MAWUSSI ZOUNON

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RESEARCH INTEREST

- High performance computing
- Software design for scientific computing
- Numerical linear algebra
- Fault tolerance algorithms

EDUCATION

Ph.D. Applied Mathematics and Computer Science Oct. 2011 - Apr. 2015
The University of Bordeaux, France,
On numerical resilience in linear algebra,
Advisor: Luc Giraud.

M.S. Computer Science Sept. 2010 - Jun. 2011
The University of Bordeaux, France,
On algorithm based fault tolerant strategies.

M.Eng. Software Engineering Sept. 2008 - Jun. 2011
ENSEIRB in Bordeaux-France &
ENSIAS in Rabat-Morocco.

Associate's Degree. Scientific Computing Sept. 2006 - Jun. 2008
FST, Fes-Morocco.

High school diploma Sept. 2003 - Jun. 2006
Lycee de Tokoin, Lome-Togo.

PROJECTS

NLAFET 2015 - Present
Parallel Numerical Linear Algebra for Extreme Scale Systems

I am currently working with Professor Jack Dongarra and Professor Nick Higham as a Research Associate at the University of Manchester in the Horizon 2020 NLAFET project to provide High-Performance and Fault Tolerant Numerical Linear Algebra Software for Future Extreme-Scale machines. My activities in this project include:

- Task-based linear algebra algorithms for modern architectures
- Standardization of batched linear algebra computation
- Novel fault tolerant algorithms
- Novel scheduling strategies for HPC systems

PLASMA-OpenMP 2016 - Present
Parallel Linear Algebra Software for Multicore Architectures

This project aims at providing OpenMP Task-based implementation of PLASMA, a software package for solving dense linear systems of equations, least squares problems, eigenvalue problems, and singular value problems using multicore processors, Xeon Phi coprocessors. My responsibilities in this project include the design of novel algorithms and the implementation of highly efficient routines.

RESCUE 2010 - 2014
Resilience for exascale scientific computing

I did my PhD thesis in the context of the RESCUE project funded by the French ministry of research. The objective of the Rescue project was to develop new algorithmic techniques and software to address resilience in large-scale simulation applications. My three main contributions in this project were:

- The design of novel numerical resilience strategies which preserve key numerical properties of well-known Krylov linear solvers namely CG and GMRES
- The design of resilient eigensolvers
- The design and implementation of an efficient parallel resilient solver for large sparse linear systems which supports two levels of parallelism (MPI + Thread). The efficiency and the scalability of the resilient solver have been tested in parallel distributed- memory environments with up to 24,000 of cores.

G8 ESC 2010 - 2014

Enabling Climate Simulations at Extreme Scale

One of the objectives of the G8 ESC project was to investigate how to run efficiently climate simulations on future exascale systems in the presence of faults. I contributed to this project with my research work on the design of resilient Krylov solvers for applications at exascale.

JOURNAL ARTICLES

1. A. Haidar, A. Abdelfattah, **M. Zounon**, S. Tomov and J. Dongarra, A Guide For Achieving High Performance With Very Small Matrices On GPU: A case Study of Batched LU and Cholesky Factorizations. IEEE Transactions on Parallel and Distributed Systems, vol. PP, no. 99
2. P. Valero-Lara, **M. Zounon**, M. Abalenkovs, L. Pelayo. Introduction to the Special Issue on High Performance Computing Solutions for Complex Problems. Scalable Computing. Practice and Experience 18(2): iii-iv 2017
3. E. Agullo, L. Giraud, A. Guermouche, J. Roman, and **M. Zounon**. Numerical recovery strategies for parallel resilient Krylov linear solvers. Numerical Linear Algebra with Applications, May 2016
4. E. Agullo, L. Giraud, P. Salas, and **M. Zounon**. Interpolation-restart strategies for resilient eigensolvers. SIAM Journal on Scientific Computing, 38(5):C560–C583, 2016

SUBMITTED JOURNAL ARTICLE

1. I. Yamazaki, J. Kurzak, P. Wu, **M. Zounon**, and J. Dongarra. Symmetric Indefinite Linear Solver using OpenMP Task on Manycore Architecture. Submitted to IEEE Transactions on Parallel and Distributed Systems

CONFERENCE PUBLICATIONS (REFEREED)

1. J. Dongarra, S. Hammarling, N. J. Higham, S. Relton, and **M. Zounon**. Optimized Batched Linear Algebra for Modern Architectures. In European Conference on Parallel Processing, pp. 511-522. Springer, Cham, 2017
2. J. Dongarra, S. Hammarling, N. J. Higham, S. D. Relton, P. Valero-Lara, and **M. Zounon**. The design and Performance of Batched BLAS on Modern High-Performance Computing Systems. Procedia Computer Science, 108, pp.495-504
3. E. Agullo, L. Giraud, and **M. Zounon**. On the resilience of parallel sparse hybrid solvers. In 22nd IEEE International Conference on High Performance Computing, HiPC 2015, Bengaluru, India, December 16-19, 2015, pages 75–84, 2015
4. E. Agullo, S. Cools, L. Giraud, A. Moreau, P. Salas, W. Vanroose, E. Yetkin, and **M. Zounon**. Hard Faults and Soft-Errors: Possible Numerical Remedies in Linear Algebra Solvers. VECPAR 2016: 11-18

SELECT TALKS

1. S. Relton, P. Valero-Lara, and **M. Zounon**. Recent Advances in Batched Linear Algebra Computation. In SIAM Conference on Computational Science and Engineering, Atlanta, Georgia, USA, February 2017
2. E. Agullo, L. Giraud, P. Salas, and **M. Zounon**. Numerical fault tolerant strategies for resilient parallel eigensolvers. In IMA Conference on Numerical Linear Algebra and Optimization, Birmingham, United Kingdom, September 2016
3. **M. Zounon.** Reference Implementation and Testing of Batched BLAS Routines. In 1st Workshop on Batched, Reproducible, and Reduced Precision BLAS, Knoxville, Tennessee, USA, May 2016
4. E. Agullo, L. Giraud, P. Salas, and **M. Zounon**. Recover-Restart Strategies for Resilient Parallel Numerical Linear Algebra Solvers. In International Workshop on Parallel Matrix Algorithms and Applications (PMAA 2014), Lugano, Switzerland, July 2014

TEACHING

The University of Manchester 2016 - 2017
Teaching Assistant

- Tutorial sessions of applied mathematics and statistics (MATH29661) for Mechanical and Aerospace Engineering Students
- Tutorial sessions of Pure mathematics (MATH10111) for undergraduate students at the School of Mathematics

The University of Bordeaux 2012 - 2014
Teaching Assistant

Ran tutorial sessions for Software Engineering Students:

- Computer architecture
- Algorithms and Data Structures
- Unix Operating system
- Programming and software design

RESPONSIBILITIES AND PROFESSIONAL ACTIVITIES

Project Management 2015 - Present
NLAFET

I am actively involved in the management of the NLAFET project, by coordinating efforts and collaborating with the research partners to meet the scientific objectives and deadlines.

PhD Thesis Supervision 2017 - Present
The University of Manchester

I am actively involved in the supervision of the PhD thesis of Thomas Mcsweeney on Scheduling and Parallel Computing.

Master Thesis Supervision 2017 - 2017
The University of Bordeaux

I co-supervised the master thesis of Amirouche Said on Application Level Fault Tolerant Strategies.

Co-organizer

- BatchedBLAS Birds of a Feather, ISC Conference 2018
- BatchedBLAS Minisymposium in SIAM Conference on Parallel Processing, Mar. 2018
- BatchedBLAS Minisymposium in SIAM Computational Science and Engineering, Feb. 2017
- BatchedBLAS Birds of a Feather, Supercomputing Conference 2017

REFERENCES

- **Professor Luc Giraud. INRIA Bordeaux**

  Contact: (+33) 561 19 30 25 luc.giraud@inria.fr

- **Professor Jack Dongarra. Innovative Computing Laboratory, EECS Department**

  Contact: +1-865-974-8295 dongarra@icl.utk.edu

- **Professor Nicholas J. Higham. The University of Manchester**

  Contact: +44 (0)161 275 5822 nick.higham@manchester.ac.uk