Assistant Computer Scientist, Argonne National Laboratory
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Abdelhalim Halim AMER

EDUCATION

2011–2015 **Doctor of Science in Mathematical and Computing Sciences** — **Tokyo Institute of Technology**
Advisor: *Satoshi Matsuoka* — **Tokyo, JAPAN**
Seiichi Tejima Doctoral Dissertation Award

2005–2010 **Engineering in Computer Science** — **National School of Computer Science (ESI)**
Advisors: Walid-Khaled Hidouci (ESI), Ahmed Toufik (CNRS LaBRI) — **Algiers, ALGERIA**

APPOINTMENTS AND EXPERIENCE

2017–present **Assistant Computer Scientist** — **Argonne National Laboratory**
Mathematics and Computer Science Division — **IL, USA**
I lead shared-memory research and engineering efforts in HPC environments. I mostly tackle synchronization, thread management, and interaction with communication libraries (e.g., MPI) challenges in popular threading systems (Pthreads and OpenMP) and user-level threads.

2015–2017 **Postdoctoral Researcher** — **Argonne National Laboratory**
Mathematics and Computer Science Division — **IL, USA**
I led the research and engineering efforts of efficient interoperation between MPI and threading models.

2014–2015 **Research Assistant** — **Tokyo Institute of Technology**
Matsuoka Laboratory — **Tokyo, JAPAN**
I was responsible for optimizing task parallel and hybrid MPI+Threads data intensive algorithms on massively parallel systems.

2014 **Research Aide** — **Argonne National Laboratory**
Mathematics and Computer Science Division — **IL, USA**
I was responsible for analyzing and mitigating lock contention management issues in multithreaded MPI libraries.

2013 **Thesis-Parts Appointment** — **Argonne National Laboratory**
Mathematics and Computer Science Division — **IL, USA**
I analyzed and characterized lock contention issues in MPICH.

2009–2010 **Student Intern** — **National School of Computer Science (ESI)**
LCSI Laboratory — **Algiers, ALGERIA**
I designed and implemented a video streaming framework over peer-to-peer networks using scalable video coding (SVC) and real-time streaming protocols.

AWARDS

2016 **Seiichi Tejima Doctoral Dissertation Award** — **Tokyo Institute of Technology**
best Ph.D dissertation in the Computer Science field — **Tokyo, JAPAN**

2010–2014 **Monbukagakusho Scholarship for Graduate Studies** — **Japanese Government (MEXT)**
funding Ph.D course at Tokyo Institute of Technology — **JAPAN**

Research Grants

2017–2019 **Exascale MPI** **Argonne National Laboratory**
Co-PI (PI: Pavan Balaji, Argonne National Laboratory) **IL, USA**
Exascale Computing Project (ECP), DOE-ASCR. Amount (single institute grant): $5,130,900.

2016–2018 **BOLT: OpenMP over Lightweight Threads** **Argonne National Laboratory**
Co-PI (PI: Sangmin Seo, Argonne National Laboratory) **IL, USA**
Argonne LDRD, Innovate program. Amount (single institute grant): $420,000.

Software Project Involvement

2013–present MPICH
A high performance and widely portable implementation of the Message Passing Interface (MPI) standard. While I am involved in several aspects related to MPI and the MPICH implementation, I particularly focus on improving interoperability between MPI and threading models.

2015–present Argobots
A low-level threading a tasking framework. I am involved in performance optimizations, API extensions to support new features required by users, and integration to programming systems (e.g., Charm++) and other software packages.

2016–present BOLT
An OpenMP runtime that exploits lightweight threading models, such as Argobots, underneath. I specialize in improving interoperability of OpenMP with other programming systems, such as MPI.

2013–2014 Extreme Big Data (EBD)
This project aims at improving the data processing capabilities of current systems in order to handle data characterized by extreme scale and complexity. My role was to investigate and improve hybrid MPI+threads runtimes to better support communication and data intensive algorithms such as graph processing applications.

Teaching Experience

Tutorials

Jun 2017 *Advanced Parallel Programming with MPI-3*, Half-Day Tutorial. **Argonne National Laboratory**
Presented by Pavan Balaji and Abdelhalim Amer **IL, USA**

Jun 2016 *Advanced Parallel Programming with MPI-3*, Half-Day Tutorial. **Argonne National Laboratory**
Presented by Pavan Balaji and Abdelhalim Amer **IL, USA**

Students Advising/Mentoring

01/2018–present Shintaro Iwasaki, Ph.D. student **(Supervisor)** **University of Tokyo**
Department of Information and Communication Engineering **Tokyo, JAPAN**
Investigating and Tackling OpenMP over Lightweight Threads Challenges

04–09, 2017 Shintaro Iwasaki, Ph.D. student **(Supervisor)** **University of Tokyo**
Department of Information and Communication Engineering **Tokyo, JAPAN**
Investigating Speculative Execution of Stackless Lightweight

04–09, 2017 Rohit Zambre, Ph.D. student **(Supervisor)** **University of California Irvine**
Department of Electrical Engineering and Computer Science **California, USA**
Studying Single-Process Network Fabric Efficient Resource Utilization

05–08, 2016 Vu Dang, Ph.D. student **(Mentor)** **University of Illinois at Urbana-Champaign (UIUC)**
Department of Computer Science **Illinois, USA**
Investigating Work-Driven Thread Synchronization in MPI+Pthreads Environments

05–06, 2016 David Haensel, Ph.D. student **(Mentor)** **Jülich Supercomputing Centre (JSC)**
Institute for Advanced Simulation (IAS) **Jülich, Germany**
FMM Scalability Enhancements Through Lightweight Threading and Tasking

05–08, 2015 Alex Brooks, Ph.D. student **(Mentor)** **University of Illinois at Urbana-Champaign (UIUC)**
Department of Computer Science **Illinois, USA**
Analyzing the Overhead in User-level Threading Libraries

PUBLICATIONS

REFEREED JOURNAL PUBLICATIONS

TOPC'18 Abdelhalim Amer, Milind Chabbi, Huiwei Lu, Yanjie Wei, Jeff Hammond, Satoshi Matsuoka, and Pavan Balaji. "Locking Contention Management in Multithreaded MPI." *ACM Transactions on Parallel Computing* (TOPC), 2018.

TPDS'17 Sangmin Seo, Abdelhalim Amer, Pavan Balaji, Cyril Bordage, George Bosilca, Alex Brooks, Philip Carns, Adrian Castello, Damien Genet, Thomas Herault, Shintaro Iwasaki, Prateek Jindal, Laxmikant V. Kale, Sriram Krishnamoorthy, Jonathan Lifflander, Huiwei Lu, Esteban Meneses, Marc Snir, Yanhua Sun, Kenjiro Taura, and Pete Beckman. "Argobots: A Lightweight Low-Level Threading and Tasking Framework." IEEE Transactions on Parallel and Distributed Systems (2017). [paper]

REFEREED CONFERENCE PUBLICATIONS

SC'18 Shintaro Iwasaki, Abdelhalim Amer, Kenjiro Taura, Pavan Balaji. *Lessons Learned from Analyzing Dynamic Promotion for User-Level Threading*. To appear in the IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC). Nov. 11-16, 2018, Dallas, TX, USA.

SC'17 Kenneth J. Raffenetti, Abdelhalim Amer, Lena Oden, Charles Archer, Wesley Bland, Hajime Fujita, Yanfei Guo, Tomislav Janjusic, Dmitry Durnov, Michael Blocksome, Min Si, Sangmin Seo, Akhil Langer, Gengbin Zheng, Masamichi Takagi, Paul Coffman, Jithin Jose, Sayantan Sur, Alexander Sannikov, Sergey Oblomov, Michael Chuvelev, Masayuki Hatanaka, Xin Zhao, Paul Fischer, Thilina Rathnayake, Matt Otten, Misun Min, and Pavan Balaji. *Why is MPI so Slow? Analyzing the Fundamental Limits in Implementing MPI-3.1*. IEEE/ACM International Conference on High Performance Computing, Networking, Storage and Analysis (SC). Nov. 12–17, 2017, Denver, Colorado.

PPoPP'17 Milind Chabbi, Abdelhalim Amer, Shasha Wen, Xu Liu. *An Efficient Abortable-locking Protocol for Multi-level NUMA Systems*. ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming 2017 (PPoPP'17). February 04 - 08, 2017, Austin, TX, USA. [paper]

CCGrid'17 Hoang-Vu Dang, Sangmin Seo, Abdelhalim Amer, and Pavan Balaji. *Advanced Thread Synchronization for Multithreaded MPI Implementations*. 17th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid'17). Madrid, Spain, May 14-17, 2017. [paper]

PPoPP'15 Abdelhalim Amer, Huiwei Lu, Yanjie Wei, Pavan Balaji and Satoshi Matsuoka. *MPI+Threads: Runtime Contention and Remedies*. ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming 2015 (PPoPP'15). Feb. 7-11, 2015, San Francisco, California. [paper] [slides]

ISC'13 Abdelhalim Amer, Naoya Maruyama, Miquel Pericàs, Kenjiro Taura, Rio Yokota, and Satoshi Matsuoka. *Fork-Join and Data-Driven Execution Models on Multi-core Architectures: Case Study of the FMM*. International Supercomputing Conference 2013 (ISC'13), 255-266. [paper] [slides]

ISCC'12 Abdelhalim Amer, Ahmed Toufik, Walid-Khaled Hidouci, and Satoshi Matsuoka. *Using Bittorrent and SVC for efficient video sharing and streaming*. IEEE Symposium on Computers and Communication 2012 (ISCC,12): 537-543. [paper] [slides]

Refereed Workshop Publications

IWOMP'16 Abdelhalim Amer, Satoshi Matsuoka, Miquel Pericàs, Naoya Maruyama, Kenjiro Taura, Rio Yokota, and Pavan Balaji. *Scaling FMM with Data-Driven OpenMP Tasks on Multicore Architectures*. To appear at the 12th International Workshop on OpenMP (IWOMP) 2016. [paper] [slides]

HPPAC'16 Daniel Ellsworth, Tapasya Patki, Swann Perarnau, Sangmin Seo, Kazutomo Yoshii, Abdelhalim Amer, Rinku Gupta, Judicael Zounmevo, Henry Hoffman, Allen Malony, Martin Schulz, and Pete Beckman. *Systemwide Power Management with Argo*. The Workshop on High-Performance, Power-Aware Computing (HPPAC) 2016

PPMM'15 Abdelhalim Amer, Huiwei Lu, Pavan Balaji, and Satoshi Matsuoka. *Characterizing MPI and Hybrid MPI+Threads Applications at Scale: Case Study with BFS*. Workshop on Parallel Programming Model for the Masses (PPMM); held in conjunction with IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing (CCGrid). May 4, 2015, Shenzhen, China. [paper] [slides]

LNCS'14 Miquel Pericàs, Abdelhalim Amer, Kenjiro Taura and Satoshi Matsuoka: *Analysis of Data Reuse in Task-Parallel Runtimes*. Lecture Notes in Computer Science, Springer, High Performance Computing Systems. Performance Modeling, Benchmarking and Simulation (*Revised Selected Papers*), pp 73-87, 2014. [paper]

PMBS'13 Miquel Pericàs, Abdelhalim Amer, Kenjiro Taura and Satoshi Matsuoka: *Analysis of Data Reuse in Task-Parallel Runtimes*. 4th International Workshop on Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS'13), Denver, November 2013. [paper] [slides]

Major Software Development Skills

Languages	C, C++, Python, Bash, R
Parallel Programming	MPI, OpenMP, Pthreads, CUDA
Continuous Integration	Jenkins, Travis CI

Professional Activities

Editorial

2017 Elsevier Parallel Computing Journal (PARCO) **Managing Guest Editor**
Special Issue on Programming Models and Applications for Multicores and Manycores

Invited Talks

May. 2017 *Argobots and MPI + Threads*, **Langley Research Center, NASA**
Workshop on Runtime Systems for Extreme Scale Parallel Mesh Generation **VA, USA**

Feb. 2016 *Towards an Extreme Scale Multithreaded MPI* **Tokyo Institute of Technology**
Guest speaker at the *Japan-Korea HPC Winter School* **University of Tsukuba**
University of Tokyo
RIKEN, Kobe.

Dec. 2015 *MPI+Threads: Thread-Safety Optimization Perspectives*, **Bonn, Germany**
4th Joint Laboratory on Extreme Scale Computing (JLESC)

May 2015 *Multithreaded MPI Communication: Opportunities and Challenges* **Tongji University**
Tongji-ANL Workshop **China**

Technical Program Committee Member

IPDPS	International Parallel and Distributed Processing Symposium, 2017
Cluster	International Conference on Cluster Computing, 2017, 2018
ISC	International Supercomputing Conference, 2017
EuroMPI	European MPI Users' Group Meeting, 2017, 2018
MULTIPROG	Programmability and Architectures for Heterogeneous Multicores, 2016, 2017
HiPC	International Conference on High Performance Computing, Data, and Analytics, 2016
CCBD	International Conference on Cloud Computing and Big Data, 2015, 2016

Technical Reviewer for International Journals

TPDS	IEEE Transactions on Parallel and Distributed Systems, 2017, 2018
TCC	IEEE Transactions on Cloud Computing, 2016
JPDC	Elsevier Journal of Parallel and Distributed Computing, 2016
CPE	Concurrency and Computation: Practice and Experience, 2016
IJHPCA	International Journal of High Performance Computing Applications, 2015
PARCO	Elsevier Parallel Computing Journal, 2014, 2016

Technical Reviewer for International Conferences and Workshops

SC	International Conference for High Performance Computing, Networking, Storage, and Analysis, 2014
HPDC	ACM International Symposium on High-Performance Parallel and Distributed Computing, 2013, 2015
ICS	International Conference on Supercomputing, 2013, 2016
IPDPS	IEEE International Parallel and Distributed Processing Symposium, 2013, 2016
CCGrid	International Symposium on Cluster, Cloud, and Grid Computing, 2016
EuroMPI	European MPI Users' Group Meeting, 2016
HotI	IEEE Hot Interconnects, 2016
HeteroPar	International Workshop on Algorithms, Models and Tools for Parallel Computing on Heterogeneous Platforms, 2016
AsHES	International Workshop on Accelerators and Hybrid Exascale Systems, 2016
ICPADS	IEEE International Conference on Parallel and Distributed Systems, 2013, 2015
ICPP	International Conference on Parallel Processing, 2015
HiPC	International Conference on High Performance Computing, 2015

Chairmanship

2018	European MPI Users' Group Meeting (EuroMPI)	**Publicity Chair**
2017	European MPI Users' Group Meeting (EuroMPI/US)	**Web Chair**
2015	IEEE International Conference on Cluster Computing (Cluster)	**Session Chair**
2015	International Workshop on Programming Models and Applications for Multicores and Manycores (PMAM)	**Session Chair**

Other Activities

2015–2017	Moderator of the hpc-announce@mcs.anl.gov mailing list

Memberships

2015–present	ACM professional member
2015–present	IEEE professional member
2012–present	ACM SIGHPC member
2011–2015	ACM student member
2011–2015	IEEE student member