

Alfredo Buttari, PhD

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Research interests

My research activity addresses various aspects of [Computational Linear Algebra](#). Currently, I am mostly focusing on [direct methods](#) for the solution of sparse linear systems. I am a member of the [MUMPS](#) development team and principal developer of the [qr-mumps](#) code.

I still somehow collaborate to the development of the [PSBLAS](#) and [MLD2P4](#) libraries which form a parallel framework for the solution of sparse linear systems through Krylov iterative methods in combination with Multilevel preconditioners.

[HPC](#) issues drive most of my research activity. My work focuses on modern, multicore-based computing systems and programming models.

Employment history

- 2009-present** | CNRS Chargé de Recherche (researcher) at the IRIT laboratory of Toulouse.
- 2008** | INRIA Post-doc at LIP, ENS-Lyon, France for the ANR-06-CIS-010 Solstice project.
- 2006-2007** | Senior Research Associate of the ICL laboratory at the University of Tennessee Knoxville, United States of America.

Education

- 2002 – 2005** | PhD in Computer Science at the University of Rome “Tor Vergata” and University of Tennessee Knoxville. Dissertation title “Software Tools for Sparse Linear Algebra Computations”. Thesis advisor Salvatore Filippone and co-advisor Victor Eijkhout.
- 2005** | International Summer School on Grid Computing at the University of Naples “Federico II”
- 1997 – 2002** | Master Degree in Computer Science at the University of Rome “Tor Vergata”. Dissertation title “Data Structures for Sparse Linear Algebra with Applications to Computational Fluid Dynamics”. Thesis advisor Salvatore Filippone.

Professional activities

- Paper Reviews** | I have been reviewer for several journals such as ACM TOMS, PARCO, IJHPCA, TPDS, JOCS, JSS, PPL, JBCS as well as conferences such as EuroPAR, IPDPS, HPCC, PARA, SPAA, PMAA, ICPP.
- Project Reviews Tutorials** | I have been project reviewer for the ANR COSINUS program in 2010
J. Kurzak and A. Buttari: “Introduction to Programming High Performance Applications on the CELL Broadband Engine”. HOTI 2007: 15th Annual IEEE Symposium on High-Performance Interconnects, Stanford, CA, 2007
- Committees** | I was a member of the program committees for the ICCSA 2010, HPCC 2009 and ICS 2011 conferences.

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Publications

Journals

- [1] Marc Baboulin, Alfredo Buttari, Jack Dongarra, Jakub Kurzak, Julie Langou, Julien Langou, Piotr Luszczek, and Stanimire Tomov. Accelerating scientific computations with mixed precision algorithms. *Computer Physics Communications*, 180(12):2526–2533, 2009. [[doi:10.1016/j.cpc.2008.11.005](https://doi.org/10.1016/j.cpc.2008.11.005)].
- [2] A. Buttari, J. Langou, J. Kurzak, and J. Dongarra. A class of parallel tiled linear algebra algorithms for multi-core architectures. *Parallel Comput.*, 35(1):38–53, 2009. [[doi:10.1016/j.parco.2008.10.002](https://doi.org/10.1016/j.parco.2008.10.002)].
- [3] A. Buttari, J. Dongarra, J. Kurzak, P. Luszczek, and S. Tomov. Using mixed precision for sparse matrix computations to enhance the performance while achieving 64-bit accuracy. *ACM Trans. Math. Softw.*, 34(4):1–22, 2008. [[doi:10.1145/1377596.1377597](https://doi.org/10.1145/1377596.1377597)].
- [4] A. Buttari, J. Langou, J. Kurzak, and J. Dongarra. Parallel tiled qr factorization for multicore architectures. *Concurr. Comput. : Pract. Exper.*, 20(13):1573–1590, 2008. [[doi:10.1002/cpe.v20:13](https://doi.org/10.1002/cpe.v20:13)].
- [5] J. Kurzak, A. Buttari, and J. Dongarra. Solving systems of linear equations on the cell processor using cholesky factorization. *IEEE Trans. Parallel Distrib. Syst.*, 19(9):1175–1186, 2008. [[doi:10.1109/TPDS.2007.70813](https://doi.org/10.1109/TPDS.2007.70813)].
- [6] A. Buttari, P. D’Ambra, D. di Serafino, and S. Filippone. 2LEV-D2P4: a package of high-performance preconditioners for scientific and engineering applications. *Appl. Algebra Eng., Commun. Comput.*, 18(3):223–239, 2007. [[doi:10.1007/s00200-007-0035-z](https://doi.org/10.1007/s00200-007-0035-z)].
- [7] A. Buttari, J. Dongarra, J. Langou, J. Langou, P. Luszczek, and J. Kurzak. Mixed precision iterative refinement techniques for the solution of dense linear systems. *Int. J. High Perform. Comput. Appl.*, 21(4):457–466, 2007. [[doi:10.1177/1094342007084026](https://doi.org/10.1177/1094342007084026)].
- [8] A. Buttari, V. Eijkhout, J. Langou, and S. Filippone. Performance optimization and modeling of blocked sparse kernels. *Int. J. High Perform. Comput. Appl.*, 21(4):467–484, 2007. [[doi:10.1177/1094342007083801](https://doi.org/10.1177/1094342007083801)].

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Conferences

- [9] A. Buttari, J. Langou, J. Kurzak, and J. Dongarra. Parallel tiled QR factorization for multicore architectures. In *PPAM'07: Proceedings of the 7th international conference on Parallel processing and applied mathematics*, pages 639–648, Berlin, Heidelberg, 2008. Springer-Verlag. [[doi:10.1007/978-3-540-68111-3_67](https://doi.org/10.1007/978-3-540-68111-3_67)].
- [10] A. Buttari, J. Dongarra, P. Husbands, J. Kurzak, and K. Yelick. Multithreading for synchronization tolerance in matrix factorization. In *Proceedings of the SciDAC 2007 Conference*, Boston, Massachusetts, 2007. Journal of Physics: Conference Series. [[doi:10.1088/1742-6596/78/1/012028](https://doi.org/10.1088/1742-6596/78/1/012028)].
- [11] A. Buttari, P. D'Ambra, D. di Serafino, and S. Filippone. Extending PSBLAS to Build Parallel Schwarz Preconditioners. In Springer, editor, *Applied Parallel Computing. State of the Art in Scientific Computing: 7th International Conference, PARA 2004, Lyngby, Denmark, June 20-23, 2004.*, volume 3732 of *Lecture Notes in Computer Science*, pages 593–602, February 2006. [[doi:10.1007/11558958_71](https://doi.org/10.1007/11558958_71)].
- [12] A. Buttari, J. Dongarra, J. Kurzak, J. Langou, P. Luszczek, and S. Tomov. The impact of multicore on math software. In *PARA*, pages 1–10, 2006. [[doi:10.1007/978-3-540-75755-9_1](https://doi.org/10.1007/978-3-540-75755-9_1)].
- [13] J. Langou, J. Langou, P. Luszczek, J. Kurzak, A. Buttari, and J. Dongarra. Exploiting the performance of 32 bit floating point arithmetic in obtaining 64 bit accuracy (revisiting iterative refinement for linear systems). In *SC '06: Proceedings of the 2006 ACM/IEEE conference on Supercomputing*, page 113, New York, NY, USA, 2006. ACM. [[doi:10.1145/1188455.1188573](https://doi.org/10.1145/1188455.1188573)].
- [14] G. Bella, A. Buttari, A. De Maio, F. Del Citto, S. Filippone, and F. Gasperini. FAST-EVP: an engine simulation tool. In Springer, editor, *High Performance Computing and Communications. First International Conference, HPCC 2005, Proceedings*, volume 3726 of *Lecture Notes in Computer Science*, pages 976–986, September 2005. [[doi:10.1007/11557654_108](https://doi.org/10.1007/11557654_108)].

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Publications

Book chapters

- [15] David Padua, editor. *Encyclopedia of Parallel Computing*, chapter MUMPS. Springer Verlag, 2011.
- [16] P. Amestoy, A. Buttari, I. Duff, A. Guermouche, J.-Y. L'Excellent, and B. çar. *Encyclopedia of Parallel Computing*, chapter The Multifrontal Method. Springer Verlag, 2011.
- [17] J. Demmel et al. *Handbook of Parallel Computing: Models, Algorithms and Applications*, volume 17 of *Chapman & Hall/CRC Computer & Information Science*, chapter Prospectus for a Linear Algebra Software Library for Dense Matrix Problems. CRC Press, 1 edition, December 2007. ISBN: 9781584886235.
- [18] *High Performance Computing and Grids in Action*, chapter Exploiting Mixed Precision Floating Point Hardware in Scientific Computations. 2007. [\[PDF\]](#).
- [19] A. Buttari, J. Dongarra, J. Kurzak, and J. Langou. *Cyberinfrastructure Technologies and Applications*, chapter Parallel Dense Linear Algebra Software in the Multicore Era. Nova Science Publishers, 2007.

PhD thesis

- [20] A. Buttari. *Software Tools for Sparse Linear Algebra Computations*. PhD thesis, University of Rome Tor Vergata, 2006. [\[PDF\]](#).

Popular Science magazines

- [21] J. Kurzak, A. Buttari, P. Luszczek, and J. Dongarra. The playstation 3 for high-performance scientific computing. *Computing in Science and Eng.*, 10(3):84–87, 2008. [\[doi:10.1109/MCSE.2008.85\]](https://doi.org/10.1109/MCSE.2008.85).

Technical reports

- [22] A. Buttari, P. Luszczek, J. Kurzak, J. Dongarra, and G. Bosilca. SCOP3: A rough guide to scientific computing on the PlayStation 3. version 0.1. Technical Report UT-CS-07-595, Innovative Computing Laboratory, University of Tennessee Knoxville, April 2007.
- [23] A. Buttari and S. Filippone. *PSBLAS-2.0 User's Manual*. University of Rome Tor Vergata, 2005.

Submitted

- [24] A. Buttari. Fine-grained multithreading for the multifrontal QR factorization of sparse matrices. 2011. Submitted to SIAM SISC and APO technical report number RT-APO-11-6 [\[PDF\]](#).
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- [26] S. Filippone and A. Buttari. An object model for sparse matrix computations in Fortran 2003. 2010. Accepted for publication on ACM TOMS.