

# CURRICULUM VITAE

## Michael Maclean Wolf

Sandia National Labs - Scalable Algorithms Dept.  
P.O. Box 5800, MS 1320  
Albuquerque, NM 87185-1320

mmwolf@sandia.gov  
(505) 284-3391  
<http://www.sandia.gov/~mmwolf/>

### Research Interests

- High-performance computing, large-scale graph analytics, scientific computing, combinatorial algorithms.

### Education

- Ph.D., Computer Science, University of Illinois at Urbana-Champaign, 2009. Advisor: Michael T. Heath.
- B.S., Computer Science and Biology, Harvey Mudd College, 1998.

### Selected Professional Experience

- **Technical Staff** (2014-present), Scalable Algorithms Dept., **Sandia National Laboratories**, Albuquerque, NM. Research into large-scale graph and data analytics, data partitioning algorithms, and exascale programming models.
- **Technical Staff** (2011-2014), Computing and Analytics Group, **MIT Lincoln Laboratory**, Lexington, MA. Responsibilities included research, leading software projects, developing software, interacting with program managers (e.g., DARPA), and program development. Led development of LLMORE software for data to processor mapping and simulation of key Department of Defense applications to existing and experimental computer architectures. Developing high-performance computing algorithms and software for solving very large graph problems.
- **Postdoc** (2009-2011), Scalable Algorithms Dept., **Sandia National Laboratories**, Albuquerque, NM. Developed architecture-aware algorithms for scalable performance, including multithreaded triangular solve algorithms and techniques for interfacing traditional MPI applications with hybrid MPI/multithreaded solvers. Researched and developed partitioning and ordering algorithms, including development of Zoltan2, a package for partitioning, load-balancing, etc. Developed algorithms to improve performance of FV-MAS climate modeling software and for the GPU acceleration of a seismic modeling code.
- **Graduate Professional Intern** (Summers 2007, 2008), Computer Science Research Institute, **Sandia National Laboratories**, Albuquerque, NM. Researched and developed two-dimensional matrix partitioning algorithms for reducing communication volume in parallel sparse matrix-vector multiplication.
- **Software Developer** (1998-2003), Advanced Computations Dept., **SLAC Linear Accelerator Center**, Stanford, CA. Developed parallel electromagnetic solvers and particle tracking software used in accelerator design as part of DOE SciDAC and Grand Challenge projects. Involved in setting up Linux cluster. Improved parallel performance of applications with better partitioning and communication techniques. Managed software projects and mentored seven summer students.

### Select Journal and Conference Papers

- M.M. Wolf, H.C. Edwards, and S.L. Olivier, "Kokkos/Qtreads Task-Parallel Approach to Linear Algebra Based Graph Analytics," *Proc. of 20th Annual IEEE High Performance Extreme Computing Conference*, 2016.
- M.M. Wolf, A.M. Klinvex, and D.M. Dunlavy, "Advantages to Modeling Relational Data using Hypergraphs versus Graphs," *Proc. of 20th Annual IEEE High Performance Extreme Computing Conference*, 2016.
- M.M. Wolf, J.W. Berry, and D.T. Stark, "A Task-Based Linear Algebra Building Blocks Approach for Scalable Graph Analytics," *Proc. of 19th Annual IEEE High Performance Extreme Computing Conference*, 2015.
- M.M. Wolf and B.A. Miller, "Improving the performance of graph analysis through partitioning with sampling," *Proc. of 19th Annual IEEE High Performance Extreme Computing Conference*, 2015.

- M.M. Wolf and B.A. Miller, "Sparse Matrix Partitioning for Parallel Eigenanalysis of Large Static and Dynamic Graphs," *Proc. of 18th Annual IEEE High Performance Extreme Computing Conference*, 2014.
- D. Kimball, et al., "Quantifying the Effect of Matrix Structure on Multithreaded Performance of the SpMV Kernel," *Proc. of 18th Annual IEEE High Performance Extreme Computing Conf.*, 2014.
- E.G. Boman and M.M. Wolf, "A Nested Dissection Partitioning Method for Parallel Sparse Matrix-Vector Multiplication," *Proc. of 17th Annual IEEE High Performance Extreme Computing Conference*, 2013.
- J.S. Mullen and M.M. Wolf and A. Klein, "PAKCK: Performance and Power Analysis of Key Computational Kernels on CPUs and GPUs," *Proceedings of 17th Annual IEEE HPEC Conference*, 2013.
- Whelihan, et al., "P-sync: A Photonically Enabled Architecture for Efficient Non-local Data Access," *Proceedings of 27th International Symposium on Parallel and Distributed Processing*, pp. 189–200, 2013.
- M.M. Wolf, et al., "LLMORE: A Framework for Data Mapping and Architecture Analysis," *Proc. of 16th Annual IEEE High Performance Extreme Computing Conference*, 2012.
- M.M. Wolf, M.A. Heroux, and E.G. Boman, "Factors Impacting Performance of Multithreaded Sparse Triangular Solve," *VECPAR 2010, LNCS 6449*, pp. 32–44, 2011.
- M.M. Wolf and M.T. Heath, "Combinatorial Optimization of Matrix-Vector Multiplication in Finite Element Assembly," *SIAM Journal on Scientific Computing*, Volume 31, Issue 4, 2009, pp. 2960-2980.
- A. Skjellum, D. Wooley, Z. Lu, M. Wolf, P. Bangalore, A. Lumsdaine, J. Squyres, B. McCandless, "Object-Oriented Analysis and Design of the Message Passing Interface," *Concurrency and Computation: Practice and Experience*, Volume 13, Issue 4, 2001, pp. 245-292.

### Selected Presentations

- "Task Parallel Approach to the Linear Algebra-Based Implementation of miniTri," SIAM Annual Meeting (AN16), Boston, MA, July 11-15, 2016. (Minisymposium Talk.)
- "Hypergraph Exploitation for Data Sciences," Graph Exploitation Symposium, Dedham, MA, May 18-19, 2016. (Invited Talk.)
- "Effects of Graph Structure on 2D Partitioning of Scale-Free Graphs with Sampling," SIAM Workshop on Network Science 2015, Snowbird, UT, May 2015. (Peer reviewed poster)
- "Zoltan2 for Extreme-Scale Data Partitioning: Sampling and Partitioning," SIAM Conf. on Computational Science and Engineering (CSE15), Salt Lake City, UT, March 14-19, 2015. (Minisymposium Talk.)
- "Detecting Anomalies in Very Large Graphs," The Sixth SIAM Workshop on Combinatorial Scientific Computing (CSC14), Lyon, France, July 21-23, 2014. (Refereed)
- "Effective Parallel Computation of Eigenpairs to Detect Anomalies in Very Large Graphs," SIAM Conference on Parallel Processing for Scientific Computing (PP14), Portland, OR, February 18-21, 2014. (Contributed Presentation.)
- "Hybrid MPI/Multithreaded PCG: A Use Case for MPI Shared Memory Allocation," Supercomputing 2010, New Orleans, November 13-19, 2010. (Peer reviewed poster)
- "Improved Data Partitioning by Nested Dissection with Applications to Information Retrieval," SIAM Workshop on Combinatorial Scientific Computing, Seaside, CA, Oct. 29-31, 2009. (Refereed presentation.)

### Selected Honors/Awards

- **Department of Energy Computational Science Graduate Fellowship (CSGF)**, 2003-2007.
- **IEEE HPEC Best Paper Finalist**, 2015.
- **University of Illinois Fellowship**, 2007-2008.

### Service

- DOE CSGF: **Practicum Coordinator** (2015-), Selection Committee (2015-).
- IEEE HPEC Conference Technical Committee (2015-present).
- SIAM CSC 2016 Local Organizing Committee.
- **Liaison**, SNL sponsored Harvey Mudd College Computer Science Clinic (2010-2011).
- SIAM UIUC Student Chapter: **President** (2007-2009), Vice-President (2006-2007).

### Computer Skills

- **Languages:** C++, C, R, Perl, Matlab, Java, Fortran, Python, Lex, Yacc, et al.
- **Libraries:** MPI, OpenMP, Pthreads, Intel TBB, HPX, CUDA, Zoltan, ParMETIS, Trilinos, PETSc, et al.