

Edgar Solomonik

POSITION	Assistant Professor , University of Illinois at Urbana-Champaign	
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RESEARCH INTERESTS	The research area of communication complexity is a unifying triangle of high performance computing, numerical linear algebra, and theoretical computer science. Quantification of data movement and synchronization costs improves understanding of the efficiency and scalability of algorithms. My work seeks new methods and better software libraries for (sparse) tensor computations as well as combinatorial problems such as sorting. My favorite application domain is quantum chemistry.	
EDUCATION	Ph.D. University of California, Berkeley Computer Science, Designated Emphasis in Computational Science, minors in math and physics Adviser: <u>James W. Demmel</u> , Committee members: <u>Katherine Yelick</u> , <u>Martin Head-Gordon</u> Dissertation: <i>Provably efficient algorithms for numerical tensor algebra</i>	August 2010 – August 2014
	B.S. University of Illinois at Urbana-Champaign Computer Science, Adviser: <u>Laxmikant V. Kale</u>	August 2008 – May 2010
FELLOWSHIPS	ETH Zurich Postdoctoral Fellowship, 2014-2016 Department of Energy Computational Science Graduate Fellowship (DOE CSGF), 2010-2014 ACM/IEEE-CS George Michael Memorial High Performance Computing Fellowship, 2013 NSF Graduate Fellowship Honorable Mention, 2010	
AWARDS	Berkeley EECS Department David J. Sakrison Memorial Prize, 2014 NERSC Award for Innovative Use of High Performance Computing, 2013 Distinguished Paper Award, Euro-Par, 2011 Finalist for CRA Outstanding Undergraduate Research Award, 2010 University of Illinois CS Department Best Undergraduate Research Project Award, 2009	
INTERNSHIPS	Lawrence Livermore National Laboratory Argonne National Laboratory DE Shaw Research Wolverine Trading	May 2012 – August 2012 May 2011 – August 2011 May 2010 – August 2010 May 2006 – August 2006, May 2007 – August 2007
TEACHING AND ADVISING	Instructor, <i>CS 357: Numerical Methods</i> , UIUC, Spring 2017 Instructor, <i>CS 598: Communication Cost Analysis of Algorithms</i> , UIUC, Fall 2016 Head TA, <i>CS 170: Efficient Algorithms and Intractable Problems</i> , <u>Satish Rao</u> , UC Berkeley, 2013 Guest lecturer, <i>CS 263-2800: Design of Parallel and High-Performance Computing</i> , <u>Torsten Hoefer</u> and <u>Markus Püschel</u> , ETH Zurich, 2014 and 2015 Advising: Tobias Wicky (2015 BS, 2017 MS), Edward Hutter (2017 BS)	

PRESENTATIONS 43 distinct talks since 2010: 7 paper presentations at computer science conferences, 6 talks at math meetings, 3 invited talks at quantum chemistry meetings, 10 invited seminars at external academic institutions, 5 special-topic course lectures, 11 in-house research presentations (see webpage for all slides)

- PUBLICATIONS
- [SC] Edgar Solomonik, Maciej Besta, Flavio Vella, and Torsten Hoefer. *Scaling betweenness centrality using communication-efficient sparse matrix multiplication*. ACM/IEEE Supercomputing Conference, Denver, Colorado, 2017 (to appear).
 - [SPAA] Edgar Solomonik, Grey Ballard, James Demmel, and Torsten Hoefer. *A communication-avoiding parallel algorithm for the symmetric eigenvalue problem*. ACM Symposium on Parallelism in Algorithms and Architectures, 2017 (to appear).
 - [HPDC] Maciej Besta, Michal Podstawski, Linus Groner, Edgar Solomonik, and Torsten Hoefer. *To push or to pull: on reducing communication and synchronization in graph computations* 26th ACM Symposium on High Performance Parallel and Distributed Computing, Washington DC, 2017 (to appear).
 - [IPDPS] Tobias Wicky, Edgar Solomonik, and Torsten Hoefer. *Communication-avoiding parallel algorithms for solving triangular systems of linear equations* IEEE International Parallel and Distributed Processing Symposium, 2017 (to appear).
 - [IPDPS] Maciej Besta, Florian Marending, Edgar Solomonik and Torsten Hoefer. *SlimSell: A vectorizable graph representation for breadth-first search* IEEE International Parallel and Distributed Processing Symposium, 2017 (to appear).
 - [TOPC] Edgar Solomonik, Erin Carson, Nicholas Knight, and James Demmel. *Tradeoffs between synchronization, communication, and computation in parallel linear algebra computations*. ACM Transactions on Parallel Computing, 2017.
 - [arXiv] Edgar Solomonik and Torsten Hoefer. *Sparse tensor algebra as a parallel programming model*. arXiv:1512.00066 [cs.MS], 2015.
 - [ETH] Edgar Solomonik, James Demmel, and Torsten Hoefer. *Communication lower bounds for tensor contraction algorithms*. Technical Report, ETH Zurich, 2015.
 - [ETH] Edgar Solomonik and James Demmel. *Contracting symmetric tensors using fewer multiplications*. Technical Report, ETH Zurich, 2015.
 - [JPDC] Edgar Solomonik, Devin Matthews, Jeff Hammond, James Demmel, and John F Stanton. *A massively parallel tensor contraction framework for coupled-cluster computations*. Journal of Parallel and Distributed Computing, 2014.
 - [SPAA] Edgar Solomonik, Erin Carson, Nicholas Knight, and James Demmel. *Tradeoffs between synchronization, communication, and work in parallel linear algebra computations*. ACM Symposium on Parallelism in Algorithms and Architectures, 2014.
 - [IPDPS] Grey Ballard, James Demmel, Laura Grigori, Mathias Jacquelin, Hong Diep Nguyen, and Edgar Solomonik. *Reconstructing Householder vectors from Tall-Skinny QR*. IEEE International Parallel and Distributed Processing Symposium, 2014.
 - [IPDPS] Edgar Solomonik, Devin Matthews, Jeff Hammond, and James Demmel. *Cyclops Tensor Framework: reducing communication and eliminating load imbalance in massively parallel contractions*. IEEE International Parallel and Distributed Processing Symposium, 2013.
 - [IPDPS] Edgar Solomonik, Aydin Buluc, and James Demmel. *Minimizing communication in all-pairs shortest-paths*. IEEE International Parallel and Distributed Processing Symposium, 2013.
 - [IPDPS] Michael Driscoll, Evangelos Georganas, Penporn Koanantakool, Edgar Solomonik, and Katherine Yelick. *A communication-optimal n-body algorithm for direct interactions*. IEEE International Parallel and Distributed Processing Symposium, 2013.
 - [VECPAR] Edgar Solomonik and James Demmel. *Matrix multiplication on multidimensional torus networks*. Lecture Notes in Computer Science. Springer Berlin Heidelberg, 2013.
 - [SC] Evangelos Georganas, Jorge Gonzalez-Dominguez, Edgar Solomonik, Yili Zheng, Juan Tourino and Katherine Yelick. *Communication avoiding and overlapping for numerical linear algebra*. ACM/IEEE Supercomputing Conference, 2012.

18. [UCB] Edgar Solomonik, Jeff Hammond, and James Demmel. *A preliminary analysis of Cyclops Tensor Framework*. Technical Report, University of California, Berkeley, 2012.
19. [SC] Edgar Solomonik, Abhinav Bhatele, and James Demmel. *Improving communication performance in dense linear algebra via topology aware collectives*. ACM/IEEE Supercomputing Conference, 2011.
20. [Euro-Par] Edgar Solomonik and James Demmel. *Communication-optimal parallel 2.5D matrix multiplication and LU factorization algorithms*. Lecture Notes in Computer Science, Euro-Par, 2011.
21. [Enc. Par. Comp.] Laxmikant Kale and Edgar Solomonik. *Parallel sorting*. Encyclopedia of Parallel Computing, Springer Verlag, David Padua, Ed., 2011.
22. [IJHPCA] Abhinav Bhatele, Lukasz Wesolowski, Eric Bohm, Edgar Solomonik, and Laxmikant V. Kale. *Understanding application performance via micro-benchmarks on three large supercomputers: Intrepid, Ranger and Jaguar*. International Journal of High Performance Computing Applications, 2010.
23. [IPDPS] Edgar Solomonik and Laxmikant V. Kale. *Highly scalable parallel sorting*. IEEE International Parallel and Distributed Processing Symposium, 2010.
24. [ParaPLOP] Vivek Kale and Edgar Solomonik. *Parallel sorting pattern*. Workshop on Parallel Programming Patterns, 2010.