

# Min Si

minsii.github.io | minsi.atwork@gmail.com | (Mobile) +1 630-880-4388  
linkedin.com/in/minsi-atwork | github.com/minsii | Naperville, IL 60540

Assistant Computer Scientist, Mathematics and Computer Science Division, Argonne National Laboratory

**Highlights:** Research interests include parallel programming models and runtime systems. Leading research and development of one-sided communication models including MPI RMA and OpenSHMEM. Experienced in project management and staff supervision.

## Education

*Ph.D. in Computer Science* 2012/10 – 2016/03  
Department of Computer Science Tokyo, Japan  
Graduate School of Information Science and Technology  
The University of Tokyo

*Master of Science* 2010/10 – 2012/09  
Department of Computer Science Tokyo, Japan  
Graduate School of Information Science and Technology  
The University of Tokyo

*Bachelor of Arts* 2003/09 – 2007/07  
Department of Japanese Language and Culture Chongqing, China  
College of Oriental Languages  
Sichuan International Studies University

## Professional Experience

*Assistant Computer Scientist* 2018/05 – Current  
Argonne National Laboratory, IL, USA  
• OpenSHMEM implementation over MPI (PI).  
• High performance MPI implementation (Co-PI).  
• Data management and runtime optimizations for AI workflow (Senior Personnel).  
• Supporting infrastructure for surrogate benchmarks on HPC systems (Senior Personnel).

*Enrico Fermi Postdoctoral Scholar* 2016/10 – 2018/04  
Argonne National Laboratory, IL, USA  
• Dynamic execution runtime (PI).  
• High performance MPI implementation (Co-PI).

*Postdoctoral Appointee* 2016/05 – 2016/09  
Argonne National Laboratory, IL, USA  
• High performance MPI implementation.

*Guest Graduate Student* 2014/05 – 2016/03  
Argonne National Laboratory, IL, USA  
• MPI optimization on massively parallel multi-/many-core architectures.

*Research Aide* 2013/05 – 2013/09  
Argonne National Laboratory, IL, USA  
• Multithreaded MPI for many-core environments.

*Summer Internship* 2011/08 – 2011/11  
NEC Corp, Tokyo, Japan  
• InfiniBand driver modification for direct data transfer from/to FPGA board.

*Part-time Programmer* 2010/12 – 2011/12  
Secioss Corp, Tokyo, Japan  
• E-commerce web system development using PHP.

*Full-time Engineer* 2008/07 – 2010/09  
Kinotrope Inc, Tokyo, Japan  
• Web system (CMS, E-commerce, Auto-test) development using PHP.

*Full-time Engineer* 2007/07 – 2008/04  
DGT Information Systems Ltd, Shanghai, China  
• Credit card member management system development using Java.

## Project Leadership

*OpenSHMEM over MPI: Analyzing and Improving the Suitability of MPI as an OpenSHMEM Runtime.*

- *PI. Period:* 01/2021 - present. *Technical Lead and Core Developer. Period:* 08/2018 to 12/2020.
- Leading research and development of OpenSHMEM over MPI implementation. Managing project milestones and reporting to DOD program managers. Participating at OpenSHMEM specification committee and contributing to specification revisions. Serving as the committee RMA working group chair since 2020/11.
- *Websites:* <http://www.mcs.anl.gov/project/oshmpi>, <https://github.com/pmodels/oshmpi>
- *Supervision (1 Postdoc):*  
Huansong Fu: Postdoctoral Research Associate, period: 03/2019 to 08/2019. Predoctoral Research Associate, period: 08/2018 to 12/2018. Ph.D. student, Florida State University, USA, period: 05/2018 to 08/2018.

*MPICH: A high-performance, portable implementation of the Message Passing Interface (MPI).*

- *Co-PI and Core Developer. Period:* 10/2016 to present.
- Leading research and development of MPI RMA model and shared memory based communication. Driving new research directions such as optimizing runtime system for AI on HPC and using AI in communication system. Contributing to MPI RMA specification revision.
- *Websites:* <http://www.mpich.org>, <https://github.com/pmodels/mpich>
- *Supervision (4 Graduate students):*  
Michael Wilkins: Ph.D. student, Northwestern University, USA. Period: 08/2020 to 11/2020.  
Li Cao: Master student, University of Chicago, USA. Period: 08/2020 to 12/2020.  
Subhadeep Bhattacharya: Ph.D. student, Florida State University, USA. Period: 05/2019 to 08/2019.  
Sarunya Pumma: Ph.D. student, Virginia Tech, USA. Period: 08/2016 to 01/2017.

*Braid: Data Flow Automation for Scalable and FAIR Science.*

- *Senior Personnel. Period:* 10/2020 to present.
- Leading research and development of AI/DL data management and optimization on HPC systems. Co-working with Dr. Bogdan Nicolae.
- *Supervision (1 Graduate student):*  
Jie Liu: Ph.D. student, University of California, Merced, USA. Period: 01/2021 to present.

*Beehive: A Dynamic Execution Environment for Performance, Power, and Resilience on Extreme-Scale Computing Systems.*

- *PI and Core Developer. Period:* 10/2016 to 03/2020.
- Leading research and development of the Beehive eco-system. Managing project milestones and reporting to Argonne LDRD program office. Collaborating research with Intel, RIKEN Japan, and BSC Spain.
- *Website:* <http://www.mcs.anl.gov/project/casper>, <https://github.com/pmodels/casper>
- *Supervision (2 Graduate students):*  
Kaiming Ouyang (joint project with MPICH): Ph.D. student, University of California, Riverside, USA. On PhD committee. Period: 10/2018 to present.  
Yanhao Chen: Ph.D. student, Rutgers University, USA. Period: 05/2018 to 08/2018.

## Honors and Awards

<i>Impact Argonne Award for Extraordinary Effort</i> Argonne National Laboratory, USA	2020/08
<i>IEEE-CS Technical Consortium on High Performance Computing (TCHPC)</i> <i>Early Career Researchers Award for Excellence in High Performance Computing.</i> SC 2018, USA	2018/11
<i>Best Paper Award at the 27th ACM International Symposium on High-Performance Parallel and Distributed Computing (Top 1/112).</i> HPDC 2018, USA	2018/06
<i>Enrico Fermi Fellowship for Postdoctoral Scientists</i> Argonne National Laboratory, USA	2016 – 2018
<i>Dean's Award for Outstanding Achievement Doctoral Course</i> The University of Tokyo, Japan	2016/03
<i>Fellowship Special Scholarship Program for International Students</i> The University of Tokyo, Japan	2012 – 2015
<i>Computer Science Research Award for Young Scientists</i> Information Processing Society of Japan (IPSJ), Japan	2012

## Research Grants

- *Senior Personnel*. FAIR Surrogate Benchmarks Supporting AI and Simulation Research (SBI). Department of Energy. Period: 09/01/2020 – 08/31/2023. Amount: \$2,245,582.
- *Senior Personnel*. Braid: Data Flow Automation for Scalable and FAIR Science. Department of Energy. Period: 10/01/2020 – 09/30/2023. Amount: \$2,700,000.
- *Tech Lead*. Analyzing and Improving the Suitability of MPI as an OpenSHMEM Runtime. Department of Defense. Period: 08/01/2018 to 09/30/2021. Amount: \$1,200,000.
- *PI*. Beehive: A Dynamic Execution Environment for Performance, Power, and Resilience on Extreme-Scale Computing Systems. Argonne LDRD program. Period: 10/01/2016 to 03/31/2020. Amount: \$464,200
- *Co-PI*. Exascale MPI. Department of Energy. Period: 10/01/2016 to 09/30/2024. Amount: \$13,599,984.78.

## Selected Publications and Presentations

### Refereed Journal Articles

1. S. Puma, **M. Si**, W. Feng, and P. Balaji. Scalable Deep Learning via I/O Analysis and Optimization. In *ACM Transactions on Parallel Computing (TOPC)*, vol. 6, no. 2, pp. 1–34. June, 2019.
2. **M. Si**, A. J. Peña, J. Hammond, P. Balaji, M. Takagi, and Y. Ishikawa. Dynamic Adaptable Asynchronous Progress Model for MPI RMA Multiphase Applications. In *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, vol. 29, no. 9, pp. 1975–1989. September, 2018.

### Research Papers in Refereed Conferences (peer-reviewed)

1. K. Ouyang, **M. Si**, A. Hori, Z. Chen, and P. Balaji. CAB-MPI: Exploring Interprocess Work-Stealing toward Balanced MPI Communication. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC 2020)*. IEEE Press, Article 36, 1–15. (Acceptance Rate: 25.4%)
2. A. Amer, C. Archer, [et al, including **M. Si**]. Software Combining to Mitigate Multithreaded MPI Contention. In *Proceedings of the 33rd ACM International Conference on Supercomputing (ICS 2019)*, pages 367–379. June 2019. (Acceptance Rate: 23%)
3. A. Hori, **M. Si (Joint First Co-Author)**, B. Gerofi, M. Takagi, J. Dayal, P. Balaji, and Y. Ishikawa. Process-in-Process: Techniques for Practical Address-Space Sharing. In *Proceedings of the 27th International Symposium on High-Performance Parallel and Distributed Computing (HPDC 2018)*, pages 131–143. June 2018. **Best Paper Award**. (Acceptance Rate: 19.6%)
4. K. Raffanetti, A. Amer, [et al, including **M. Si**]. Why is MPI so Slow? Analyzing the Fundamental Limits in Implementing MPI-3.1. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC 2017)*, pages 62:1–62:12. November 2017. (Acceptance Rate: 18%)
5. **M. Si**, A. J. Peña, J. Hammond, P. Balaji, M. Takagi, and Y. Ishikawa. Casper: An Asynchronous Progress Model for MPI RMA on Many-Core Architectures. In *Proceedings of the IEEE/ACM International Parallel and Distributed Processing Symposium (IPDPS 2015)*, pages 665–676, May 2015. (Acceptance Rate: 21.8%)
6. **M. Si**, A. J. Peña, P. Balaji, M. Takagi, and Y. Ishikawa. MT-MPI: Multithreaded MPI for Many-core Environments. In *Proceedings of the 28th ACM International Conference on Supercomputing (ICS 2014)*, pages 125–134. May 2014. (Acceptance Rate: 21%)

### Invited Talks

#### General HPC Runtime Systems.

- Challenges and Opportunities in Co-Design for High-Performance Computing Software Systems *Invited talk at UMN Cloud Data Center and Edge (CDCE) workshop, 2021/02*
- Co-Design for High-Performance Computing Software Systems. *REBASE talk at ACM SIGPLAN conference on Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH 2020)*.
- AI@Edge: Software System Implications. *Microelectronics Workshop at Argonne National Laboratory, October 2019*.

#### OpenSHMEM.

- OpenSHMEM over MPI: A Performance Contender. *OpenSHMEM Birds of a Feather (unofficial) at SC20*.
- OpenSHMEM over MPI: Capabilities and Challenges. *OpenSHMEM Birds of a Feather at SC19*.
- OpenSHMEM over Portable MPI RMA with Asynchronous Progress Support. *OpenSHMEM Birds of a Feather at SC17*.
- Performance Analysis of MPI RMA in Supporting OpenSHMEM Runtime. *OpenSHMEM Birds of a Feather at SC18*.

#### Beehive and MPI.

- Towards Dynamic Communication Runtime for Scalable Irregular Parallel Computing. *Florida State University*, December 2018.
- Towards Portable and Adaptable Asynchronous Communication for One-Sided Applications. *Tenth International Workshop on Parallel Programming Models and Systems Software for High-End Computing (P2S2 2017)*.
- Data Locality Challenges in Irregular Applications for Exascale Programming. *Fourth Workshop on Programming Abstractions for Data Locality (PADAL 2017)*.

## Professional Services and Activities

### Editorial Affiliations

- IEEE Transactions on Parallel and Distributed Systems (IEEE TPDS). *Co-Editor* of Special Section on Parallel and Distributed Computing Techniques for AI, ML and DL in 2020.
- International Journal of Concurrency and Computation: Practice and Experience (CCPE). *Guest Co-Editor* of the Special Issue on Programming Models and Applications for Multicores and Manycores (PMAM) in 2021, 2020, 2019. *Guest Co-Editor* of the Special Issue on Parallel Programming Models and Systems Software (P2S2) in 2021-2020.
- Elsevier International Journal of Parallel Computing (PARCO). *Guest Co-Editor* of the Special Issue on Applications and System Software for Hybrid Exascale Systems (AsHES) in 2019, 2018. *Guest Co-Editor* of the Special Issue on Parallel Programming Models and Systems Software (P2S2) in 2019, 2018. *Guest Co-Editor* of the Special Issue on Programming Models and Applications for Multicores and Manycores (PMAM) in 2018.

### Chair and Co-Chair - Conferences / Workshops

- IEEE International Conference on High Performance Computing, Data, and Analytics (HiPC). *Program Track Vice-chair* of 2021.
- IEEE Symposium on High Performance Interconnects (HOTI). *Program Co-Chair* of 2021.
- International Workshop on Accelerators and Hybrid Emerging Systems (AsHES), held in conjunction with IEEE International Parallel and Distributed Processing Symposium (IPDPS). *General Chair* of 2021, 2020. *Program Co-Chair* of 2019, 2018.
- International Workshop on Parallel Programming Models and Systems Software for High-End Computing (P2S2), held in conjunction with International Conference on Parallel Processing (ICPP). *Program Co-Chair* of 2021, 2020, 2019, 2018. *Publicity Chair* of 2016.
- International Workshop on Programming Models and Applications for Multicores and Manycores (PMAM), held in conjunction with Principles and Practice of Parallel Programming (PPoPP). *Program Co-Chair* of 2021, 2020, 2019.
- International Conference for High Performance Computing, Networking, Storage, and Analysis (SC). *Panels Vice-Chair* of 2019.
- IEEE International Conference on Cluster Computing (Cluster). *Financial Chair* of 2022. *Virtual Arrangements Co-Chair* of 2021.
- European MPI Users Group Meeting (EuroMPI). *Financial Chair* of 2020. *Financial Co-Chair* of 2017. *Web Co-Chair* of 2018.
- International Conference on High Performance Computing in Asia-Pacific Region (HPC Asia). *Program Track Co-Chair* of 2021.

### Committee Member - Conferences / Workshops

- International Conference for High Performance Computing, Networking, Storage and Analysis (SC). *TPC Member* of 2021, 2020. *Panels PC Member* of 2021.
- IEEE International Parallel and Distributed Processing Symposium (IPDPS). *TPC Member* of 2021. *Workshops Committee Member* of 2020, 2019, 2018, 2017.
- ACM International Conference on Supercomputing (ICS). *TPC Member* of 2021, 2020, 2018. *External Review Committee Member* of 2019.
- ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES). *TPC Member* of 2021.
- ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP). *TPC Member* of 2018. *External Review Committee Member* of 2021, 2020.
- IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid). *TPC Member* of 2019, 2018, 2017.
- IEEE International Conference on Cluster Computing (Cluster). *TPC Member* of 2018, 2017.
- International Conference on Parallel Processing (ICPP). *TPC Member* of 2019.

- European MPI Users Group Meeting (EuroMPI). *TPC Member* of 2019, 2018, 2017.
- Workshop on OpenSHMEM and Related Technologies (OpenSHMEM). *TPC Member* of 2018, 2017.
- Supercomputing Asia conference (SCA). *TPC Member* of 2019, 2018.
- International Symposium on High Performance Interconnects (HOTI). *TPC Member* of 2017.
- IEEE International Conference on High Performance Computing and Communications (HPCC). *TPC Member* of 2017.

**Journal Referee**

- IEEE Transactions on Parallel and Distributed Systems (TPDS). 2020, 2019, 2018, 2017, 2014.
- IEEE Transactions on Computers (TC). 2020, 2019.
- IEEE Transactions on Cloud Computing (TCC). 2017.
- IEEE Transactions on Multi-Scale Computing Systems (TMSCS). 2018, 2017.
- Journal of Parallel and Distributed Computing (JPDC). 2020, 2019, 2018, 2017, 2016, 2015.
- Concurrency and Computation: Practice and Experience (CPE). 2017, 2016
- Elsevier International Journal of Parallel Computing (PARCO). 2020, 2018, 2017, 2016.
- International Journal of Parallel Programming (IJPP). 2018, 2016.