

Edgar Solomonik

POSITION **Assistant Professor**, Department of Computer Science, University of Illinois at Urbana-Champaign

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EDUCATION **Ph.D. University of California, Berkeley** August 2010 – August 2014
Computer Science, Adviser: James W. Demmel
Dissertation: *Provably efficient algorithms for numerical tensor algebra*

B.S. University of Illinois at Urbana-Champaign 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 IEEE TCHPC Early Career Researchers Excellence Award in High Performance Computing, 2018
Alston S. Householder Prize XX, 2016
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

TEACHING *CS 450 / CSE 401 / ECE 491 / MATH 450: Numerical Analysis*, UIUC, Spring 2018, Fall 2018
CS 554 / CSE 512: Parallel Numerical Algorithms, UIUC, Fall 2017
CS 357 / MATH 357: Numerical Methods, UIUC, Spring 2017
CS 598: Communication Cost Analysis of Algorithms, UIUC, Fall 2016

ADVISING Current PhD students: Edward Hutter, Raul Platero, Samah Karim (co-advised with William Gropp)
(BS 2018, UIUC) Pavle Simonovic
(BS 2017, UIUC) Edward Hutter (DOE CSGF fellow)
(BS 2016, MS 2017, ETH Zurich, co-advised with Torsten Hoeﬂer) Tobias Wicky
PhD thesis committee member: Amanda Bienz (2018)

TALKS **Keynote Talks:** PMAA (2018)
First-Author Conference Paper Presentations: SC (2011, 2017), SPAA (2014, 2017), IPDPS (2013 x2, 2011), VECPAR (2012), Euro-Par (2011, Distinguished Paper Award)
Invited Talks at Chemistry and Physics Meetings: American Chemical Society Annual Meeting (2018), Simons CCQ Tensor Network Workshop (2017), MolSSI Workshop on Core Software Blocks in Quantum Chemistry: Tensors and Integrals (2017), ISTCP (2016), QESC (2015), NSF S2I2 Workshop on Tensor Libraries (2013)

Talks at Applied Mathematics and Scientific Computing Meetings: Fast Solvers (2018), PASC (2018), Householder symposium (2014, 2017), Householder prize lecture (2017), SIAM CSE (2013, 2017), SIAM ALA (2015, 2012), SIAM PP (2012, 2014, 2016)

Seminars at National Laboratories: Argonne National Laboratory (2011, 2017), Sandia National Laboratory (2017), Lawrence Livermore National Laboratory (2012), Max-Planck-Institute for Solid State Research in Stuttgart, Germany (2016), Max-Planck-Institute for Chemical Energy Conversion in Muelheim, Germany (2015), Swiss National Supercomputing Center (2013)

External Seminars at Universities: University of Chicago (2017), University of California, Davis (2016), University of Toronto (2016), Stony Brook University (2016), California Institute of Technology (2016), University of Colorado, Boulder (2016), Georgia Institute of Technology (2016), Cornell University (2016), TU Munich (2016), EPFL (2015), University of Tokyo (2012)

SERVICE

Organizing committees: ARRAY 2017

Program committees: EuroMPI 2019, SC (2018, 2019), ISC 2019, IPDPS (2018, 2019), IA³ 2018, HIPC 2018, SPAA 2018, GABB 2017, PACT 2017

Departmental committees: advisory (2016-2018), awards (2016-2018)

PUBLICATIONS

1. [arXiv] Linjian Ma and Edgar Solomonik. *Accelerating Alternating Least Squares for Tensor Decomposition by Pairwise Perturbation*. arXiv:1811.10573 [math.NA], November 2018.
2. [arXiv] Vipul Harsh, Laxmikant Kale, and Edgar Solomonik. *Histogram sort with sampling*. arXiv:1803.01237 [cs.DC], March 2018.
3. [SC] Edgar Solomonik, Maciej Besta, Flavio Vella, and Torsten Hoefler. *Scaling betweenness centrality using communication-efficient sparse matrix multiplication*. ACM/IEEE Supercomputing Conference, November 2017.
4. [arXiv] Edward Hutter and Edgar Solomonik. *Communication-avoiding Cholesky-QR2 for rectangular matrices*. arXiv:1710.08471 [cs.DC], October 2017.
5. [arXiv] Edwin Pednault, John A. Gunnels, Giacomo Nannicini, Lior Horesh, Thomas Magerlein, Edgar Solomonik, and Robert Wisnieff. *Breaking the 49-qubit barrier in the simulation of quantum circuits*. arXiv:1710.05867 [quant-ph], October 2017.
6. [arXiv] Edgar Solomonik, James Demmel, and Torsten Hoefler. *Communication lower bounds of bilinear algorithms for symmetric tensor contractions*. arXiv:1707.04618 [cs.DC], July 2017.
7. [SPAA] Edgar Solomonik, Grey Ballard, James Demmel, and Torsten Hoefler. *A communication-avoiding parallel algorithm for the symmetric eigenvalue problem*. ACM Symposium on Parallelism in Algorithms and Architectures, 2017.
8. [HPDC] Maciej Besta, Michal Podstawski, Linus Groner, Edgar Solomonik, and Torsten Hoefler. *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.
9. [IPDPS] Tobias Wicky, Edgar Solomonik, and Torsten Hoefler. *Communication-avoiding parallel algorithms for solving triangular systems of linear equations*. IEEE International Parallel and Distributed Processing Symposium, 2017.
10. [IPDPS] Maciej Besta, Florian Marending, Edgar Solomonik and Torsten Hoefler. *SlimSell: A vectorizable graph representation for breadth-first search*. IEEE International Parallel and Distributed Processing Symposium, 2017.
11. [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, 2016.
12. [arXiv] Edgar Solomonik and Torsten Hoefler. *Sparse tensor algebra as a parallel programming model*. arXiv:1512.00066 [cs.MS], 2015.

- 13.[ETH] Edgar Solomonik, James Demmel, and Torsten Hoefler. *Communication lower bounds for tensor contraction algorithms*. Technical Report, ETH Zurich, 2015.
- 14.[ETH] Edgar Solomonik and James Demmel. *Contracting symmetric tensors using fewer multiplications*. Technical Report, ETH Zurich, 2015.
- 15.[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.
- 16.[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.
- 17.[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.
- 18.[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.
- 19.[IPDPS] Edgar Solomonik, Aydin Buluc, and James Demmel. *Minimizing communication in all-pairs shortest-paths*. IEEE International Parallel and Distributed Processing Symposium, 2013.
- 20.[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.
- 21.[VECPAR] Edgar Solomonik and James Demmel. *Matrix multiplication on multidimensional torus networks*. Lecture Notes in Computer Science. Springer Berlin Heidelberg, 2013.
- 22.[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.
- 23.[UCB] Edgar Solomonik, Jeff Hammond, and James Demmel. *A preliminary analysis of Cyclops Tensor Framework*. Technical Report, University of California, Berkeley, 2012.
- 24.[SC] Edgar Solomonik, Abhinav Bhatele, and James Demmel. *Improving communication performance in dense linear algebra via topology aware collectives*. ACM/IEEE Supercomputing Conference, 2011.
- 25.[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.
- 26.[Enc. Par. Comp.] Laxmikant Kale and Edgar Solomonik. *Parallel sorting*. Encyclopedia of Parallel Computing, Springer, David Padua, Ed., 2011.
- 27.[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.
- 28.[IPDPS] Edgar Solomonik and Laxmikant V. Kale. *Highly scalable parallel sorting*. IEEE International Parallel and Distributed Processing Symposium, 2010.
- 29.[ParaPLOP] Vivek Kale and Edgar Solomonik. *Parallel sorting pattern*. Workshop on Parallel Programming Patterns, 2010.