

# Jakub Kurzak

## CONTACT INFORMATION

Innovative Computing Laboratory  
Electrical Engineering and Computer Science Department  
University of Tennessee  
1122 Volunteer Blvd  
Ste 413 Claxton  
Knoxville, TN 37996-3450

OFFICE: 351 Claxton  
PHONE: (865) 974-9985  
FAX: (865) 974-8296  
EMAIL: [kurzak@eecs.utk.edu](mailto:kurzak@eecs.utk.edu)  
WEBSITE: <http://www.cs.utk.edu/~kurzak>

## EDUCATION

### PhD

Computer Science Department  
University of Houston  
Houston, Texas  
2005

ISBN-13: 9780542512018  
ISBN: 0542512017

### MS

Electrical Engineering Department  
Wrocław University of Technology  
Wrocław, Poland  
2000

## EXPERIENCE

### Research Scientist

#### Senior Research Associate

Innovative Computing Laboratory  
Electrical Engineering and Computer Science Department  
University of Tennessee  
Knoxville, Tennessee

March 2009 - present  
January 2006 - February 2009

### Research Assistant

Institute for Molecular Design  
Department of Chemistry  
University of Houston  
Houston, Texas

January 2001 - December 2005

### Software Design Engineer Intern

Silicon & Software Systems Ltd.  
Wrocław, Poland

July 2000 - December 2000

## BOOK CHAPTERS

- [6] W. Alvaro, J. Kurzak, J. Dongarra,  
**Implementing Matrix Multiplication on the Cell B. E.**  
In *Scientific Computing with Multicore and Accelerators*  
Computational Science Series, Chapman & Hall/CRC, 2010
- [5] J. Kurzak, J. Dongarra  
**Implementing Matrix Factorizations on the Cell B. E.**  
In *Scientific Computing with Multicore and Accelerators*  
Computational Science Series, Chapman & Hall/CRC, 2010
- [4] J. Kurzak, H. Ltaief, J. Dongarra, R. Badia,  
**Scheduling for Numerical Linear Algebra Library at Scale**  
In *Trends in High Performance & Large Scale Computing*  
Advances in Parallel Computing series, IOS Press
- [3] A. Buttari, J. J. Dongarra, J. Kurzak, J. Langou  
**Parallel Dense Linear Algebra Software in the Multicore Era**  
In *Cyberinfrastructure Technologies and Applications*  
Nova Science Publishers, Inc., 2009  
[ISBN-10: 1606920634](#) [ISBN-13: 978-1606920633](#)
- [2] A. Buttari, J. Dongarra, J. Kurzak, P. Luszczek, S. Tomov  
**Using Mixed Precision in Solving Linear Systems of Equations**  
In *High Performance Computing and Grids in Action*  
Advances in Parallel Computing series, IOS Press, 2008  
[ISBN-10: 1586038397](#) [ISBN-13: 978-1586038397](#)
- [1] J. Demmel, B. Parlett, W. Kahan, M. Gu, D. Bindel, Y. Hida, E. J. Riedy, C. Voemel,  
J. Kurzak, A. Buttari, J. Langou, S. Tomov, J. Dongarra, X. Li, O. Marques, J. Langou, P. Luszczek  
**Prospectus for a Dense Linear Algebra Software Library**  
In *Handbook of Parallel Computing: Models, Algorithms and Applications*  
Computer and Information Science Series, Chapman & Hall/CRC, 2008  
[ISBN-10: 1584886234](#) [ISBN-13: 978-1584886235](#)

## JOURNAL PUBLICATIONS

- [18] J. Kurzak, H. Ltaief, J. Dongarra, Rosa M. Badia  
**Scheduling Dense Linear Algebra Operations on Multicore Processors**  
*Concurrency and Computation: Practice and Experience* (accepted)
- [17] H. Ltaief, J. Kurza, J. Dongarra,  
**Scheduling Two-sided Transformations using Algorithms-by-Tiles on Multicore Architectures**  
*Scientific Programming* (accepted)
- [16] H. Ltaief, J. Kurza, J. Dongarra  
**Parallel Band Two-Sided Matrix Bi-diagonalization for Multi-Core Architectures**  
*IEEE Transactions on Parallel and Distributed Systems* (accepted)
- [15] H. Ltaief, J. Kurzak, J. Dongarra  
**Parallel Block Hessenberg Reduction Using Algorithms-by-Tiles for Multi-core Architectures Revisited**  
*ACM Transactions on Mathematical Software* (accepted)
- [14] M. Baboulin, A. Buttari, J. Dongarra, J. Kurzak, J. Langou, J. Langou, P. Luszczek, S. Tomov  
**Accelerating Scientific Computations with Mixed Precision Algorithms**  
*Computer Physics Communications*, special issue in celebration of its 40<sup>th</sup> anniversary (accepted)  
[DOI: 10.1016/j.cpc.2008.11.005](#)
- [13] J. Kurzak, J. Dongarra  
**QR Factorization for the CELL Processor**  
*Scientific Programming*, Special Issue: High Performance Computing with the Cell Broadband Engine  
17(1-2):31-42, 2009  
[DOI: 10.3233/SPR-2009-0268](#)

- [12] J. Kurzak, W. Alvaro, J. Dongarra  
**Optimizing Matrix Multiplication for a Short-Vector SIMD Architecture - CELL Processor**  
*Parallel Computing: Systems & Applications, Special Issue: Revolutionary Technologies for Acceleration of Emerging Petascale Applications* 35(3):138-150, 2009  
[DOI: 10.1016/j.parco.2008.12.010](https://doi.org/10.1016/j.parco.2008.12.010)
- [11] A. Buttari, J. Langou, J. Kurzak, J. Dongarra  
**A Class of Parallel Tiled Linear Algebra Algorithms for Multicore Architectures**  
*Parallel Computing: Systems and Applications* 35:38-53, 2009  
[DOI: 10.1016/j.parco.2008.10.002](https://doi.org/10.1016/j.parco.2008.10.002)
- [10] A. Buttari, J. Langou, J. Kurzak, J. Dongarra  
**Parallel Tiled QR Factorization for Multicore Architectures**  
*Concurrency and Computation: Practice and Experience* 20(13):1573-1590, 2008  
[DOI: 10.1002/cpe.1301](https://doi.org/10.1002/cpe.1301)
- [9] A. Buttari, J. Dongarra, J. Kurzak, P. Luszczek, S. Tomov  
**Using Mixed Precision for Sparse Matrix Computations to Enhance the Performance While Achieving 64-bit Accuracy**  
*ACM Transactions on Mathematical Software*, 34(4), article 17, 22 pages, 2008  
[DOI: 10.1145/1377596.1377597](https://doi.org/10.1145/1377596.1377597)
- [8] A. Buttari, J. Dongarra, J. Langou, J. Langou, P. Luszczek, J. Kurzak  
**Mixed Precision Iterative Refinement Techniques for the Solution of Dense Linear Systems**  
*International Journal of High Performance Computing Applications*, 21(4):457-466, 2007  
[DOI: 10.1177/1094342007084026](https://doi.org/10.1177/1094342007084026)
- [7] J. Kurzak, A. Buttari, J. Dongarra  
**Solving Systems of Linear Equations on the CELL Processor Using Cholesky Factorization**  
*IEEE Transactions on Parallel and Distributed Systems*, 19(9):1175-1186, 2008  
[DOI: 10.1109/TPDS.2007.70813](https://doi.org/10.1109/TPDS.2007.70813)
- [6] J. Kurzak, J. Dongarra  
**Implementation of Mixed Precision in Solving Systems of Linear Equations on the CELL Processor**  
*Concurrency and Computation: Practice and Experience* 19(10):1371-1385, 2007  
[DOI: 10.1002/cpe.1164](https://doi.org/10.1002/cpe.1164)
- [5] J. Kurzak, B. M. Pettitt  
**Message-Passing Implementation of the Data Diffusion Communication Model in Fast Multipole Methods: Large Scale Biomolecular Simulations**  
*Journal of Algorithms & Computational Technology* 2(4):557-579, 2008  
[DOI: 10.1260/174830108786231722](https://doi.org/10.1260/174830108786231722)
- [4] J. Kurzak, D. Mirkovic, B. M. Pettitt, S. L. Johnsson  
**Automatic Generation of FFTs for Translations of Multipole Expansions in Spherical Harmonics**  
*International Journal of High Performance Computing Applications* 22(2):219-230, 2008  
[DOI: 10.1177/1094342008090915](https://doi.org/10.1177/1094342008090915)
- [3] J. Kurzak, B. M. Pettitt  
**Fast Multipole Methods for Particle Dynamics**  
*Molecular Simulation* 32(10/11):775-790, 2006  
[DOI: 10.1080/08927020600991161](https://doi.org/10.1080/08927020600991161)
- [2] J. Kurzak, B. M. Pettitt  
**Massively Parallel Implementation of a Fast Multipole Method for Distributed Memory Machines**  
*Journal of Parallel and Distributed Computing* 65(7):870-881, 2005  
[DOI: 10.1016/j.jpdc.2005.02.001](https://doi.org/10.1016/j.jpdc.2005.02.001)
- [1] J. Kurzak, B. M. Pettitt  
**Communications Overlapping in Fast Multipole Particle Dynamics Methods**  
*Journal of Computational Physics* 203(2):731-743, 2005  
[DOI: 10.1016/j.jcp.2004.09.012](https://doi.org/10.1016/j.jcp.2004.09.012)

## CONFERENCE PUBLICATIONS

- [9] E. Agullo, J. Demmel, J. Dongarra, B. Hadri, J. Kurzak, J. Langou, H. Ltaief, P. Luszczek, S. Tomov  
**Numerical Linear Algebra on Emerging Architectures: The PLASMA and MAGMA Projects**  
*SciDAC'09: Scientific Discovery through Advanced Computing*, San Diego, California, 2009  
*Journal of Physics: Conference Series* 180:012037, IOP Publishing, 2009  
[DOI: 10.1088/1742-6596/180/1/012037](https://doi.org/10.1088/1742-6596/180/1/012037)
- [8] J. Kurzak, H. Ltaief, J. Dongarra, Rosa M. Badia  
**Scheduling Dense Matrix Factorizations on Multicore Processors**  
*PPAM'09: International Conference on Parallel Processing and Applied Mathematics*, Wrocław, Poland, 2009  
(accepted)
- [7] W. Alvaro, J. Kurzak, J. Dongarra  
**Fast and Small Short Vector SIMD Matrix Multiplication Kernels or the Synergistic Processing Element of the CELL Processor**  
*ICCS'08: International Conference on Computational Science*, Kraków, Poland, 2008  
*Lecture Notes in Computer Science* 5101:935-944, Springer, 2008  
[DOI: 10.1007/978-3-540-69384-0\\_98](https://doi.org/10.1007/978-3-540-69384-0_98)
- [6] A. Buttari, J. Langou, J. Kurzak, J. Dongarra  
**Parallel Tiled QR Factorization for Multicore Architectures**  
*PPAM'07: International Conference on Parallel Processing and Applied Mathematics*, Gdańsk, Poland, 2007  
*Lecture Notes in Computer Science* 4967:639-648, Springer, 2007  
[DOI: 10.1007/978-3-540-68111-3\\_67](https://doi.org/10.1007/978-3-540-68111-3_67)
- [5] J. Langou, J. Langou, P. Luszczek, J. Kurzak, A. Buttari, J. Dongarra  
**Exploiting the Performance of 32 Bit Floating Point Arithmetic in Obtaining 64 Bit Accuracy (Revisiting Iterative Refinement for Linear Systems)**  
*SC'06: ACM/IEEE Conference on Supercomputing*, Tampa, Florida, 2006  
[DOI: 10.1145/1188455.1188573](https://doi.org/10.1145/1188455.1188573)
- [4] A. Buttari, J. Dongarra, P. Husbands, J. Kurzak, K. Yelick  
**Multithreading for Synchronization Tolerance in Matrix Factorization**  
*SciDAC'07: Scientific Discovery through Advanced Computing*, Boston, Massachusetts, 2007  
*Journal of Physics: Conference Series* 78:012028, IOP Publishing, 2007  
[DOI: 10.1088/1742-6596/78/1/012028](https://doi.org/10.1088/1742-6596/78/1/012028)
- [3] J. Kurzak, J. Dongarra,  
**Implementing Linear Algebra Routines on Multi-Core Processors with Pipelining and a Look Ahead**  
*PARA'06: Applied Parallel Computing, State of the Art in Scientific Computing, 8th International Workshop*, Umeå, Sweden, *Lecture Notes in Computer Science* 4699:147-156, Springer, 2007  
[DOI: 10.1007/978-3-540-75755-9\\_18](https://doi.org/10.1007/978-3-540-75755-9_18)
- [2] J. Demmel, J. Dongarra, B. Parlett, W. Kahan, M. Gu, D. Bindel, Y. Hida, X. Li, O. Marques, E. J. Riedy, C. Voemel, J. Langou, P. Luszczek, J. Kurzak, A. Buttari, J. Langou, S. Tomov  
**Prospectus for the Next LAPACK and ScaLAPACK Libraries**  
*PARA'06: Applied Parallel Computing, State of the Art in Scientific Computing, 8th International Workshop*, Umeå, Sweden, *Lecture Notes in Computer Science* 4699:11-23, Springer, 2007  
[DOI: 10.1007/978-3-540-75755-9\\_2](https://doi.org/10.1007/978-3-540-75755-9_2)
- [1] A. Buttari, J. Dongarra, J. Kurzak, J. Langou, P. Luszczek, S. Tomov  
**Impact of Multicore on Math Software**  
*PARA'06: Applied Parallel Computing, State of the Art in Scientific Computing, 8th International Workshop*, Umeå, Sweden, *Lecture Notes in Computer Science* 4699:1-10, Springer, 2007  
[DOI: 10.1007/978-3-540-75755-9\\_1](https://doi.org/10.1007/978-3-540-75755-9_1)

## TECHINICAL REPORTS

J. Kurzak, J. Dongarra

**LAPACK Working Note 220:**

**Fully Dynamic Scheduler for Numerical Computing on Multicore Processors**

Technical Report UT-CS-09-643, Department of Computer Science, University of Tennessee, 2009

<http://www.netlib.org/lapack/lawnspdf/lawn220.pdf>

A. Buttari, J. Dongarra, J. Kurzak

**LAPACK Working Note 185:**

**Limitations of the PlayStation 3 for High Performance Cluster Computing**

Technical Report UT-CS-07-597, Department of Computer Science, University of Tennessee, 2007

<http://www.netlib.org/lapack/lawnspdf/lawn186.pdf>

A. Buttari, P. Luszczek, J. Kurzak, J. Dongarra, G. Bosilca

**SCOP3: A Rough Guide to Scientific Computing On the PlayStation 3**

Technical Report UT-CS-07-595, Department of Computer Science, University of Tennessee, 2007

[www.netlib.org/utk/people/JackDongarra/PAPERS/scop3.pdf](http://www.netlib.org/utk/people/JackDongarra/PAPERS/scop3.pdf)

## POPULAR SCIENCE MAGAZINES

J. Kurzak, A. Buttari, P. Luszczek, J. Dongarra

**The PlayStation 3 for High Performance Scientific Computing**

Computing in Science and Engineering 10(3):84-87, 2008

[ISSN: 1521-9615](http://www.netlib.org/utk/people/JackDongarra/PAPERS/scop3.pdf)

## TUTORIALS

J. Kurzak

**Cell Broad Engine Programming to the Metal**

AFRL / Griffis Institute, Rome, NY

<http://www.afrl.hpc.mil/PET/OTR/IBMCellProcessor/ibmcellprocessordescription.htm>

J. Kurzak, A. Buttari

**Introduction to Programming High Performance Applications on the CELL Broadband Engine**

15th Annual IEEE Symposium on High-Performance Interconnects (HOTI 2007)

[DOI: 10.1109/HOTI.2007.19](https://doi.org/10.1109/HOTI.2007.19)

## EDITOR

J. Dongarra, D. Bader, J. Kurzak  
**Scientific Computing with Multicore and Accelerators** (tentative)  
Taylor & Francis

## REVIEWER

Transactions on Parallel and Distributed Systems (IEEE)  
Journal of Parallel and Distributed Computing (Elsevier)  
Parallel Computing: Systems and Applications (Elsevier)  
Concurrency and Computation: Practice and Experience (Wiley)  
International Journal of High Performance Computing Applications (SAGE)  
Journal of Computer and System Sciences (Elsevier)  
IBM Journal of Research and Development

International Conference on Supercomputing (ICS)  
International Parallel & Distributed Processing Symposium (IPDPS)  
Workshop on State-of-the-Art in Scientific and Parallel Computing (PARA)  
International Conference on Parallel Processing and Applied Mathematics (PPAM)  
International Conference on High Performance and Embedded Architectures and Compilers (HiPEAC)

Springer  
U.S. Department of Energy, Office of Science  
Natural Sciences and Engineering Research Council of Canada

## PROGRAM COMMITTEE

CCGrid'10: International Symposium on Cluster, Cloud and Grid Computing  
PPAC'09: Workshop on Parallel Programming on Accelerator Clusters  
PPAM'09: International Conference on Parallel Processing and Applied Mathematics

## GRANTS

J. Dongarra, J. Kurzak, J. Langou  
**CPA-ACR-T: PLASMA: Parallel Linear Algebra Software for Multiprocessor Architectures**  
National Science Foundation

## COLLABORATORS

E. Agullo	J. Demmel	W. Kahan	D. Mirkovic
W. Alvaro	J. Dongarra	J. Langou	B. Parlett
M. Baboulin	M. Gu	J. Langou	M. Pettitt
R. Badia	B. Hadri	X. Li	J. Riedy
D. Bindel	Y. Hida	H. Ltaief	S. Tomov
G. Bosilca	P. Husbands	P. Luszczek	C. Voemel
A. Buttari	L. Johnsson	O. Marques	K. Yelick