

# Torsten Hoefler

Full Professor of Computer Science, ETH Zürich

## Education

- 2005–2008 **Ph.D., Computer Science (Dr. rer. nat.)** **Indiana University  
Bloomington, IN, USA**  
GPA: 4.0/4.0 (“summa cum laude”)  
Committee: Andrew Lumsdaine, Randall Bramley, Jack Dongarra, Richard Graham, Minaxi Gupta  
**IU Young Alumni Award 2014**
- 2000–2004 **Diplom, Informatik (Master of CS)** **Chemnitz University of Technology  
Chemnitz, Germany**  
Grade: sehr gut (“very good”)  
**Universitätspreis 2005 (best student in class)**, Advisor: Wolfgang Rehm
- 1993–1999 **Gymnasium (Academic High School)** **Gymnasium Oelsnitz  
Oelsnitz, Germany**  
Graduated top of class (3<sup>rd</sup> best among 90 students)

## Research Interests

My research interests revolve around the central topic of "Performance-centric Software Development". In the context of High-Performance Computing (HPC), one can identify three sub-branches that I am actively working on: (1) **performance modeling, simulation, and optimization of large-scale parallel applications**, (2) **topologies, routing, and host interfaces of large-scale networks**, and (3) **advanced parallel programming techniques and runtime environments**.

## Awards and Honors

- 2019 **ACM Gordon Bell Prize** **Denver, CO, USA**  
*"[...] recognize outstanding achievement in high-performance computing. The purpose of the award is to track the progress over time of parallel computing, with particular emphasis on rewarding innovation in applying high-performance computing to applications in science, engineering, and large-scale data analytics."* awarded in the categories "Sustained Application Performance" and "Novelty of Programming Approach", \$10,000
- 2019 **Best Student Paper Award at SC19** **Denver, CO, USA**  
advisor on the best student paper at ACM/IEEE Supercomputing 2019; selected by a committee during the conference out of a set of twelve candidates (out of 387 submissions), \$1,000
- 2019 **IEEE TCSC Award for Excellence in Scalable Computing (MCR)** **Zhangjiajie, China**  
*"for contributions on all aspects of large-scale scalable parallel processing systems and supercomputers"*
- 2017 **Student Teaching Award "Best Interaction"** **Zurich, Switzerland**  
elected democratically by computer science students
- 2017 **Best Student Paper Award at IEEE HOTI'17** **Santa Clara, CA, USA**  
collaborator on the best student paper at IEEE Hot Interconnects 2017, \$250
- 2016 **Outstanding Paper Award at ACM OOPSLA'16** **Amsterdam, Netherlands**  
designated as outstanding paper of the ACM Symposium on Object-oriented Programming, Systems, Languages, and Applications (four out of 52 accepted papers (203 submissions))
- 2016 **Best Student Paper Award at IEEE HOTI'16** **Santa Clara, CA, USA**  
advisor on the best student paper at IEEE Hot Interconnects 2016, \$250
- 2016 **Karsten Schwan Best Paper Award at ACM HPDC'16** **Kyoto, Japan**  
designated as best paper of the ACM Symposium on High-Performance Parallel and Distributed Computing (out of 20 accepted papers (129 submissions))
- 2015 **Latsis Prize of ETH Zürich** **Zürich, Switzerland**  
*"The purpose of the Latsis Prize is to recognize and reward scientific work of particular excellence from all fields of research undertaken at the ETH Zurich" (one award per year to one scientist across all disciplines), CHF 25k*

- 2015 **ERC Starting Grant** **Brussels, Europe**  
*"ERC Starting Grants aim to support up-and-coming research leaders who are about to establish a proper research team and to start conducting independent research [...]" (8% acceptance). EUR 1.5M*
- 2015 **Best Student Paper Award at IEEE HOTI'15** **Santa Clara, CA, USA**  
 advisor on the best student paper at IEEE Hot Interconnects 2015, \$250
- 2015 **Best Paper Award at ACM HPDC'15** **Portland, OR, USA**  
 designated as best paper of the ACM Symposium on High-Performance Parallel and Distributed Computing (out of 19 accepted papers (116 submissions))
- 2015 **Best Paper Award at IEEE Intl. Parallel & Distr. Processing Symposium** **Hyderabad, India**  
 designated as best paper of the software track at IPDPS'15 (four tracks, one award each, plenary presentation, of 108 accepted papers (496 submissions))
- 2014 **Best Student Paper Award at SC14** **New Orleans, LA, USA**  
 advisor on the best student paper at ACM/IEEE Supercomputing 2014; selected by a committee during the conference out of a set of seven candidates (out of 394 submissions), \$1,000
- 2014 **Young Alumni Award, Indiana University School of Informatics** **Indianapolis, IN, USA**  
*"in recognition of outstanding early career achievement that brings acclaim and recognition to the field of informatics, and honor and distinction to Indiana University." (the school had ≈1,800 students)*
- 2013 **Best Paper Award at SC13** **Denver, CO, USA**  
 designated as best paper at ACM/IEEE Supercomputing 2013; selected by a committee during the conference out of a set of thirteen candidates (out of 457 submissions)
- 2013 **IEEE TCSC Young Achiever in Scalable Computing** **Denver, CO, USA**  
*"Awarded to individuals who have made outstanding, influential, and potentially long-lasting contributions in the field of scalable computing within 5 years of receiving their PhD."*
- 2013 **IBM Faculty Award** **Yorktown Heights, NY, USA**  
*"To qualify for this internationally competitive award [...] candidates must have an outstanding reputation for contributions in their field or, in the case of junior faculty, show unusual promise.", \$30,000*
- 2013 **Best Paper Award at EuroMPI'13** **Madrid, Spain**  
 designated as best paper of EuroMPI 2013 after a two-round review process, ≈\$3,400 gift
- 2012 **SIAM SIAG/SC Junior Scientist Prize** **Savannah, GA, USA**  
*"awarded to an outstanding junior researcher in the field of algorithms research and development for parallel scientific and engineering computing", ≈\$2,000 travel funds*
- 2011 **Best Poster Award PPOPP'11** **San Antonio, TX, USA**  
 designated as best poster at the 2011 ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming; selected by a committee during the poster session.
- 2010 **Best Paper Award at SC10** **New Orleans, LA, USA**  
 designated as best paper at ACM/IEEE Supercomputing 2010; selected by a committee during the conference out of a set of nine candidates (out of 257 submissions) \$1,000
- 2010 **Best Paper Award LSAP'10** **Chicago, IL, USA**  
 designated as best paper at the 2010 ACM Workshop on Large-Scale System and Application Performance; selected by a committee
- 2009 **Best Paper Award LCI'09** **Boulder, CO, USA**  
 best student paper at the Linux Cluster Institute Conference 2009; selected by a committee; \$500
- 2008 **Cluster Challenge Champion SC'08** **Austin, TX, USA**  
 co-advised the winning team at IEEE/ACM SC08's Cluster Challenge; a competition involving seven international teams of undergraduate students running HPC applications on a self-made cluster computer
- 2008 **Travel Award CCGrid'08** **Lyon, France**  
 IEEE/TCSC Doctoral Symposium for Cluster Computing and the Grid 2008, \$2,000
- 2005 **State Fellowship for Doctoral Studies** **Chemnitz, Germany**  
 Saxon Ministry of Science and the Fine Arts (Sächsisches Ministerium für Wissenschaft und Kunst), one of four reputable fellowships at TU Chemnitz, €1,400/month; extension declined after one year.
- 2005 **Universitätspreis 2005 (Best Student Award)** **Chemnitz, Germany**  
 Chemnitz University of Technology, €2,000

- 2005 **PARS Nachwuchspreis 2005 (PARS Junior Researcher Award)** Lübeck, Germany  
Group of Parallel Algorithms, Computer Architectures and System Software in the German Computer Society (Gesellschaft für Informatik, GI), € 500
- 2005 **HPC Europa, Scientific Highlight** Caseleccio di Reno, Italy  
Selected as outstanding visitor of the HPC Europe scientific exchange program.

### Awards of Mentees

- 2019 **ACM Student Research Competition** Denver, CO, USA  
Marcin Copik received the ACM SRC Gold Medal (graduate)
- 2018 **ACM Student Research Competition** Dallas, TX, USA  
Salvatore Di Girolamo received the ACM SRC Bronze Medal (graduate)
- 2013 **ACM Student Research Competition** Denver, CO, USA  
Robert Gerstenberger received the ACM SRC Bronze Medal (undergraduate)

## Positions and Experience

- 2020–present **Full Professor of Computer Science** ETH Zürich  
*Computer Science Department*  
I lead research on scalable parallel computing, advising PhD and Master students in the Scalable Parallel Computing Laboratory.
- 2020–present **Adjunct Professor of Electrical Engineering** ETH Zürich  
*Department of Information Technology and Electrical Engineering*
- 2017–2020 **Associate Professor (tenured) of Computer Science** ETH Zürich  
*Computer Science Department*
- 2012–2017 **Assistant Professor (tenure track) of Computer Science** ETH Zürich  
*Computer Science Department*
- 2010–2013 **Adjunct Assistant Professor of Computer Science** University of Illinois  
*Computer Science Department* Urbana-Champaign  
I led research in high-performance computing involving CS faculty members focused on topology mapping [ICS'11] and performance modeling [SC'11]. I taught two classes on High-Performance Computing.
- 2012 **Interim Technical Program Manager Applications** University of Illinois  
*Blue Waters Directorate, NCSA* Urbana-Champaign  
I led the Advanced Application and User Support Group, consisting of 11 domain specialists at Masters or Ph.D. level who provide advanced scientific computing support to a small number of expert users (≈40) of Blue Waters in their respective domains. Also certification of application and system performance milestones during installation and bringup of Blue Waters.
- 2010–2012 **Application and System Performance Modeling and Simulation Lead** University of Illinois  
*Blue Waters Directorate, NCSA* Urbana-Champaign  
I performed Modeling and Simulation of Sustained Petaflop Applications for Blue Waters, MPI Forum Activities. Scientific advisors: Marc Snir, Bill Gropp.
- 2008–2010 **Postdoctoral Fellow** Indiana University  
*Open Systems Lab* Bloomington, IN  
Parallel Programming, Modelling and Network Research, MPI Forum Activities  
Scientific advisor: Andrew Lumsdaine.
- 2006–2008 **Research Assistant** Indiana University  
*Open Systems Lab* Bloomington, IN  
Parallel Computing and Networking Research
- Jan 2007 **Visiting Researcher** Commissariat à l'Énergie Atomique  
*Direction des Applications Militaires (CEA-DAM)* Bruyères-le-Châtel, France  
Parallel Quantum-Mechanical Computations with ABINIT

- Dec 2005 **Visiting Researcher** **CINECA**  
Casalecchio di Reno, Italy  
*CINECA Consorzio Interuniversitario*  
Parallel Ab-Initio Quantum Mechanical Computations
- 2004–2006 **Research Assistant** **Chemnitz University of Technology**  
Chemnitz, Germany  
Parallel Ab-Initio Quantum Mechanical Computations, Networking Research

### Significant Leadership and Service Positions

- 2013–present **ACM SIGHPC Executive Committee (3rd term)** **SIGHPC**  
Member of the first, second, and third elected Executive Committee of ACM SIGHPC, Special Interest Group on High Performance Computing. As one of two elected members-at-large, I co-represent the body of approximately 1,000 members. I was re-elected in both 2016 and 2019.
- 2014–2018 **Associate Editor (2 terms)** **IEEE TPDS**  
IEEE Transactions on Parallel and Distributed Systems, I was re-appointed in 2016
- 2012–present **Associate Editor** **IJHPCA**  
SAGE International Journal of High Performance Computing Applications
- 2010–present **MPI Forum WG Lead** **Message Passing Interface Forum**  
I lead the MPI-3 Working Group for Collective Operations and Topology.
- 2013 **Expert in Resilience and Software Engineering** **EESI2**  
Invited member of two working groups in the European Exascale Software Initiative 2 to “provide recommendations on strategic European actions [...]”
- 2014–2016 **Scientific Advisory Board** **Simula**  
Simula Research Laboratory, Norway
- 2014–2018 **Scientific Advisory Board** **EPIGRAM Project**  
Member of the SAB of the European Project for Exascale ProGRAMming Models (EPIGRAM)

### Industry Experience and Significant Consulting

- 2019 **Visiting Researcher (sabbatical)** **Microsoft, AI and Advanced Architecture Group**  
Research and development of advanced AI and quantum architectures and systems.
- 2018 **Visiting Researcher (summer)** **Microsoft, Quantum Architecture Group**  
Research and development of quantum architectures and systems.
- 2018 **Scientific Advisor** **Vulcan Inc., Seattle, WA**  
External advisor to the late Paul Allan to help him select groups to fund a \$500M Climate Code Modernization Initiative.
- 2018 **Consultant** **Cray Inc.**  
Advising on advanced networking.
- 2017 **Visiting Researcher (summer)** **Microsoft Research, Quantum Architecture Group**  
Research and development of quantum architectures and systems.
- 2000–2005 **Software Engineer** **DELTA proveris AG**  
Design and Implementation of Database (Informix) and Web Applications (PHP/Perl)

## Publications

**Total:** 86 top conference papers, 12 journal papers, 7700+ citations, 47 h-index (Google Scholar)

**Since 2013:** 76 top conference papers, 7 journal papers, 17 best paper noms., 11 awards

Full publication list available at <http://htor.inf.ethz.ch/publications/>

### Selected Peer-reviewed Conference Publications

- VLDB’20** Claude Barthels, Ingo Müller, Konstantin Taranov, Torsten Hoefler, Gustavo Alonso: Strong consistency is not hard to get: TwoPhase Locking and TwoPhase Commit on Thousands of Cores *In Proceedings of the VLDB Endowment, Vol. 12, No. 13, VLDB Endowment, Sep. 2020*

- USENIX ATC'20** Konstantin Taranov, Benjamin Rothenberger, Adrian Perrig, Torsten Hoefler: sRDMA – Efficient NIC-based Authentication and Encryption *In Proceedings of the 2020 USENIX Annual Technical Conference, USENIX, Jul. 2020, (acceptance rate 18.6%, 65/348)*
- SPAA'20** Lukas Gianinazzi, Torsten Hoefler: Parallel Planar Subgraph Isomorphism and Vertex Connectivity *In Proceedings of the 32nd ACM Symposium on Parallelism in Algorithms and Architectures (SPAA'20), ACM, Jul. 2020*
- DAC'20** Andreas Kurth, Samuel Riedel, Florian Zaruba, Torsten Hoefler, Luca Benini: ATUNs: Modular and Scalable Support for Atomic Operations in a Shared Memory Multiprocessor *In Proceedings of the 57th Annual Design Automation Conference, ACM, Jun. 2020*
- CVPR'20** Elad Hoffer, Tal Ben-Nun, Itay Hubara, Niv Giladi, Torsten Hoefler, Daniel Soudry: Increasing batch size through instance repetition improves generalization *In The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Jun. 2020*
- IPDPS'20** Marcus Ritter, Alexandru Calotoiu, Thorsten Reimann, Torsten Hoefler, Felix Wolf: Performance Modeling at a Discount presented in New Orleans, LA, USA, IEEE, May 2020, Accepted at the 34th IEEE International Parallel and Distributed Processing Symposium (IPDPS'20)
- IPDPS'20** Maciej Besta, Raghavendra Kanakagiri, Harun Mustafa, Mikhail Karasikov, Gunnar Rättsch, Torsten Hoefler, Edgar Solomonik: Communication-Efficient Jaccard Similarity for High-Performance Distributed Genome Comparisons May 2020, *In Proceedings of the 34th IEEE International Parallel and Distributed Processing Symposium*
- FPGA'20** Johannes de Fine Licht, Grzegorz Kwasniewski, Torsten Hoefler: Flexible Communication Avoiding Matrix Multiplication on FPGA with High-Level Synthesis Feb. 2020, *In Proceedings of the 28th ACM/SIGDA International Symposium on Field-Programmable Gate Arrays*
- PPoPP'20** Shigang Li, Tal Ben-Nun, Salvatore Di Girolamo, Dan Alistarh, Torsten Hoefler: Taming Unbalanced Training Workloads in Deep Learning with Partial Collective Operations *In Proceedings of the 25th Symposium on Principles and Practice of Parallel Programming (PPoPP'20), Feb. 2020, (acceptance rate: 23.1% (28/121))*
- SC19** Cedric Renggli, Dan Alistarh, Mehdi Aghagolzadeh, Torsten Hoefler: SparCML: High-Performance Sparse Communication for Machine Learning *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19), presented in Denver, CO, USA, ACM, Nov. 2019 (acceptance rate: 22.7% (78/344))*
- SC19** Tiziano De Matteis, Johannes de Fine Licht, Jakub Beránek, Torsten Hoefler: Streaming Message Interface: High-Performance DistributedMemory Programming on Reconfigurable Hardware *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19), presented in Denver, CO, USA, ACM, Nov. 2019 (acceptance rate: 22.7% (78/344))*
- SC19** Alexandros Nikolaos Ziogas, Tal Ben-Nun, Guillermo Indalecio Fernández, Timo Schneider, Mathieu Luisier, Torsten Hoefler: Optimizing the Data Movement in Quantum Transport Simulations via Data-Centric Parallel Programming *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19), presented in Denver, CO, USA, ACM, Nov. 2019 (acceptance rate: 22.7% (78/344))*
- SC19** Alexandros Nikolaos Ziogas, Tal Ben-Nun, Guillermo Indalecio Fernández, Timo Schneider, Mathieu Luisier, Torsten Hoefler: A Data-Centric Approach to Extreme-Scale Ab initio Dissipative Quantum Transport Simulations *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19), presented in Denver, CO, USA, ACM, Nov. 2019 **Gordon Bell Prize Winner***
- SC19** Salvatore Di Girolamo, Konstantin Taranov, Andreas Kurth, Michael Schaffner, Timo Schneider, Jakub Beranek, Maciej Besta, Luca Benini, Duncan Roweth, Torsten Hoefler: Network-Accelerated Non-Contiguous Memory Transfers *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19), presented in Denver, CO, USA, ACM, Nov. 2019 (acceptance rate: 22.7% (78/344))*
- SC19** Daniele De Sensi, Salvatore Di Girolamo, Torsten Hoefler: Mitigating Network Noise on Dragonfly Networks through Application-Aware Routing *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19), presented in Denver, CO, USA, ACM, Nov. 2019 (acceptance rate: 22.7% (78/344))*
- SC19** Tal Ben-Nun, Johannes de Fine Licht, Alexandros Nikolaos Ziogas, Timo Schneider, Torsten Hoefler: Stateful Dataflow Multigraphs: A Data-Centric Model for Performance Portability on Heterogeneous Architectures *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19), presented in Denver, CO, USA, ACM, Nov. 2019 (acceptance rate: 22.7% (78/344))*

- SC19** Maciej Besta, Simon Weber, Lukas Gianinazzi, Robert Gerstenberger, Andrey Ivanov, Yishai Oltchik, Torsten Hoefler: Slim Graph: Practical Lossy Graph Compression for Approximate Graph Processing, Storage, and Analytics *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19)*, presented in Denver, CO, USA, ACM, Nov. 2019 (acceptance rate: 22.7% (78/344))
- SC19** Grzegorz Kwasniewski and Marko Kabić and Maciej Besta and Joost VandeVondele and Raffaele Solcà and Torsten Hoefler: Red-Blue Pebbling Revisited: Near Optimal Parallel Matrix-Matrix Multiplication *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC19)*, presented in Denver, CO, USA, ACM, Nov. 2019 (acceptance rate: 22.7% (78/344))
- PASC'19** Felix Thaler, Stefan Moosbrugger, Carlos Osuna, Mauro Bianco, Hannes Vogt, Anton Afanasyev, Lukas Mosimann, Oliver Fuhrer, Thomas Schulthess, Torsten Hoefler: Porting the COSMO Weather Model to Intel KNL presented in Zurich, Switzerland, ACM, Jun. 2019, Accepted at the ACM Platform for Advanced Scientific Computing Conference (PASC19)
- DAC'19** Niels Gleinig and Frances Ann Hubis and Torsten Hoefler: Embedding Functions Into Reversible Circuits: A Probabilistic Approach to the Number of Lines *Proceedings of the 56th Annual Design Automation Conference*, presented in Las Vegas, NV, USA, ACM, ISBN: 978-1-4503-6725-7/19/06, Jun. 2019
- PLDI'19** T. Gysi, T. Grosser, L. Brandner, T. Hoefler: A Fast Analytical Model of Fully Associative Caches *Proceedings of the 40th ACM SIGPLAN Conference on Programming Language Design and Implementation*, presented in Phoenix, AZ, USA, pages 816–829, ACM, ISBN: 978-1-4503-6712-7, Jun. 2019
- ICS'19** Paul R. Eller, Torsten Hoefler, William Gropp: Using Performance Models to Understand Scalable Krylov Solver Performance at Scale for Structured Grid Problems *Proceedings of the 2019 ACM International Conference on Supercomputing (ICS'19)*, presented in Phoenix, AZ, ACM, Jun. 2019
- IPDPS'19** S. Di Girolamo, P. Schmid, T. Schulthess, T. Hoefler: SimFS: A Simulation Data Virtualizing File System Interface *IEEE*, May 2019, Accepted at the 33rd IEEE International Parallel & Distributed Processing Symposium (IPDPS'19)
- IPDPS'19** T. Ben-Nun, M. Besta, S. Huber, A. N. Ziogas, D. Peter, T. Hoefler: A Modular Benchmarking Infrastructure for High-Performance and Reproducible Deep Learning *IEEE*, May 2019, Accepted at the 33rd IEEE International Parallel & Distributed Processing Symposium (IPDPS'19)
- PPoPP'19** Martin Kuetzler, Maksym Planeta, Jan Bierbaum, Carsten Weinhold, Hermann Haertig, Amnon Barak, Torsten Hoefler: Corrected Trees for Reliable Group Communication *Feb. 2019*, Accepted at *The ACM Conference Principles and Practice of Parallel Programming 2019 (PPoPP'19)* (acceptance rate: 19% (29/152))
- FPGA'19** Maciej Besta, Marc Fischer, Tal Ben-Nun, Johannes De Fine Licht, Torsten Hoefler: Substream-Centric Maximum Matchings on FPGA *Feb. 2019*, In *Proceedings of the 27th ACM/SIGDA International Symposium on Field-Programmable Gate Arrays* (acceptance rate: 23%)
- NIPS'18** Tal Ben-Nun, Alice Shoshana Jakobovits, Torsten Hoefler: Neural Code Comprehension: A Learnable Representation of Code Semantics *In Advances in Neural Information Processing Systems 31*, presented in Montreal, Canada, Curran Associates, Inc., Dec. 2018
- NIPS'18** Dan Alistarh, Torsten Hoefler, Mikael Johansson, Sarit Khirirat, Nikola Konstantinov, Cedric Renggli: The Convergence of Sparsified Gradient Methods *In Advances in Neural Information Processing Systems 31*, presented in Montreal, Canada, Curran Associates, Inc., Dec. 2018
- PACT'18** M. Besta, D. Stanojevic, T. Zivic, J. Singh, M. Hoerold, T. Hoefler: Log(Graph): A Near-Optimal High-Performance Graph Representation *Limassol, Cyprus, ACM, Nov. 2018*, Accepted at the 27th International Conference on Parallel Architectures and Compilation (PACT'18)
- SC18** Heng Lin, Xiaowei Zhu, Bowen Yu, Xiongchao Tang, Wei Xue, Wenguang Chen, Lufei Zhang, Torsten Hoefler, Xiaosong Ma, Xin Liu, Weimin Zheng, Jingfang Xu: ShenTu: Processing Multi-Trillion Edge Graphs on Millions of Cores in Seconds *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC18)*, presented in Denver, CO, USA, ACM, Nov. 2018, **Gordon Bell Award Finalist**
- Cluster'18** Y. Oyama, T. Ben-Nun, T. Hoefler, S. Matsuoka: Accelerating Deep Learning Frameworks with Micro-batches *In IEEE International Conference on Cluster Computing, CLUSTER 2018, Belfast, UK, September 10-13, 2018*, presented in Belfast, UK, IEEE, ISBN: 978-1-5386-8319-4, Sep. 2018, (28% (44/154))
- Cluster'18** Alexandru Calotoiu, Alexander Graf, Torsten Hoefler, Daniel Lorenz, Sebastian Rinke, Felix Wolf: Lightweight Requirements Engineering for Exascale Co-design *In IEEE International Conference on Cluster Computing, CLUSTER 2018, Belfast, UK, September 10-13, 2018*, presented in Belfast, UK, IEEE, ISBN: 978-1-5386-8319-4, Sep. 2018, (28% (44/154))

- EuroSys'18** K. Taranov, G. Alonso, T. Hoefler: Fast and strongly-consistent per-item resilience in key-value stores *Apr. 2018, EuroSys '18: Thirteenth EuroSys Conference 2018, April 23–26, 2018, Porto, Portugal (acceptance rate: 16% (43/262))*
- ASPLOS'18** M. Besta, S. M. Hassan, S. Yalamanchili, R. Ausavarungnirun, O. Mutlu, T. Hoefler: Slim NoC: A Low-Diameter On-Chip Network Topology for High Energy Efficiency and Scalability *Mar. 2018, Accepted at the 23rd ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS'18)*
- PPoPP'18** Lukas Gianinazzi, Pavel Kalvoda, Alessandro De Palma, Maciej Besta, Torsten Hoefler: Communication-Avoiding Parallel Minimum Cuts and Connected Components *In Proceedings of the 23rd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming, presented in Vienna, Austria, pages 403–404, ACM, ISBN: 978-1-4503-4982-6, Feb. 2018*
- PPoPP'18** J. de Fine Licht, M. Blott, T. Hoefler: Designing scalable FPGA architectures using high-level synthesis *In Proceedings of the 23rd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming, presented in Vienna, Austria, pages 403–404, ACM, ISBN: 978-1-4503-4982-6, Feb. 2018*
- VMCAI** Cedric Baumann, Andrei Marian Dan, Yuri Meshman, Torsten Hoefler, Martin Vechev: Automatic Verification of RMA Programs via Abstraction Extrapolation *Springer International Publishing, Feb. 2018*
- ICDE'18** Ingo Mueller, Andrea Arteaga, Torsten Hoefler, Gustavo Alonso: Reproducible Floating-Point Aggregation in RDBMSs *Feb. 2018, In Proceedings of the 2018 IEEE 34th International Conference on Data Engineering*
- SC17** E. Solomonik, M. Besta, F. Vella, T. Hoefler: Scaling Betweenness Centrality using Communication-Efficient Sparse Matrix Multiplication *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC17), Nov. 2017, (acceptance rate: 18% (61/327))*
- SC17** T. Hoefler, S. Di Girolamo, K. Taranov, R. E. Grant, R. Brightwell: sPIN: High-performance streaming Processing in the Network *In Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC17), Nov. 2017, (acceptance rate: 18% (61/327)) **Best Paper Finalist (5/61)***
- VLDB'17** C. Barthels, T. Schneider, I. Mueller, G. Alonso, T. Hoefler: Distributed Join Algorithms on Thousands of Cores *Vol 10, Nr. 5, In Proc. VLDB Endow., presented in Munich, Germany, pages 517–528, VLDB Endowment, ISSN: 2150-8097, Aug. 2017*
- HOTI'17** P. Yebenes, J. Escudero-Sahuquillo, P. J. Garcia, F. J. Quiles, T. Hoefler: Improving Non-Minimal and Adaptive Routing Algorithms in Slim Fly Networks *In Proceedings of the 25th Annual Symposium on High-Performance Interconnects (HOTI'17), Aug. 2017 **Best Student Paper***
- HOTI'17** T. Schneider, J. Dinan, M. Flajslik, K. D. Underwood, and T. Hoefler: Fast Networks and Slow Memories: A Mechanism for Mitigating Bandwidth Mismatches *In Proceedings of the 25th Annual Symposium on High-Performance Interconnects (HOTI'17), Aug. 2017*
- HPDC'17** M. Poke, T. Hoefler, C. W. Glass: AllConcur: Leaderless Concurrent Atomic Broadcast *In Proceedings of the 26th International Symposium on High-Performance Parallel and Distributed Computing (HPDC'17), presented in Washington, DC, USA, ACM, Jun. 2017, (acceptance rate: 19%)*
- HPDC'17** M. Besta, M. Podstawski, L. Groner, E. Solomonik, T. Hoefler: To Push or To Pull: On Reducing Communication and Synchronization in Graph Computations *In Proceedings of the 26th International Symposium on High-Performance Parallel and Distributed Computing (HPDC'17), presented in Washington, DC, USA, ACM, Jun. 2017, (acceptance rate: 19%)*
- ICCS'17** A. Arteaga, O. Fuhrer, T. Hoefler, T. Schulthess: Model-Driven Choice of Numerical Methods for the Solution of the Linear Advection Equation *In Proceedings of the International Conference on Computational Science (ICCS'17), presented in Zurich, Switzerland, Elsevier, Jun. 2017*
- SPAA'17** E. Solomonik, G. Ballard, J. Demmel, T. Hoefler: A Communication-Avoiding Parallel Algorithm for the Symmetric Eigenvalue Problem *Nr. 11, In Proceedings of the 29th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA'17), presented in Washington, DC, USA, pages 111–121, ACM, ISBN: 978-1-4503-4593-4, Jun. 2017*
- IPDPS'17** M. Besta, F. Marending, E. Solomonik, T. Hoefler: SlimSell: A Vectorized Graph Representation for Breadth-First Search *In Proceedings of the 31st IEEE International Parallel & Distributed Processing Symposium (IPDPS'17), presented in Orlando, FL, USA, IEEE, May 2017, (acceptance rate: 22%, 116/516)*

- IPDPS'17** S. Di Girolamo, F. Vella and T. Hoefler: Transparent Caching for RMA Systems *In Proceedings of the 31st IEEE International Parallel & Distributed Processing Symposium (IPDPS'17), presented in Orlando, FL, USA, IEEE, May 2017, (acceptance rate: 22%, 116/516)*
- IPDPS'17** T. Hoefler, A. Barak, A. Shiloh and Z. Drezner: Corrected Gossip Algorithms for Fast Reliable Broadcast on Unreliable Systems *In Proceedings of the 31st IEEE International Parallel & Distributed Processing Symposium (IPDPS'17), presented in Orlando, FL, USA, IEEE, May 2017, (acceptance rate: 22%, 116/516)*
- IPDPS'17** T. Wicky, E. Solomonik and T. Hoefler: Communication-Avoiding Parallel Algorithms for Solving Triangular Systems of Linear Equations *In Proceedings of the 31st IEEE International Parallel & Distributed Processing Symposium (IPDPS'17), presented in Orlando, FL, USA, IEEE, May 2017, (acceptance rate: 22%, 116/516)*
- IPDPS'17** S. Ramos and T. Hoefler: Capability Models for Manycore Memory Systems: A Case-Study with Xeon Phi KNL *Proceedings of the 31st IEEE International Parallel & Distributed Processing Symposium (IPDPS'17), presented in Orlando, FL, USA, IEEE, May 2017, (acceptance rate: 22%, 116/516)*
- CIAC'17** K. T. Foerster, L. Groner, T. Hoefler, M. Koenig, S. Schmid, R. Wattenhofer: Multi-agent Pathfinding with n Agents on Graphs with n Vertices: Combinatorial Classification and Tight Algorithmic Bounds *In Algorithms and Complexity - 10th International Conference, CIAC 2017, Athens, Greece, May 24-26, 2017, Proceedings, presented in Athens, Greece, May 2017*
- PPoPP'17** S. Shudler, A. Calotoiu, T. Hoefler, F. Wolf: Isoefficiency in Practice: Configuring and Understanding the Performance of Task-based Applications *In Proceedings of the 22nd ACM SIGPLAN symposium on Principles and practice of parallel programming, presented in College Station, TX, ACM, Feb. 2017 (acceptance rate: 21%, 29/139)*
- OOPSLA'16** Andrei Marian Dan, Patrick Lam, T. Hoefler, and Martin Vechev: Modeling and Analysis of Remote Memory Access Programming *ACM Symposium on Object-oriented Programming, Systems, Languages, and Applications OOPSLA'16 (acceptance rate: 25%, 52/203) Outstanding Paper Award (4/52)*
- SC16** T. Gysi, J. Baer, and T. Hoefler: dCUDA: Hardware Supported Overlap of Computation and Communication *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC16) (acceptance rate: 18%, 82/446)*
- SC16** J. Domke and T. Hoefler: Scheduling-Aware Routing for Supercomputers *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC16) (acceptance rate: 18%, 82/446)*
- SC16** W. Tang, B. Wang, S. Ethier, G. Kwasniewski, T. Hoefler, K. Ibrahim, K. Madduri, S. Williams, L. Oliker, C. Rosales-Fernandez, and T. Williams: Extreme Scale Plasma Turbulence Simulations on Top Supercomputers Worldwide *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC16) (acceptance rate: 18%, 82/446)*
- SC16** M. Martinasso, G. Kwasniewski, S. Alam, T. Schulthess, and T. Hoefler: A PCIe Congestion-Aware Performance Model for Densely Populated Accelerator Servers *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC16) (acceptance rate: 18%, 82/446)*
- HOTI'16** T. Schneider, O. Bibartiu and T. Hoefler: Ensuring Deadlock-Freedom in Low-Diameter InfiniBand Networks *In Proceedings of the 24th IEEE Symposium on High-Performance Interconnects, HOTI'16 Best Student Paper*
- HPDC'16** J. Domke, T. Hoefler, and S. Matsuoka: Routing on the Dependency Graph: A New Approach to Deadlock-Free High-Performance Routing *In Proceedings of the 25th Symposium on High-Performance Parallel and Distributed Computing (HPDC'16) (acceptance rate: 16%, 20/129)*
- HPDC'16** P. Schmid, M. Besta, and T. Hoefler: High-Performance Distributed RMA Locks *In Proceedings of the 25th Symposium on High-Performance Parallel and Distributed Computing (HPDC'16) (acceptance rate: 16%, 20/129) received Karsten Schwan Best Paper Award (1/20)*
- ICS'16** T. Grosser and T. Hoefler: Polly-ACC: Transparent compilation to heterogeneous hardware *In Proceedings of the the 30th International Conference on Supercomputing (ICS'16) (acceptance rate: 24%, 43/178)*
- PACT'15** H. Schweizer, M. Besta, and T. Hoefler: Evaluating the Cost of Atomic Operations on Modern Architectures *In Proceedings of the 24th International Conference on Parallel Architectures and Compilation (PACT'15) (acceptance rate: 21%, 38/179)*
- PACT'15** A. Bhattacharyya and T. Hoefler: Using Compiler Techniques to Improve Automatic Performance Modeling *In Proceedings of the 24th International Conference on Parallel Architectures and Compilation (PACT'15) (acceptance rate: 21%, 38/179)*



- SC15** T. Hoefler and R. Belli: Scientific Benchmarking of Parallel Computing Systems *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC15)* (acceptance rate: 22%, 79/358)
- SC15** G. Kathareios, C. Minkenberg, B. Prisacari, G. Rodriguez, and T. Hoefler: Cost-Effective Diameter-Two Topologies: Analysis and Evaluation *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC15)* (acceptance rate: 22%, 79/358)
- HOTI'15** S. Di Girolamo, P. Jolivet, K. D. Underwood and T. Hoefler: Exploiting Offload Enabled Network Interfaces *In Proceedings of the 23rd IEEE Symposium on High-Performance Interconnects, HOTI'15* **Best Student Paper**
- HPDC'15** M. Besta and T. Hoefler: Accelerating Irregular Computations with Hardware Transactional Memory and Active Messages *In Proceedings of ACM Symposium on High-Performance Parallel and Distributed Computing, HPDC'15* (acceptance rate: 16% (19/116)) **HPDC'15 Best Paper (1/19)**
- ICS'15** S. Shudler, A. Calotoiu, T. Hoefler, and F. Wolf: Exascaling Your Library: Will Your Implementation Meet Your Expectations? *In Proceedings of the ACM Conference on Supercomputing, ICS'15* (acceptance rate: 25% (40/160))
- HPDC'15** M. Poke and T. Hoefler: DARE: High-Performance State Machine Replication on RDMA Networks *Accepted at ACM HPDC'15* (acceptance rate: 16% (19/116))
- ICS'15** M. Besta and T. Hoefler: Active Access: A Mechanism for High-Performance Distributed Data-Centric Computations *In Proceedings of the ACM Conference on Supercomputing, ICS'15* (acceptance rate: 25% (40/160))
- ICS'15** T. Gysi, T. Gresser, and T. Hoefler: MODESTO: Data-centric Analytic Optimization of Complex Stencil Programs on Heterogeneous Architectures *In Proceedings of the ACM Conference on Supercomputing, ICS'15* (acceptance rate: 25% (40/160))
- HPDC'15** S. Ramos and T. Hoefler: Cache Line Aware Optimizations for ccNUMA Systems *In Proceedings of ACM Symposium on High-Performance Parallel and Distributed Computing, HPDC'15* (short paper)
- IPDPS'15** R. Belli and T. Hoefler: Notified Access: Extending Remote Memory Access Programming Models for Producer-Consumer Synchronization *In Proceedings of the IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, (acceptance rate: 21.8% (108/496)) **IPDPS'15 Best Paper (4/108)**
- SC14** M. Besta and T. Hoefler: Slim Fly: A Cost Effective Low-Diameter Network Topology *In Proceedings of IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC14)*, (acceptance rate: 21%, 82/394), **SC14 Best Student Paper (1/82)**
- SC14** J. Domke, T. Hoefler, and S. Matsuoka: Fail-in-Place Network Design: Interaction between Topology, Routing Algorithm and Failures *In Proceedings of IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC14)*, (acceptance rate: 21%, 82/394)
- SC14** K. B. Ferreira, P. Widener, S. Levy, D. Arnold, and T. Hoefler: Understanding the Effects of Communication and Coordination on Checkpointing at Scale *In Proceedings of IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC14)*, (acceptance rate: 21%, 82/394)
- PACT'14** A. Bhattacharyya and T. Hoefler: PEMOGEN: Automatic Adaptive Performance Modeling during Program Runtime *In Proceedings of 23rd Intl. Conference on Parallel Architectures and Compilation Techniques (PACT'14)*
- HPDC'14** B. Prisacari, G. Rodriguez, P. Heidelberger, D. Chen, C. Minkenberg and T. Hoefler: Efficient Task Placement and Routing in Dragonfly Networks *In Proceedings of the 23rd ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC'14)*, (acceptance rate: 16%, 21/130)
- HPDC'14** M. Besta and T. Hoefler: Fault Tolerance for Remote Memory Access Programming Models *In Proceedings of the 23rd ACM International Symposium on High-Performance Parallel and Distributed Computing (HPDC'14)*, (acceptance rate: 16%, 21/130), **Best Paper Nominee (3/21)**
- SPAA'14** T. Hoefler and G. Kwasniewski: Automatic Complexity Analysis of Explicitly Parallel Programs *In Proceedings of the 26th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA'14)*, (acceptance rate: 25%, 30/122)
- IPDPS'14** A. Arteaga, T. Hoefler and O. Fuhrer: Designing Bit-Reproducible Portable High-Performance Applications *In Proceedings of IEEE International Parallel & Distributed Processing Symposium (IPDPS)*, (acceptance rate: 21.1%, 114/541)
- ACM TACO (HIPEAC)** B. Prisacari, G. Rodriguez, C. Minkenberg, and T. Hoefler: Fast Pattern-Specific Routing for Fat Tree Networks *In ACM Transactions on Architecture and Code Optimization, and presented at the HIPEAC 2014 conference*, (acceptance rate: 24%, 2011)

- SC13** A. Calotoiu, T. Hoefler, M. Poke, and F. Wolf: Using Automated Performance Modeling to Find Scalability Bugs in Complex Codes *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC13)*, (acceptance rate: 20%, 92/457)
- SC13** R. Gerstenberger, M. Besta, and T. Hoefler: Enabling Highly-Scalable Remote Memory Access Programming with MPI-3 One Sided *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC13)*, (acceptance rate: 20%, 92/457), **SC13 Best Paper Award (1/92) and Best Student Paper Finalist (8/92)**
- SC13** A. Friedley, G. Bronevetsky, A. Lumsdaine, and T. Hoefler: Hybrid MPI: Efficient Message Passing for Multi-core Systems *In Proceedings of the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC13)*, (acceptance rate: 20%, 92/457)
- ICPP'13** T. Schneider, R. Grant, B. Barrett, R. Brightwell, and T. Hoefler: Protocols for Fully Offloaded Collective Operations on Accelerated Network Adapters *In Proceedings of the Intl. Conference on Parallel Processing, ICPP'13*
- EuroMPI'13** T. Schneider, F. Kjolstad, and T. Hoefler: MPI Datatype Processing using Runtime Compilation *In Proceedings of ACM/SIGHPC Recent Advances in Message Passing Interface, EuroMPI'13 Best Paper Award (1/25)*
- ICS'13** B. Prisacari, G. Rodriguez, C. Minkenber, and T. Hoefler: Bandwidth-optimal Alltoall Exchanges in Fat Tree Networks *In Proceedings of the 27th ACM International Conference on Supercomputing, ICS'13* (acceptance rate: 21%, 41/198)
- LCPC'13** T. Schneider, R. Gerstenberger, and T. Hoefler: Compiler Optimizations for Non-Contiguous Remote Data Movement *In Proceedings of 26th International Workshop on Languages and Compilers for Parallel Computing, LCPC'13*
- HPDC'13** S. Ramos Garea and T. Hoefler: Modeling Communication in Cache-Coherent SMP Systems - A Case-Study with Xeon Phi *In Proceedings of the 22nd ACM Symposium on High-Performance Parallel and Distributed Computing, HPDC'13* (acceptance rate: 15%, 20/131)
- HPDC'13** S. Li, T. Hoefler, and M. Snir: NUMA-Aware Shared Memory Collective Communication for MPI *In Proceedings of the 22nd ACM Symposium on High-Performance Parallel and Distributed Computing, HPDC'13* (acceptance rate: 15%, 20/131), **Best Paper Nominee (3/20)**
- PPoPP'13** A. Friedley, T. Hoefler, G. Bronevetsky, and A. Lumsdaine: Ownership Passing: Efficient Distributed Memory Programming on Multi-core Systems *In Proceedings of the 18th ACM SIGPLAN symposium on Principles and Practice of Parallel Programming, PPoPP'13*, pages 177–186. ACM, Feb. 2013 (acceptance rate: 21%, 100/472)
- SC12** T. Hoefler and T. Schneider: Optimization Principles for Collective Neighborhood Communications *In Proceedings of the International Conference on High Performance Computing, Networking, Storage and Analysis, SC'12*, pages 98:1–98:10. IEEE Computer Society Press, Nov. 2012, (acceptance rate: 21%, 100/472)
- EuroMPI'12** T. Schneider, R. Gerstenberger, and T. Hoefler: Micro-Applications for Communication Data Access Patterns and MPI Datatypes *In Recent Advances in the Message Passing Interface - 19th European MPI Users' Group Meeting, EuroMPI 2012*, volume 7490, pages 121-131. Springer, Sept. 2012
- EuroMPI'12** S. Pellegrini, T. Hoefler, and T. Fahringer: Exact Dependence Analysis for Increased Communication Overlap *In Recent Advances in the Message Passing Interface - 19th European MPI Users' Group Meeting, EuroMPI 2012*, volume 7490, pages 89–99. Springer, Sept. 2012
- EuroMPI'12** T. Hoefler J. Dinan, D. Buntinas, P. Balaji, B. Barrett, R. Brightwell, W. Gropp, V. Kale, and R. Thakur: Leveraging MPI's One-Sided Communication Interface for Shared-Memory Programming *In Recent Advances in the Message Passing Interface - 19th European MPI Users' Group Meeting, EuroMPI 2012*, volume 7490, pages 132–141. Springer, Sept. 2012
- PACT'12** T. Hoefler and T. Schneider: Runtime Detection and Optimization of Collective Communication Patterns *In Proceedings of the 21st international conference on Parallel Architectures and Compilation Techniques, PACT'12*, pages 263–272. ACM, Sept. 2012, (acceptance rate: 19%, 39/207)
- PPoPP'12** T. Hoefler and T. Schneider: Communication-Centric Optimizations by Dynamically Detecting Collective Operations *In Proceedings of the 17th ACM SIGPLAN symposium on Principles and Practice of Parallel Programming, PPoPP'12*, pages 305–306. ACM, Feb. 2012, (poster paper) (acceptance rate (posters): 17%, 32/185)
- PPoPP'12** F. Kjolstad, T. Hoefler, and M. Snir: Automatic Datatype Generation and Optimization *In Proceedings of the 17th ACM SIGPLAN symposium on Principles and Practice of Parallel Programming, PPoPP'12*, pages 327–328. ACM, Feb. 2012, (poster paper) (acceptance rate (posters): 17%, 32/185)

- SC11** T. Hoefler, W. Gropp, M. Snir, and W. Kramer: Performance Modeling for Systematic Performance Tuning *In State of the Practice Reports, SC'11*, pages 6:1–6:12. ACM, Nov. 2011
- EuroMPI'11** W. Gropp, T. Hoefler, R. Thakur, and J. L. Traeff: Performance Expectations and Guidelines for MPI Derived Datatypes *In Recent Advances in the Message Passing Interface, EuroMPI'11*, volume 6960, pages 150–159. Springer, Sept. 2011
- EuroMPI'11** V. Venkatesan, M. Chaarawi, E. Gabriel, and T. Hoefler: Design and Evaluation of Nonblocking Collective I/O Operations *In Recent Advances in the Message Passing Interface, EuroMPI'11*, volume 6960, pages 90–98. Springer, Sept. 2011
- EuroMPI'11** T. Hoefler, and M. Snir.: Writing Parallel Libraries with MPI - Common Practice, Issues, and Extensions *In Recent Advances in the Message Passing Interface, EuroMPI'11*, volume 6960, pages 345–355. Springer, Sept. 2011, *Keynote Paper at the IMUDI session at EuroMPI 2011 Conference*
- EuroPar'11** T. Schneider, S. Eckelmann, T. Hoefler, and W. Rehm.: Kernel-Based Offload of Collective Operations - Implementation, Evaluation and Lessons Learned. *In Proceedings of the 17th international conference on Parallel processing - Volume Part II, EuroPar'11*, pages 264-275. Springer, Aug. 2011 (acceptance rate 29.9%, 81/271)
- ICS'11** T. Hoefler and M. Snir.: Generic Topology Mapping Strategies for Large-scale Parallel Architectures. *In Proceedings of the 2011 ACM International Conference on Supercomputing, ICS'11*, pages 75–85. ACM, Jun. 2011 (acceptance rate 21.7%, 35/161)
- ICS'11** J. Willcock, T. Hoefler, N. Edmonds, and A. Lumsdaine.: Active Pebbles: Parallel Programming for Data-Driven Applications. *In Proceedings of the 2011 ACM International Conference on Supercomputing, ICS'11*, pages 235–245. ACM, Jun. 2011 (acceptance rate 21.7%, 35/161)
- IPDPS'11** J. Domke, T. Hoefler, and W. Nagel.: Deadlock-Free Oblivious Routing for Arbitrary Topologies. *In Proceedings of the 25th IEEE International Parallel & Distributed Processing Symposium, IPDPS'11*, pages 613–624. IEEE Computer Society, May 2011 (acceptance rate: 19.6%, 112/571)
- PPoPP'11** J. Willcock, T. Hoefler, N. Edmonds, and A. Lumsdaine.: Active Pebbles: A Programming Model For Highly Parallel Fine-Grained Data-Driven Computations. *In Proceedings of the 16th ACM symposium on Principles and Practice of Parallel Programming, PPoPP'11*, pages 305–306. ACM, Feb. 2011 **Best Poster at PPoPP'11** (acceptance rate: 25%, 26/165 papers + 16/165 poster).
- PADL'11** E. Holk, W. E. Byrd, J. Willcock, and T. Hoefler, A. Chauhan, and A. Lumsdaine.: Kanor – A Declarative Language for Explicit Communication. *In Proceedings of the 13th international conference on Practical aspects of declarative languages, PADL'11*, pages 190–204. Springer, Jan. 2011
- HiPC'10** N. Edmonds, T. Hoefler, and A. Lumsdaine.: A Space-Efficient Parallel Algorithm for Computing Betweenness Centrality in Distributed Memory. *In Proceedings of International Conference on High Performance Computing, HiPC'10*, pages 1–10. Dec. 2010 (acceptance rate: 19.2%)
- SC'10** T. Hoefler, T. Schneider, and A. Lumsdaine.: Characterizing the Influence of System Noise on Large-Scale Applications by Simulation. *In Proceedings of the 2010 ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis, SC'10*, pages 1–11. IEEE Computer Society, Nov. 2010 **Best Paper at SC10**, (acceptance rate: 19.8%, 50/253)
- PACT'10** J. Willcock, T. Hoefler, N. Edmonds, and A. Lumsdaine.: AM++: A Generalized Active Message Framework. *In Proceedings of the 19th international conference on Parallel Architectures and Compilation Techniques, PACT'10*, pages 401-410. ACM, Sept. 2010 (acceptance rate: 17%, 46/266)
- EuroMPI'10** T. Hoefler, G. Bronevetsky, B. Barrett, B. R. de Supinski, and A. Lumsdaine.: Efficient MPI Support for Advanced Hybrid Programming Models. *In Recent Advances in the Message Passing Interface, EuroMPI'10*, pages 50–61, volume LNCS 6305. Springer, Sept. 2010
- EuroMPI'10** T. Hoefler, W. Gropp, R. Thakur, and J. L. Traeff.: Toward Performance Models of MPI Implementations for Understanding Application Scaling Issues. *In Recent Advances in the Message Passing Interface, EuroMPI'10*, pages 21–30, volume LNCS 6305. Springer, Sept. 2010
- EuroMPI'10** T. Hoefler and S. Gottlieb.: Parallel Zero-Copy Algorithms for Fast Fourier Transform and Conjugate Gradient using MPI Datatypes. *In Recent Advances in the Message Passing Interface, EuroMPI'10*, pages 132–141, volume LNCS 6305. Springer, Sept. 2010
- HotI'10** B. Arimilli, R. Arimilli, V. Chung, S. Clark, W. Denzel, B. Drerup, T. Hoefler, J. Joyner, J. Lewis, J. Li, N. Ni, and R. Rajamony.: The PERCS High-Performance Interconnect. *Proceedings of 18th Symposium on High-Performance Interconnects (Hot Interconnects 2010)*. IEEE, Aug. 2010. (invited paper)

- PPoPP'10** T. Hoefler, C. Siebert, and A. Lumsdaine.: Scalable Communication Protocols for Dynamic Sparse Data Exchange. *Proceedings of the 2010 ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, pages 159–168. ACM, Jan. 2010. (acceptance rate: 16.8%, 29/173)
- HiPC'09** P. Kambadur, A. Gupta, T. Hoefler, and A. Lumsdaine.: Demand-driven Execution of Static Directed Acyclic Graphs Using Task Parallelism. In *Proceedings of International Conference on High Performance Computing, HiPC'09*, pages 284–293. Dec. 2009 (acceptance rate: 11%, 35/320)
- HotI'09** T. Hoefler, T. Schneider, and A. Lumsdaine.: Optimized Routing for Large-Scale InfiniBand Networks. *17th Annual IEEE Symposium on High Performance Interconnects, HOTI'09, IEEE Computer Society, Aug. 2009.* (acceptance rate: 30%, 14/47)
- ICPP'09** T. Hoefler, C. Siebert, and A. Lumsdaine.: Group Operation Assembly Language - A Flexible Way to Express Collective Communication *ICPP-2009 - The 38th International Conference on Parallel Processing. IEEE, Sep. 2009.* (acceptance rate: 32%, 71/220)
- EuroMPI'09** T. Hoefler, A. Lumsdaine, and J. Dongarra.: Towards Efficient MapReduce Using MPI. *Recent Advances in Parallel Virtual Machine and Message Passing Interface, 16th European PVM/MPI Users' Group Meeting, EuroPVM/MPI'09. Springer, Sep. 2009.*
- LCI'09** J. Mueller, T. Schneider, J. Domke, R. Geyer, M. Haesing, T. Hoefler, S. Hoehlig, G. Juckeland A. Lumsdaine, M. Mueller, and W. Nagel.: Cluster Challenge 2008: Optimizing Cluster Configuration and Applications to Maximize Power Efficiency. *Proceedings of the 10th LCI International Conference on High-Performance Clustered Computing, LCI'09, Mar. 2009. **Best Student Paper at LCI'09***
- Cluster'08** T. Hoefler, T. Schneider, and A. Lumsdaine.: Multistage Switches are not Crossbars: Effects of Static Routing in High-Performance Networks. *Proceedings of the 2008 IEEE International Conference on Cluster Computing, CLUSTER'08. IEEE Computer Society, Oct. 2008.* (acceptance rate: 30%, 28/92)
- Cluster'08** T. Hoefler and A. Lumsdaine.: Message Progression in Parallel Computing - To Thread or not to Thread? *Proceedings of the 2008 IEEE International Conference on Cluster Computing, CLUSTER'08. IEEE Computer Society, Oct. 2008.* (acceptance rate: 30%, 28/92)
- HotI'08** P. Geoffray and T. Hoefler.: Adaptive Routing Strategies for Modern High Performance Networks. *16th Annual IEEE Symposium on High Performance Interconnects, HOTI'08, pages 165–172. IEEE Computer Society, Aug. 2008.* (acceptance rate: 30%, 14/47)
- SPAA'08** T. Hoefler, P. Gottschling, and A. Lumsdaine.: Leveraging Non-blocking Collective Communication in High-performance Applications. *Proceedings of the Twentieth Annual Symposium on Parallelism in Algorithms and Architectures, SPAA'08, pages 113–115. Association for Computing Machinery (ACM), Jun. 2008.* (acceptance rate: 28%, 36/128)
- SC07** T. Hoefler, A. Lumsdaine, and W. Rehm.: Implementation and Performance Analysis of Non-Blocking Collective Operations for MPI. In *proceedings of the 2007 International Conference on High Performance Computing, Networking, Storage and Analysis, SC07. IEEE Computer Society/ACM, Nov. 2007.* (acceptance rate: 20%, 54/268)
- EuroMPI'06** T. Hoefler, P. Gottschling, W. Rehm, and A. Lumsdaine.: Optimizing a Conjugate Gradient Solver with Non-Blocking Collective Operations. *Proceedings of Recent Advantages in Parallel Virtual Machine and Message Passing Interface, EuroPVM/MPI'06, pages 374–382. Springer, Sep. 2006.*
- EuroPar'06** F. Mietke, R. Baumgartl, R. Rex, T. Mehlan, T. Hoefler, and W. Rehm.: Analysis of the Memory Registration Process in the Mellanox InfiniBand Software Stack. *Proceedings of Euro-Par 2006 Parallel Processing, pages 124–133. Springer-Verlag Berlin, Aug. 2006.* (acceptance rate: 37.9%, 110/290)

### Edited Journals

- IJHPCA'13** T. Hoefler and Kamil Iskra (Editors):. Operating systems and runtime environments on supercomputers *IJHPCA, May 2013 (vol 27 no. 2).*
- IJHPCA'12** T. Hoefler and Kamil Iskra (Editors):. Issues in Large Scale Computing Environments: Heterogeneous Computing and Operating Systems *IJHPCA, May 2012 (vol 26 no. 2).*
- IEEE Micro'12** T. Hoefler, P. Geoffray, F. Petrini, J. L. Traeff (Editors):. Top Picks from Hot Interconnects 2011: Petascale Network Architectures *IEEE Micro, Jan/Feb. 2012 (vol 32 no. 1).*
- PARCO'12** T. Hoefler (Editor):. Extensions for Next-Generation Parallel Programming Models. *Elsevier Parallel Computing, Jan/Feb. 2012.*

## Selected Journal Publications and Book Chapters

- IEEE TOC** Fabian Schuiki, Florian Zaruba, Torsten Hoefler, Luca Benini: Stream Semantic Registers: A Lightweight RISC-V ISA Extension Achieving Full Compute Utilization in Single-Issue Cores *IEEE Transactions on Computers (TOC)*. *IEEE*, Apr. 2020
- TRETS** Maciej Besta, Marc Fischer, Tal Ben-Nun, Dimitri Stanojevic, Johannes de Fine Licht, Torsten Hoefler: Substream-Centric Maximum Matchings on FPGA *In Proceedings of the ACM Trans. Reconfig. Technol. Systems*
- TPDS** Sergei Shudler, Yannick Berens, Alexandru Calotoiu, Torsten Hoefler, Alexandre Strube, Felix Wolf: Engineering Algorithms for Scalability through Continuous Validation of Performance Expectations *IEEE Transactions on Parallel and Distributed Systems (TPDS)*. Vol 30, Nr. 8, *IEEE*, Jul. 2019
- CiSE** T. Schulthess, P. Bauer, O. Fuhrer, T. Hoefler, C. Schaer, N. Wedi: Reflecting on the goal and baseline for exascale computing: a roadmap based on weather and climate simulations *Computing in Science and Engineering (CiSE)*. Vol 21, Nr. 1, *IEEE Computer Society*, ISSN: 1521-9615, Jan. 2019
- CACM** R. Gerstenberger, M. Besta, T. Hoefler: Enabling Highly-Scalable Remote Memory Access Programming with MPI-3 One Sided *In Communications of the ACM*, ACM, Oct. 2018, **Invited Article to Research Highlights**
- GMD'18** O. Fuhrer, T. Chadha, T. Hoefler, G. Kwasniewski, X. Lapillonne, D. Leutwyler, D. Luethi, C. Osuna, C. Schaer, T. C. Schulthess, H. Vogt: Near-global climate simulation at 1 km resolution: establishing a performance baseline on 4888 GPUs with COSMO 5.0 *Geoscientific Model Development*. Vol 11, Nr. 4, *Copernicus Publications*, May 2018
- IEEE TPDS'18** Shigang Li, Yunquan Zhang, Torsten Hoefler: Cache-Oblivious MPI All-to-All Communications Based on Morton Order *IEEE Transactions on Parallel and Distributed Systems (TPDS)*. Vol 29, Nr. 3, *IEEE*, Mar. 2018
- IEEE TPDS'17** Didem Unat, Anshu Dubey, Torsten Hoefler, John Shalf, Mark Abraham, Mauro Bianco, Bradford L. Chamberlain, Romain Cledat, H. Carter Edwards, Hal Finkel, Karl Fuerlinger, Frank Hannig, Emmanuel Jeannot, Amir Kamil, Jeff Keasler, Paul H J Kelly, Vitus Leung, Hatem Ltaief, Naoya Maruyama, Chris J. Newburn, and Miquel Pericas: Trends in Data Locality Abstractions for HPC Systems *IEEE Transactions on Parallel and Distributed Systems (TPDS)*. Vol 28, Nr. 10, *IEEE*, Oct. 2017
- IEEE TPDS'16** S. Ramos and T. Hoefler.: Cache Line Aware Algorithm Design for Cache-Coherent Architectures *IEEE Transactions on Parallel and Distributed Systems (TPDS)*. Vol PP, Nr. 99, *IEEE*, Jan. 2016
- IEEE MICRO'16** S. Di Girolamo, P. Jolivet, K. D. Underwood, and T. Hoefler.: Exploiting Offload Enabled Network Interfaces *IEEE MICRO*. Vol 36, Nr. 4, *IEEE*, Jul. 2016
- ACM TOPC'15** T. Hoefler, J. Dinan, R. Thakur, B. Barrett, P. Balaji, W. Gropp, K. Underwood.: Remote Memory Access Programming in MPI-3 *ACM Transactions on Parallel Computing (TOPC)*. ACM, Jan. 2015
- JSFI'14** T. Hoefler and D. Moor.: Energy, Memory, and Runtime Tradeoffs for Implementing Collective Communication Operations *Journal of Supercomputing Frontiers and Innovations*. Vol 1, Nr. 2, pages 58–75, Oct. 2014
- Computing'13** T. Schneider, R. Gerstenberger, T. Hoefler.: Application-oriented ping-pong benchmarking: how to assess the real communication overheads. *Journal of Computing*. Springer, May. 2013.
- Computing'13** T. Hoefler, J. Dinan, D. Buntinas, P. Balaji, B. Barrett, R. Brightwell, W. Gropp, V. Kale and R. Thakur.: MPI + MPI: a new hybrid approach to parallel programming with MPI plus shared memory. *Journal of Computing*. Springer, May. 2013.
- MPI-3.0 Standard** The MPI Forum.: MPI: A Message-Passing Interface Standard, Version 2.2. *Technical report, MPI Forum*, 2012. (Chapters 5 (Collective Operations), 7 (Process Topologies), and 11 (One Sided)).
- PPL'11** P. Balaji, D. Buntinas, D. Goodell, W. Gropp, T. Hoefler, S. Kumar, E. Lusk, R. Thakur, and J. L. Traeff.: MPI on Millions of Cores. *Parallel Processing Letters (PPL)*, Mar. 2011.
- CiSE'10** T. Hoefler.: Software and Hardware Techniques for Power-Efficient HPC Networking. *Computing in Science and Engineering (CiSE)*, Dec. 2010.
- CCPE'10** T. Hoefler, R. Rabenseifner, H. Ritzdorf, B. R. de Supinski, R. Thakur, , and J. L. Traeff.: The Scalable Process Topology Interface of MPI 2.2. *Concurrency and Computation: Practice and Experience*, Dec. 2010.
- MPI-2.2 Standard** The MPI Forum.: MPI: A Message-Passing Interface Standard, Version 2.2. *Technical report, MPI Forum*, 2009. (Chapters 5 (Collective Operations) and 7 (Process Topologies)).

- PPL'09** T. Hoefler, T. Schneider, and A. Lumsdaine.: The Effect of Network Noise on Large-Scale Collective Communications. *Parallel Processing Letters (PPL)*, 19(4):573–593, Aug. 2009.
- PARCO'07** T. Hoefler, P. Gottschling, A. Lumsdaine, and W. Rehm.: Optimizing a Conjugate Gradient Solver with Non-Blocking Collective Operations. *Elsevier Journal of Parallel Computing (PARCO)*, 33(9):624–633, Sep. 2007.

### Peer-reviewed Workshop Publications

- LSAP'11** T. Hoefler and M. Snir.: Performance Engineering: A Must for Petaflops and Beyond. *Proceedings of Workshop on Large-Scale System and Application Performance (LSAP 2011)*. **Keynote Paper**
- PROPER'10** T. Hoefler.: Bridging Performance Analysis Tools and Analytic Performance Modeling for HPC. *Proceedings of Workshop on Productivity and Performance (PROPER 2010)*. Springer, Dec. 2010. **Keynote Paper**
- LSAP'10** T. Hoefler, T. Schneider, and A. Lumsdaine.: LogGOPSim - Simulating Large-Scale Applications in the LogGOPS Model. *In Proceedings of the 19th ACM International Symposium on High Performance Distributed Computing, LSAP'10*, pages 597–604. ACM, Jun. 2010 **Best Paper at LSAP'10**
- HIPS'09** T. Hoefler and J. L. Traeff.: Sparse Collective Operations for MPI. *Proceedings of the 23rd IEEE International Parallel & Distributed Processing Symposium, HIPS'09 Workshop*, May 2009.
- LSPP'09** T. Hoefler, T. Schneider, and A. Lumsdaine.: The Impact of Network Noise at Large-Scale Communication Performance. *Proceedings of the 23rd IEEE International Parallel & Distributed Processing Symposium, LSPP'09 Workshop*, May 2009.
- CAC'09** C. Kaiser, T. Hoefler, B. Bierbaum, and T. Bemberl.: Implementation and Analysis of Nonblocking Collective Operations on SCI Networks. *Proceedings of the 23rd IEEE International Parallel & Distributed Processing Symposium, CAC'09 Workshop*, May 2009.
- CAC'09** T. Hoefler, T. Schneider, and A. Lumsdaine.: A Power-Aware, Application-Based, Performance Study Of Modern Commodity Cluster Interconnection Networks. *Proceedings of the 23rd IEEE International Parallel & Distributed Processing Symposium, CAC'09 Workshop*, May 2009.
- CAC'08** T. Hoefler and A. Lumsdaine.: Optimizing non-blocking Collective Operations for InfiniBand. *Proceedings of the 22nd IEEE International Parallel & Distributed Processing Symposium, CAC'08 Workshop*, Apr. 2008.
- CAC'07** T. Hoefler, C. Siebert, and W. Rehm.: A practically constant-time MPI Broadcast Algorithm for large-scale InfiniBand Clusters with Multicast. *Proceedings of the 21st IEEE International Parallel & Distributed Processing Symposium, CAC'07 Workshop*, page 232. IEEE Computer Society, Mar. 2007.
- CAC'06** T. Hoefler, T. Mehlan, F. Mietke, and W. Rehm.: Fast Barrier Synchronization for InfiniBand. *Proceedings of the 20th IEEE International Parallel & Distributed Processing Symposium, CAC'06 Workshop*, Apr. 2006.
- PARS'05** T. Hoefler and W. Rehm.: A Communication Model for Small Messages with InfiniBand. *PARS Mitteilungen (German)*, pages 32–41. PARS, Jun. 2005. **Received PARS Junior Researcher Award.**

### Selected Invited Talks

21 invited keynotes, more than 40 invited talks, not counting regular conference or workshop paper presentations

- Keynote **High-Performance Communication in Machine Learning**  
HPBD&IS'19 Keynote talk at the (Virtual) International Conference on High-Performance Big Data and Intelligent Systems (HPBD&IS'20)
- Keynote **HPC for ML and ML for HPC - Scalability, Communication, and Programming**  
MLHPC'19 Keynote talk at the International Machine Learning in High-Performance Computing (MLHPC'19 in conjunction with ACM/IEEE Supercomputing, SC19)
- Keynote **High-Performance Communication in Machine Learning**  
PPAM'19 Keynote talk at the 13th International Conference on Parallel Processing and Applied Mathematics (PPAM'19)
- Keynote **Data-Centric Parallel Programming**  
ParCo'19 Keynote talk at the 18th International Parallel Computing conference (ParCo'19)
- Keynote **High-Performance Communication for Machine Learning**  
EMiT'19 Keynote talk at the 5th Conference on Emerging Technologies – EMiT2019

Keynote AsHES	<b>Performance Portability with Data-Centric Parallel Programming</b> Keynote talk at the 9th International Workshop on Accelerators and Hybrid Exascale Systems (AsHES) (delayed online)	
Keynote AHPC'19	<b>High-Performance Communication in Machine Learning</b> Keynote at the Austrian HPC meeting 2019	
Keynote ExaMPI'18	<b>RDMA, Scalable MPI-3 RMA, and Next-Generation Post-RDMA Interconnects</b> Keynote at ExaMPI 2018 Workshop (in conjunction with SC18)	
Tsinghua University	<b>Performance Modeling for Future Computing Technologies</b> Invited talk at 60 years of CS @ Tsinghua celebration	
Keynote HPCAC	<b>Demystifying Parallel and Distributed Deep Learning: An In-Depth Concurrency Analysis</b> Keynote at Swiss HPC Advisory Council Conference 2018	
Keynote Multicore @ Siemens	<b>Developing high-performance software, from modeling to programming</b> Invited opening presentation at the Multicore@Siemens conference	
Keynote HiPINEB'18	<b>The three L's in modern high-performance networking: low latency, low cost, low processing load</b> Keynote at the HiPINEB workshop at HPCA'18	<b>in conjunction with HPCA'17</b>
Keynote EMBRACE'17	<b>Scientific Benchmarking of Parallel Computing Systems</b> Keynote talk at EMBRACE Workshop (IPDPS'17)	<b>in conjunction with IPDPS'17</b>
Keynote HPC China'16	<b>Theory and Practice in HPC: Modeling, Programming, and Networking</b> Keynote at the HPC China 2016 conference	<b>Xi'an, China</b>
Keynote Cluster'16	<b>Theory and Practice in HPC: Modeling, Programming, and Networking</b> Opening Keynote at the IEEE Cluster 2016 conference	<b>Taipei, Taiwan</b>
Keynote HIPS'15	<b>How fast will your application go? Static and dynamic techniques for application performance modeling.</b> Keynote at the HIPS'15/LSPP'15 combined workshop in conjunction with IPDPS'15	<b>Hyderabad, India</b>
Keynote LLVMHPC'14	<b>A case for runtime recompilation in HPC</b> Keynote at the LLVM Compiler Infrastructure in HPC workshop at SC14, Nov. 2014	<b>New Orleans, LA, USA</b>
Keynote ExaMPI'13	<b>MPI Beyond 3.0 and Towards Larger-Scale Computing</b> Keynote at the Workshop on Exascale MPI at SC13, Nov. 2013, ≈120 attendees	<b>Denver, CO, USA</b>
SC13	<b>The Second Green Graph500 List</b> Birds of a Feather, Nov. 2013	<b>Denver, CO, USA</b>
Dagstuhl	<b>Fault Tolerance for Remote Memory Access Programming Models</b> Invited to seminar "Resilience in Exascale Computing"	<b>Dagstuhl, Germany</b>
ISC'13	<b>The First Green Graph500 List</b> Birds of a Feather, Jun. 2013	<b>Leipzig, Germany</b>
EASC'13	<b>Application-Centric Benchmarking and Modeling for Co-Design</b> Exascale Applications and Software Conference	<b>Edinburgh, UK</b>
Keynote MCC'12	<b>MPI-3.0: A Response to New Challenges in Hardware and Software</b> Keynote talk at Multicore Challenge Conference 2012	<b>Stuttgart, Germany</b>
TiTech'12	<b>Optimized routing and process mapping for arbitrary network topologies</b> Invited talk at Tokio Institute of Technology	<b>Tokio, Japan</b>
Keynote EuroMPI'11	<b>Writing Parallel Libraries with MPI - The Good, the Bad, and the Ugly</b> Keynote talk at 18th European PVM/MPI User's Group Meeting	<b>Santorini, Greece</b>
Keynote EnA-HPC'11	<b>Energy-aware Software Development for Massive-Scale Systems</b> Keynote at the International Conference on Energy-Aware High Performance Computing	<b>Hamburg, Germany</b>
Jülich 2011	<b>Model-Driven HPC Software and System Design and Optimization</b> Jülich Supercomputing Center, Apr. 2011	<b>Jülich, Germany</b>

Keynote PROPER'10	<b>Analytical Performance Modeling and Simulation for Blue Waters</b> Keynote at the Workshop on Productivity and Performance in conjunction with EuroPar, Aug. 2010	Ischia, Italy
Argonne Natl. Laboratory	<b>Nonblocking and Sparse Collective Operations on Petascale Computers</b> Argonne National Laboratory, Jun. 2010	Chicago, IL, USA
SC'09 BoF	<b>Selected MPI-2.2 and MPI-3 Features</b> MPICH Birds of a Feather, Nov. 2009	Portland, OR, USA
Cisco Systems	<b>The Effects of Common Communication Patterns in Large-Scale Networks with Switch-Based Static Routing</b> Nerd Lunch at Cisco Systems, Aug. 2008	San Jose, CA, USA
Berkeley Natl. Laboratory	<b>Multistage Interconnection Networks are not Crossbars</b> Lawrence Berkeley National Laboratory, Aug. 2008	Berkeley, CA, USA
Livermore Natl. Laboratory	<b>Non-blocking Collective Operations for MPI</b> Lawrence Livermore National Laboratory, Aug. 2008	Livermore, CA, USA
HLRS	<b>Non-blocking Collectives for MPI-2</b> High Performance Computing Center Stuttgart (HLRS), Dec. 2007	Stuttgart, Germany
ABINIT Workshop	<b>Optimization of a parallel 3d-FFT with non-blocking Collective Operations</b> Invited to the 3rd International ABINIT Developer Workshop, Jan. 2007	Liege, Belgium
TU Munich	<b>Fast Barrier Synchronization for InfiniBand</b> Technical University of Munich, Sep. 2005	Munich, Germany

## Impact

DFSSSP Routing	<b>Deadlock-free Single Source Shortest Path routing</b> The fastest routing algorithm for arbitrary topologies. Available in OpenSM (the InfiniBand subnet manager) and used at various sites. (with J. Domke)
Nonblocking Collectives	<b>Nonblocking Collective Operations for MPI</b> Proposed algorithms and reference implementation that are now used in virtually every MPI implementation. Drove the standardization in MPI-3.0.
Neighborhood Collectives	<b>Neighborhood Collective Operations for MPI</b> Proposed algorithms and reference implementation that are now used in virtually every MPI implementation. Drove the standardization in MPI-3.0.
RMA Programming	<b>Remote Memory Access Programming</b> Co-editor and driver of the MPI-3.0 One Sided chapter. This functionality is implemented in virtually all MPI libraries. (with W. Gropp and R. Thakur)

## External Funding

2018–2024	<b>EPI: The European Processor Initiative</b> EUR 1.82M; EU Horizon 2020, FET, (lead: Luca Benini, ETH)	ETH Zürich
2018–2021	<b>QIRO: An Intermediate Representation for Quantum Computing</b> \$255'000; Gift by Microsoft in the context of the MSJRC joint lab	ETH Zürich
2018–2021	<b>EPIGRAM-HS: Enabling Extrame-scale Applications on Heterogeneous Hardware</b> EUR 371'000; EU Horizon 2020, FET, (lead: Stefano Markidis, KTH)	ETH Zürich
2018–2019	<b>Intel Parallel Computing Center</b> \$200'000; Unrestricted gift by Intel Corp., extended into second year after evaluation	ETH Zürich
2017–2020	<b>Portability and Scalability of COSMO on Heterogeneous Architectures</b> CHF 494'300; Platform for Advanced Scientific Computing, led by MeteoSwiss	ETH Zürich
2017–2019	<b>Automatic Performance Modeling of HPC Applications with Multiple Model Parameters (Catwalk 2)</b> CHF 187,787; DFG Normal Antrag with TU Darmstadt (funded through DE-CH lead agency)	ETH Zürich



2014-2017	<b>Data Centric Mapping</b> \$255'000; Gift by Microsoft in the context of the MSJRC joint lab	ETH Zürich
2015-2018	<b>Mont-Blanc 3, European scalable and power efficient HPC platform based on low-power embedded technology</b> EUR 396,350; EU Horizon 2020 - Excellent Science FET Proactive - with the MontBlanc 3 Consortium	ETH Zürich
2015-2018	<b>Cloud-reserving climate modeling on future supercomputing platform (crClim)</b> CHF 176,550; Swiss National Science Fund - Sinergia with D-USYS, MeteoSwiss, CSCS	ETH Zürich
2016-2021	<b>Data-Centric Parallel Programming (DAPP)</b> EUR 1.5M; ERC Starting Grant	ETH Zürich
2013-2017	<b>A Heterogeneous Compiler Platform for Scientific Codes</b> \$649,713; Platform for Advanced Scientific Computing	ETH Zürich
2013-2016	<b>Data-Centric Compilation Techniques for Parallel Programs</b> \$188,171; Swiss National Science Fund	ETH Zürich
2013-2016	<b>Google Ph.D. Fellowship for Maciej Besta</b> \$255,000 unrestricted gift; First European Fellowship for Parallel Computing	ETH Zürich
2013	<b>Programming Hierarchical Memory Systems for Big Data Analytics</b> \$30,000 unrestricted gift by IBM (faculty award)	ETH Zürich
2013-2016	<b>A Quick Development Path for Performance Models</b> ETH's share: \$177,338; DFG Special Priority Programme SPPEXA (funded by SNF)	ETH Zürich
2011-2012	<b>Nonblocking Collective Operations for Portals IV</b> \$50,000 subcontract of Sandia National Laboratories, NNSA, DOE, to UIUC	University of Illinois
2010-2013	<b>Compiled MPI: Cost-Effective Exascale Application Development</b> UI's share: \$165,000; funded under DOE X-Stack; in Collaboration with Daniel Quinlan, Greg Bronevetsky (LLNL) and Andrew Lumsdaine (IU)	University of Illinois
2005	<b>Quantum Mechanical Computations</b> €55,000; individual funding for Ph.D. studies received from AMD Saxony	Chemnitz University of Technology

## Teaching Experience

(Co)taught 7 undergraduate courses, 9 graduate courses, 6 seminars, 22 tutorials, 0 PhD committees

Spring 2020	<b>Parallel Programming</b> <i>co-taught with Hermann Lederer, undergrad, ≈ 450 students</i>	ETH Zürich
Jun. 2019	<b>Half-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, ≈ 30 attendees</i>	ISC'19 Frankfurt, Germany
Spring 2019	<b>Parallel Programming</b> <i>co-taught with Martin Vechev, undergrad, ≈ 400 students</i>	ETH Zürich
Fall 2018	<b>Design of Parallel and High-Performance Computing</b> <i>co-taught with Markus Pueschel ≈ 60 students</i>	ETH Zürich
Nov. 2018	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, B. Gropp, R. Thakur, ≈ 70 attendees</i>	SC18 Dallas, TX
Jun. 2018	<b>Half-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, ≈ 35 attendees</i>	ISC'18 Frankfurt, Germany
Spring 2018	<b>Parallel Programming</b> <i>co-taught with Martin Vechev, undergrad, ≈ 400 students</i>	ETH Zürich
Fall 2017	<b>Design of Parallel and High-Performance Computing</b> <i>co-taught with Markus Pueschel ≈ 50 students</i>	ETH Zürich
Nov. 2017	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, B. Gropp, R. Thakur, ≈ 70 attendees</i>	SC17 Denver, CO

Jun. 2017	<b>Half-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, ≈ 35 attendees</i>	ISC'17 Frankfurt, Germany
Spring 2017	<b>Parallel Programming</b> <i>co-taught with Martin Vechev, undergrad, ≈ 400 students</i>	ETH Zürich
Fall 2016	<b>Design of Parallel and High-Performance Computing</b> <i>co-taught with Markus Pueschel ≈ 40 students</i>	ETH Zürich
Nov. 2016	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, B. Gropp, R. Thakur, ≈ 70 attendees</i>	SC16 Salt Lake City, UT
Jun. 2016	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, ≈ 30 attendees</i>	ISC'16 Frankfurt, Germany
Nov. 2015	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, B. Gropp, R. Thakur, ≈ 70 attendees</i>	SC15 Austin, TX
Nov. 2015	<b>Half-day Tutorial: Insightful Automatic Performance Modeling</b> <i>co-presented with A. Calotoiu, M. Schulz, F. Wolf, ≈ 30 attendees</i>	SC15 Austin, TX
Sep. 2015	<b>Half-day Tutorial: Insightful Automatic Performance Modeling</b> <i>co-presented with A. Calotoiu, M. Schulz, F. Wolf, ≈ 20 attendees</i>	EuroMPI'15 Bordeaux, France
Sep. 2015	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>≈ 20 attendees</i>	Speedup'15 Lugano, Switzerland
Fall 2015	<b>Design of Parallel and High-Performance Computing</b> <i>co-taught with Markus Pueschel ≈ 40 students</i>	ETH Zürich
Jun. 2015	<b>Half-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, ≈ 40 attendees</i>	ISC'15 Frankfurt, Germany
Spring 2015	<b>Operating Systems and Networks</b> <i>co-taught with Adrian Perrig, undergrad, ≈ 140 students</i>	ETH Zürich
Spring 2015	<b>Computational Science, Seminar</b> <i>co-taught with Peter Arbenz &amp; Petros Koumoutsakos, ≈ 15 students</i>	ETH Zürich
Spring 2015	<b>Research Topics in Software Engineering, Seminar</b> <i>≈ 25 students</i>	ETH Zürich
Fall 2014	<b>Design of Parallel and High-Performance Computing</b> <i>co-taught with Markus Pueschel ≈ 40 students</i>	ETH Zürich
Nov. 2014	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with P. Balaji, B. Gropp, R. Thakur, ≈ 120 attendees</i>	SC14 Denver, CO, USA
Sep. 2014	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>invited lecturer ≈ 50 attendees</i>	EuroMPI/Asia 2014 Kobe, Japan
Fall 2013	<b>Design of Parallel and High-Performance Computing</b> <i>co-taught with Markus Pueschel ≈ 35 students</i>	ETH Zürich
Jun. 2014	<b>Full-day Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with Pavan Balaji, ≈ 15 attendees</i>	ISC'13 Leipzig, Germany
Spring 2014	<b>Operating Systems and Networks</b> <i>co-taught with Adrian Perrig, undergrad, ≈ 130 students</i>	ETH Zürich
Spring 2014	<b>Computational Science, Seminar</b> <i>co-taught with Peter Arbenz &amp; Petros Koumoutsakos, ≈ 10 students</i>	ETH Zürich
Nov. 2013	<b>Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with Pavan Balaji, Rajeev Thakur, James Dinan ≈ 50 attendees</i>	SC13 Denver, CO, USA
Fall 2013	<b>Design of Parallel and High-Performance Computing</b> <i>co-taught with Markus Pueschel ≈ 25 students</i>	ETH Zürich
Fall 2013	<b>Research Topics in Software Engineering, Seminar</b> <i>co-taught with Martin Vechev ≈ 20 students</i>	ETH Zürich

Jul. 2013	<b>MPI Programming</b> Invited lecturer at CHPC Winter School, $\approx$ 65 students	<b>University of Johannesburg Johannesburg, South Africa</b>
Jun. 2013	<b>Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with Pavan Balaji &amp; Martin Schulz, <math>\approx</math> 15 attendees</i>	<b>ISC'13 Leipzig, Germany</b>
Jun. 2013	<b>Tutorial: Advanced Parallel Programming with MPI</b> <i>co-presented with Pavan Balaji, <math>\approx</math> 25 attendees</i>	<b>ICS'13 Eugene, OR, USA</b>
Spring 2013	<b>Operating Systems and Networks</b> <i>co-taught with Donald Kossmann, undergrad, <math>\approx</math> 130 students</i>	<b>ETH Zürich</b>
Spring 2013	<b>Computational Science, Seminar</b> <i>co-taught with Peter Arbenz &amp; Petros Koumoutsakos, <math>\approx</math> 5 students</i>	<b>ETH Zürich</b>
Feb 24	<b>Tutorial: MPI &amp; Advanced Parallel Programming</b> <i>co-presented with Pavan Balaji</i>	<b>PPoPP'13 Shenzen, China</b>
Fall 2012	<b>Design of Parallel and High-Performance Computing</b> <i>co-taught with Thomas Gross &amp; Markus Pueschel, <math>\approx</math> 25 students</i>	<b>ETH Zürich</b>
Fall 2012	<b>Computational Science, Seminar</b> <i>co-taught with Peter Arbenz &amp; Petros Koumoutsakos, <math>\approx</math> 5 students</i>	<b>ETH Zürich</b>
Jun 17	<b>Tutorial: Next Generation MPI Programming</b> <i>co-presented with Martin Schulz, <math>\approx</math> 25 attendees</i>	<b>ISC'12 Hamburg, Germany</b>
May 23-15	<b>Tutorial: Advanced Distributed Memory Parallel Programming</b> Advanced Distributed Memory Parallel Programming: MPI-2.2, MPI 3.0 and PGAS, $\approx$ 35 attendees	<b>CSCS</b>
Spring 2011	<b>Hot Topics in HPC: Networks and Fault tolerance, CS498</b> (4cr grad./3cr undergrad.), <i>co-taught with Franck Cappello, <math>\approx</math> 25 students</i>	<b>University of Illinois</b>

### Advising and Mentoring

I advise(d) 12 Ph.D. students and more than 20 M.Sc. students, of which two (Marc Fischer, Cedric Renggli) received the ETH Medal for their thesis. I mentor(ed) 9 postdocs (four with an ETH Fellowship) and currently host two SNSF Ambizione fellows (Tobias Grosser, Tal Ben-Nun) in my group.

#### Postdocs (chronologically)

**ETH Zürich**

Sabela Ramos (ETH Fellow)  
Tobias Grosser  
Edgar Solomonik (ETH Fellow)  
Tal Ben-Nun (ETH Fellow)  
Tiziano De Matteis  
Nikoli Dryden (ETH Fellow)  
Shigang Li  
Tobias Gysi  
Daniele De Sensi (ETH Fellow)

#### PhD Students (chronologically)

**ETH Zürich**

Maciej Besta  
Tobias Gysi, thesis title: "Data Movement Optimization for High-Performance Computing" (2019)  
Bogdan Prisacari, thesis title "Workload and Interconnection Network Aware Performance Optimization" (2020)  
Salvatore di Girolamo  
Grzegorz Kwasniewski  
Konstantin Taranov  
Johannes de Fine Licht  
Alexandros Nikolaos Ziogas  
Marcin Copik  
Niels Gleinig  
Lukas Gianinazzi  
Andrei Ivanov

## Student Cluster Challenge

I am passionate about fostering young talent and encourage all undergraduate students to participate in the student cluster challenge competition. My teams have twice been among the winners!

- 2019 **Advisor** **ETH Zurich**  
Cluster Challenge Preparation  
Preparing the (winning) ETH team of undergraduate students for the challenge at ISC'19.
- 2008 **Co-Advisor** **Indiana University**  
Cluster Challenge Preparation  
Preparing the (winning) IU/TUD team of undergraduate students for the challenge at SC'08
- 2007 **Co-Advisor** **Indiana University**  
Cluster Challenge Preparation  
Preparing the IU team of undergraduate students for the challenge at SC'07.

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## Service

### Leadership Service

- 2019–now **SCXY**, *IEEE/ACM Supercomputing Steering Committee*
- 2010–now **MPI Forum Meetings**, *MPI-3 Working Group for Collective Operations and Topology*
- 2012–now **Green Graph 500**, *chair the Green Graph 500 list of the greenest data analytics machines.*
- 2014–now **Workshop on High-Performance Interconnects in the Exascale and Big-Data**, *Steering Committee*
- 2014–2017 **Platform for Advanced Scientific Computing Conference**, *Steering Committee*
- EuroMPI'19 **European Conference on MPI (EuroMPI)**, *General Chair*
- SC18 **IEEE/ACM Supercomputing**, *Papers Chair*
- ACM PASC'17 **ACM Platform for Advanced Scientific Computing Conference**, *Program Co-Chair*
- ICPP'17 **International Conference on Parallel Processing**, *Area Co-Chair*
- IPDPS'17 **International Parallel & Distributed Processing Symposium**, *Technical Area Chair*
- ACM PASC'16 **ACM Platform for Advanced Scientific Computing Conference**, *Program Co-Chair*
- SC15 **IEEE/ACM Supercomputing**, *Panels Co-Chair*
- HOTI'14 **IEEE Hot Interconnects**, *Tutorials Co-Chair*
- SIAM PP'14 **SIAM Parallel Processing**, *Member of the Organizing Committee*
- HOTI'13 **IEEE Hot Interconnects**, *General Co-Chair*
- SC13 **IEEE/ACM Supercomputing**, *Emerging Technologies Chair*
- EuroPar'13 **European Conference on Parallel Processing**, *Local Topic Chair for High-Performance Networks and Communication*
- HOTI'12 **IEEE Hot Interconnects**, *Program Chair*
- SC12 **IEEE/ACM Supercomputing**, *Technical Posters Chair*
- HIPS'11 **16th International Workshop on High-Level Parallel Programming Models and Supportive Environments**, *General Chair*
- HOTI'11 **IEEE Hot Interconnects**, *Program Co-Chair*
- HOTI'10 **IEEE Hot Interconnects**, *Tutorials Chair*

### Standardization Committees

- 2012–present **MPI Forum**, *Representing ETH Zurich, Chair of the Collective Operations and Topology Working Group for MPI-3.1*
- 2010–2012 **MPI Forum**, *Representing University of Illinois at Urbana-Champaign, Chair of the Collective Operations and Topology Working Group for MPI-3*
- 2007–2010 **MPI Forum**, *Representing Indiana University, Chair of the Collective Operations Working Group, Co-Author of the Chapter 5 (Collective Communication) and Chapter 7 (Process Topologies) in MPI-2.2*

## Journal Editorial Boards

2014–present	<b>Subject Area Editor</b> Supercomputing Frontiers and Innovations	<b>SuperFri</b>
2014–present	<b>Associate Editor</b> IEEE Transactions on Parallel and Distributed Systems	<b>IEEE TPDS</b>
2013–present	<b>Associate Editor</b> Elsevier Parallel Computing Journal	<b>PARCO</b>
2012–present	<b>Associate Editor</b> SAGE International Journal of High Performance Computing Applications	<b>IJHPCA</b>

## Organized Workshops

**Co-Chair of Intl. Workshop on Runtime and Operating Systems for Supercomputers (ROSS)**,  
*Organized in conjunction with ACM ICS or ACM HPDC annually from 2011-present*

**16th International Workshop on High-Level Parallel Programming Models and Supportive Environments (HIPS'11)**, *Organized in conjunction with IEEE IPDPS'11, Anchorage, AL, USA, 2011*

**1st Blue Waters Performance Modeling Workshop**, *Organized a performance modeling workshop with speakers from the Los Alamos National Laboratory for early users of the Blue Waters Petascale system, Urbana, IL, 2010*

**3rd KiCC Workshop**, *Co-Organized 3rd workshop on Kommunikation in Clusterrechnern und Clusterverbundsystemen, Aachen 2007*

**2nd KiCC Workshop**, *Co-Organized 2nd workshop on Kommunikation in Clusterrechnern und Clusterverbundsystemen, Chemnitz 2007*

**1st KiCC Workshop**, *Co-Organized 1st workshop on Kommunikation in Clusterrechnern und Clusterverbundsystemen, Chemnitz 2005*

## Professional Organizations

**IEEE Computer Society**, *Senior Member*

**Association for Computing Machinery (ACM)**, *Member*

**ACM SIGHPC**, *Member and Member at Large (elected)*

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## Significant Project Involvement

### Research Projects

- 2010–2013 **NSF Blue Waters**, *Sustained Petaflop Computing with the Blue Waters machine. Responsible for Modelling and Simulation of Parallel Petaflop Applications*
- 2008–2010 **DOE CIFTS**, *Coordinated and Improved Fault Tolerance for High Performance Computing Systems*
- 2007–2010 **DOE FAST-OS II**, *Forum to Address Scalable Technology for Runtime and Operating Systems*
- 2005–2006 **CHiC**, *Co-Design and Procurement of the Chemnitzer Hochleistungs-Linux-Cluster, project volume 2.6 + 1.7 Million Euro, 528 diskless InfiniBand nodes, 8.2 TFlop/s (73.4% HPL efficiency) #117 in Top 500 June 2007*