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Research Interests

My main research interests are in many aspects of Computational Linear Algebra. So far, I focused my activity on direct methods for the solution of dense and sparse linear systems. I investigate fast low-rank approximation kernels and methods. I co-authored a research implementation of Block Low-Rank kernels in MUMPS (MUltifrontal Massively Parallel Solver) in which project I have been involved as a Ph.D. student. I have developed both serial and distributed industrial softwares, in C and Fortran (15K+ lines of code in the Spooles library and LS-Dyna multiphysics simulation software), including a dense, parallel Block Low-Rank solver.

Professional experience

January 2014 to date	Research scientist at Livermore Software Technology Corporation, 7374 Las Positas Road, Livermore CA 94551, USA. Research, development and implementation of linear solvers in LS-Dyna.
April-Sept. 2010	Internship at IRIT (Computer Science Research Institute of Toulouse), 2 rue Charles Camichel, Toulouse, France, with APO (Parallel Algorithms and Optimization) team. Collaboration to MUMPS project. Study on low-rank approximations of frontal matrices.
July-August 2009	Internship at Tor Vergata University, via di Tor Vergata, Rome, Italy, in Salvatore Filippone's team. Study on one-way dissection algorithms to reduce the fill-in in sparse matrix factorizations.
July 2008	Internship at Bragard S.A., 50 rue Leo Valentin, 88000 Épinal, France. Factory worker in the expedition and reception teams.

Education

October 2010 – October 2013	Ph.D. degree in Computer Science and Applied Mathematics at INPT(ENSEEIHT)-IRIT, 2 rue Charles Camichel, 31000 Toulouse, France. Ph.D. thesis: *Improving multifrontal solvers by means of algebraic Block Low-Rank representations* . Awarded the selective Leopold Escande Prize. Defense date: 28/10/2013. Advisors: Patrick Amestoy and Alfredo Buttari . Referees: Tim Davis and Esmond Ng . President of the Jury: Iain S. Duff .
July 2011	Hausdorff Research Institute for Mathematics, Poppelsdorfer Allee 45, 53115 Bonn, Germany. Summer school on $\mathcal{H}$-matrices with W. Hackbusch, S. Börm and L .Grasedyck.
Sept.-Dec. 2009	University of Edinburgh, Old College, South Bridge, Edinburgh EH8 9YL, Scotland, United Kingdom. Visiting student (financial mathematics, applied mathematics, economics, computer science).
2007–2010	ENSEEIHT, 2 rue Charles Camichel, 31000 Toulouse, France MSc & Engineering degree in Computer Science and Applied Mathematics. Master's thesis: *Frontal matrices factorizations — Low-rank forms* .

Publications

2015

P. Amestoy, C. Ashcraft, O. Boiteau, A. Buttari, J-Y. L'Excellent and C. Weisbecker. *Improving multifrontal methods by means of block low-rank representations* . Society for Industrial and Applied Mathematics (SIAM), Vol. 37 N. 3, p. 1451-1474, July 2015.

P. Amestoy, R. Brossier, A. Buttari, J.-Y. L'Excellent, T. Mary, L. Métivier, A. Miniussi, S. Operto, J. Virieux and C. Weisbecker *3D frequency-domain seismic modeling with a Parallel BLR multifrontal direct solver* . Proceeding of International Conference "Society of Exploration Geophysicits (SEG) Annual Meeting" with peer-review, New Orleans, USA.

P. Amestoy, R. Brossier, A. Buttari, J.-Y. L'Excellent, T. Mary, L. Métivier, A. Miniussi, S. Operto, A. Ribodetti, J. Virieux and C. Weisbecker *Efficient 3D frequency-domain full-waveform inversion of ocean-bottom cable data with sparse block low-rank direct solver: a real data case study from the North Sea* . Proceeding of International Conference "Society of Exploration Geophysicits (SEG) Annual Meeting" with peer-review, New Orleans, USA.

2014

B. Pajot, Y. Li, V. Berthoumieux, C. Weisbecker, R. Brossier, L. Metivier, P. Thierry, S. Operto and J. Virieux. *A review of recent forward problem developments used for frequency-domain FWI* . Expanded Abstracts, 76th Annual "European Association of Geoscientists and Engineers (EAGE)" Conference & Exhibition, with peer-review, Amsterdam, Netherlands.

2013

C. Weisbecker, P. Amestoy, O. Boiteau, R. Brossier, A. Buttari, J.-Y. L'Excellent, S. Operto and J. Virieux. *3D frequency-domain seismic modeling with a Block Low-Rank algebraic multifrontal direct solver* . Proceeding of International Conference "Society of Exploration Geophysicits (SEG) Annual Meeting" with peer-review, Houston, USA.

E. Agullo, P. Amestoy, A. Buttari, A. Guermouche, G. Joslin, J.-Y. L'Excellent, X. S. Li, A. Napov, F.-H. Rouet, M. Sid-Lakhdar, S. Wang, C. Weisbecker and I. Yamazaki. *Recent advances in sparse direct solvers* . Proceeding of International Conference on Structural Mechanics in Reactor Technology (SMIRT-22) with peer-review, San Francisco, USA.

P. Amestoy, A. Buttari, G. Joslin, J.-Y. L'Excellent, M. Sid-Lakhdar, C. Weisbecker, M. Forzan, C. Pozza, R. Perrin and V. Pellissier. *Shared memory parallelism and low-rank approximation techniques applied to direct solvers in FEM simulation* . IEEE Transactions on Magnetics, IEEE, Numéro spécial Extended selected short papers from Compumag 2013 conference, Budapest, Hungary.

Presentations

2018

C. Ashcraft, F.-H. Rouet and C. Weisbecker. *A Hybrid Parallel Block Low-Rank Solver with Flexible Factorization Algorithms and Communication Schemes* . SIAM Parallel Processing (PP18), Tokyo, Japan.

C. Ashcraft, R. Grimes, R. Lucas, F.-H. Rouet and C. Weisbecker. *Variable clustering techniques for low-rank factorization-based linear solvers and preconditioners.* SIAM Parallel Processing (PP18), Tokyo, Japan.

C. Ashcraft, L. Cambier, E. Darve, R. Grimes, Y. Huang, P. L'Eplattenier, R. Lucas, F.-H. Rouet, C. Weisbecker and Z. Xu. *Using Block Low-Rank techniques for industrial problems.* Joint Mathematics Meeting (JMM18), San Diego (CA), USA.

2016

J. Anton, C. Ashcraft and C. Weisbecker. *A Block Low-Rank Multithreaded Factorization for Dense BEM Operators* . SIAM Parallel Processing (PP16), Paris, France.

J. Anton, C. Ashcraft and C. Weisbecker. *Traversing a BLR Factorization Task Dag Based on a Fan-All Wraparound Map* . SIAM Parallel Processing (PP16), Paris, France.

	F.-H. Rouet, P. Amestoy, C. Ashcraft, A. Buttari, P. Ghysels, J.-Y. L'Excellent, X. S. Li, T. Mary and C. Weisbecker. *A Comparison of Parallel Rank-Structured Solvers* . SIAM Parallel Processing (PP16), Paris, France.
	J. Anton, C. Ashcraft, P. L'Eplattenier, R. Grimes, F.-H. Rouet and C. Weisbecker. *Using low-rank approximation techniques for engineering problems* . 7th International Conference on Computational Methods (ICCM2016), Berkeley (CA), USA.
2015	J. Anton, C. Ashcraft and C. Weisbecker. *On the Updates in a Dense Block Low-Rank Factorization* CIMI workshop on Fast Solvers, Toulouse, France.
2014	P. Amestoy, C. Ashcraft, O. Boiteau, A. Buttari, J-Y. L'Excellent and C. Weisbecker. *Parallelization and Pivoting in a Block-Low Rank Multifrontal Solver* . SIAM Parallel Processing (PP14), Portland (OR), USA.
2013	P. Amestoy, C. Ashcraft, O. Boiteau, A. Buttari, J-Y. L'Excellent and C. Weisbecker. *Block Low-Rank (BLR) approximations to improve multifrontal sparse solvers* . Sparse Days, CERFACS, Toulouse, France.
2012	P. Amestoy, C. Ashcraft, O. Boiteau, A. Buttari, J-Y. L'Excellent and C. Weisbecker. *Improving Multifrontal Methods by means of Low-Rank Approximation techniques* . SIAM Linear Algrebra (LA12), Valencia, Spain.
2011	P. Amestoy, C. Ashcraft, O. Boiteau, A. Buttari, J-Y. L'Excellent and C. Weisbecker. *Grouping variables in Frontal Matrices to improve Low-Rank Approximations in a Multifrontal Solver* . Preconditioning 2011, Bordeaux, France.

Teaching

	All these units have be taught at ENSEEIHT (Toulouse, France), with Master's degree students.
Parallel Computing, Grid Computing	*Practicals. 16.5 hours.* Implementation and study of a parallel Jacobi solver based on PVM. Analysis of the performance with respect to the variant (synchronous/asynchronous).
Linear Algebra	*Practicals. 7.0 hours.* Sparse, numerical and applied linear algebra. Study of fill reducing algorithms, implementation of dense LU factorizations with different pivoting strategies.
Linear Algebra	*Project. 11.0 hours.* In charge of the design of a project on the use of Empirical Orthogonal Function in meteorology. Implementation and study of different methods for the computation of eigenvalues. Evaluation based on written reports and oral examinations.

Technical skills

Programmation	C, Fortran, MPI, Python, bash.
OS	Linux, Mac.
Other tools	gdb, Matlab, Latex, Makefile, git, SVN, suite Office.

Languages

French	Native language.
English	Fluent, TOEIC 930 (2010).
Brazilian Portuguese	Fluent.
German	Basic.