Software, March '08, Baton Rouge, LA.
- *Scientific Computing: Applications, Algorithms, Architecture.*
 - Colorado State University, March '08, Fort Collins, CO.
 - RWTH Aachen University, January '08, Aachen, Germany. Hosts: Marek Behr and Chris Bischof.
- *Streaming 2D FFTs on the Cell Broadband Engine.*
DESA Workshop, December '07, Washington, DC.
- *Sparse Direct Factorizations Based on Unassembled Hyper-Matrices.*
ICIAM07: 6th International Congress on Industrial and Applied Mathematics, July '07. Zurich, CH.
- *Dense Linear Algebra on Multicore Architectures: What Kind of Parallelism?* CScADS. Workshop on Automatic Tuning for Petascale Systems, July '07, Snowbird, UT.
- *Can Computers Develop Libraries? A Different Perspective on Scientific Computing.*
The University of Chicago, February '07, Chicago, IL. Host: Ridgway Scott.
- *Mechanical Generation of Correct Linear Algebra Libraries with multiple variants.*
 - Georgia Institute of Technology, March '06, Atlanta, GA. Host: Richard Fujimoto.
 - Carnegie Mellon University, February '06, Pittsburgh, PA. Host: Markus Pueschel.
 - University of Oxford, January '06, Oxford, UK. Host: Richard Bird.
 - Argonne National Laboratory, March '05, Argonne, IL. Host: Jorge Moré.

– IBM T.J. Watson Research Center, January '05, Yorktown Heights, NY.
Host: John Gunnels.

- *Formal Correctness and Stability of Dense Linear Algebra Algorithms*. 17th IMACS World Congress: Scientific Computation, Applied Mathematics and Simulation, July '05, Paris, France.
- *A Parallel Eigensolver for Dense Symmetric Matrices Based on Multiple Relatively Robust Representations*. Householder XVI Symposium on Numerical Linear Algebra, May '05, Silver Springs Mountain Resort, PA.

REFERENCES:

- Prof. **Robert van de Geijn**, Department of Computer Sciences, The University of Texas at Austin. Phone: (512) 471-9720. Fax: (512) 471-8885. Email: rvdg@cs.utexas.edu
- Prof. **Chris Bischof**, Institute for Scientific Computing and Center for Computing and Communication, RWTH Aachen. Phone: +49 241 80 29110. Fax: +49 241 8022241. Email: bischof@rz.rwth-aachen.de
- Prof. **Enrique Quintana-Orti**, Depto. de Ingenieria y Ciencia de Computadores, Universidad Jaume I. Spain. Phone: (+34) 964 728257. Email: quintana@icc.uji.es
- Dr. **Victor Eijkhout**, Texas Advanced Computing Center (TACC), The University of Texas at Austin. Austin, TX. Phone: (512) 471-5809. Fax: (512) 475-9445. Email: eijkhout@tacc.utexas.edu