Jahanzeb Maqbool Hashmi

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Objective

I am interested to work with collaborative research and development teams and design large-scale parallel and distributed systems to scale state-of-the-art computational and deep learning workloads on HPC and Cloud systems.

Education

Ph.D. in Computer Science and Engineering

The Ohio State University, Columbus, Ohio, USA 2015 - 2020
Thesis: Designing High Performance Shared-Address-Space and Adaptive Communication Middlewares for Next-Generation HPC Systems
Advisor: Dhabaleswar K. (DK) Panda

M.S. in Computer Engineering

Ajou University, Suwon, South Korea 2012 - 2014
Thesis: Exploring Performance and Energy Efficiency of ARM Multicore Cluster for High Performance Scientific Computing
Advisor: Sangyoon Oh

B.S. Information Technology

National University of Science and Technology, Islamabad, Pakistan 2007 - 2011
Thesis: Implementation and Evaluation of Scientific Simulations on HPC Architectures
Advisor: Aamir Shafi

Technical Skills

- Performance Engineering of Scientific and AI applications
- Parallel Programming Models and Runtimes — MPI, OpenMP, CUDA, HIP, OpenSHMEM, UPC++
- Distributed Deep Learning frameworks and Middlewares — Tensorflow, PyTorch, Horovod
- Languages — C, C++, CUDA, Java, Bash, Python (Basic)
- Tools — Git, LaTeX, GDB, PerfAPI (PAPI), mpiP, Valgrind, Gnuplot
- Working experience of developing Linux Kernel modules
- Strong programming, debugging, and problem solving skills.
- Experienced with large-scale software design, development, and release life-cycle.
- Strong communication and presentation skills.

Professional Experience

- **Senior Research Associate,** The Ohio State University, USA 2020 - Present
  - Working on the design and development of high-performance MPI library for next-generation HPC and Cloud systems with many-core CPUs, GPUs (NVIDIA CUDA and AMD ROCm), and accelerators.
  - Working on semantic and performance optimizations of MPI runtimes for scaling distributed deep learning on native and cloud HPC systems.
  - Working on design and development of generalized hierarchical MPI collective communications framework for modern CPU and GPU systems.
- **Graduate Research Associate,** Network Based Computing Laboratory, OSU, USA 2015 - 2020
  - **Zero-copy Communication:** Designed and developed a truly zero-copy based inter-process (IPC) communication called *shared address space* communication backend for MVAPICH2 targeting many-core architectures. These designs are part of MVAPICH2-X and are deployed on top supercomputers (e.g., SDSC Expanse) and HPC Clouds (e.g., Microsoft Azure HBv2)
  - **Adaptive MPI for HPC Clouds:** Designed an adaptive and topology aware MPI runtime for HPC cloud systems that often required different physical to virtual NUMA mappings (e.g., Azure HB series). This design helped achieve efficient MPI communication on Microsoft Azure HBv1 systems transparently.

- **Sparse Layouts and MPI Datatypes on CPUs and GPUs:** Designed novel mechanisms to accelerate the data-transfer performance of MPI derived datatypes focusing sparse data layouts on CPU and GPU resident data.
- **MPI for PGAS and Task Runtimes:** Worked on the design, development, and maintenance of MVAPICH2-X based PGAS libraries e.g., OpenSHMEM, UPC, and UPC++. Collaboratively worked on exploring the efficacy of emerging task-based programming models e.g., Kokkos with MPI.

- **Research Associate,** College of Technological Innovation, Zayed University, UAE. 2014 - 2015
  - Designed a novel Genetic Algorithm (GA) based solution for feature selection in sentiment analysis. The improved designs achieved 40% reduction in feature size without affecting the overall accuracy.
  - Conducted research related to sentiment analysis, opinion mining, and social network analysis with applications to digital forensics.
  - Designed and developed a unified framework for sentiment analysis with focus on cyber criminal activities on social networks.

Select Publications

For complete list of publications, please refer to my Google Scholar.

1. A. Jain, A. Awan, A. Aljuhani, **J. Hashmi**, Q. Anthony, H. Subramoni, D. Panda, R. Machiraju, A. Parwani. "GEMS: GPU Enabled Memory Aware Model Parallelism System for Distributed DNN Training", in proceeding of *IEEE/ACM International Conference for High Performance Computing, Networking, Storage, and Analysis* (SC '20) , Nov 2020
2. **J. Hashmi**, C. Chu, S. Chakraborty, M. Bayatpour, H. Subramoni, and DK Panda. "FALCON-X: Zero-copy MPI Derived Datatype Processing on Modern CPU and GPU Architectures", Journal of Parallel and Distributed Computing (JPDC), Volume 144, October 2020, Pages 1-13, doi.org/10.1016/j.jpdc.2020.05.008
3. **J. Hashmi**, S. Xu, B. Ramesh, M. Bayatpour, H. Subramoni, and D. K. Panda. "Machine-agnostic and Communication-aware Designs for MPI on Emerging Architectures", in proceeding of *34th IEEE International Parallel and Distributed Processing Symposium* (IPDPS '20) , May 2020
4. **J. Hashmi**, S. Chakraborty, M. Bayatpour, H. Subramoni, D. K. Panda. "FALCON: Efficient Designs for Zero-copy MPI Datatype Processing on Emerging Architectures", in proceeding of *33rd IEEE International Parallel and Distributed Processing Symposium* (IPDPS '19) , May 2019 [Best Paper Finalist]
5. **J. Hashmi**, S. Chakraborty, M. Bayatpour, H. Subramoni, D. K. Panda. "Designing Efficient Shared Address Space Reduction Collectives for Multi-/Many-cores", in proceeding of *32nd IEEE International Parallel and Distributed Processing Symposium* (IPDPS '18) , May 2018
6. S. Chakraborty, M. Bayatpour, **J. Hashmi**, H. Subramoni, D. K. Panda. "Cooperative Rendezvous Protocols for Improved Performance and Overlap", in proceeding of *IEEE/ACM International Conference for High Performance Computing, Networking, Storage, and Analysis* (SC '18) , Nov 2018 [Best Paper Finalist]
7. M. Bayatpour, **J. Hashmi**, S. Chakraborty, H. Subramoni, P. Kousha, D. K. Panda. "SALaR: Scalable and Adaptive Designs for Large Message Reduction Collectives", in proceeding of *IEEE International Conference on Cluster Computing* (CLUSTER 2018) , Sep 2018 [Best Paper Award]
8. A. Awan, K. Hamidouche, **J. Hashmi**, and D. K. Panda. "S-Caffe: Co-designing MPI Runtimes and Caffe for Scalable Deep Learning on Modern GPU Clusters", in proceeding of *22nd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming* (PPoPP '17) , February 2017

Awards and Honors

- Best Student Research Poster Award, College of Engineering, OSU 2020
- Best Paper Award Finalist at IPDPS '19, Brazil (Top-4 out of 372) 2019
- Department Fellowship in Computer Science and Engineering, OSU (Top-2 Ph.D. admits) 2015 - 2016
- Global IT Talents Fellowship by South Korean Ministry of Education for M.S. studies 2012 - 2014
- Prime Minister's National ICT Scholarship for fully funded undergraduate studies 2007 - 2011
- NUST Merit Scholarship for 5 out of 8 semesters at NUST-SEECS 2007 - 2011
- National Talented Science Student Award by ministry of education, Pakistan (Top-10 nationwide) 2003