

Benjamin Kitor

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Research Interests

High-performance communication in heterogeneous compute clusters with a focus on collective communications and deep learning.

Education

MASc in Computer Engineering, planning to graduate May 2023 (Ongoing) – Queen's University, Kingston, ON

BASc in Computer Engineering, May 2021 – Queen's University, Kingston, ON

Queen's Electrical and Computer Engineering 4+1 Accelerated Master's – Started May 2020

Awards

Vector Scholarship in Artificial Intelligence, 2021-22

NSERC Undergraduate Student Research Award, May-August 2020

Publications

Y. H. Temuçin, A. H. Sojoodi, P. Alizadeh, B. Kitor and A. Afsahi, "Accelerating Deep Learning Using Interconnect-Aware UCX Communication for MPI Collectives," in IEEE Micro, vol. 42, no. 2, pp. 68-76, 1 March-April 2022, DOI: 10.1109/MM.2022.3148670.

Research Experience/Projects

Argonne Training Program on Extreme-Scale Computing (ATPESC) – Chicago, IL – Aug 2022

- Was accepted to attend a workshop hosted by Argonne National Lab
- Gained experience running applications at scale on ALCF clusters Theta and Polaris

Process Arrival Pattern Aware Allreduce – C, UCX, OpenMPI – 2022

- Developed a novel method to disseminate process arrival patterns information in distributed memory systems
- Utilizes RMA and atomic operations provided by UCX for efficient communications
- Accompanying PAP-Aware allreduce algorithm successfully increased Horovod throughput

Topology Aware Collective Rank Reordering – C, OpenMPI – 2020/21

- Optimized OpenMPI's Allreduce and Broadcast algorithms through renumbering ranks based on hardware/network topology and the collective algorithm
- Measured microbenchmark improvements with 128 GPUs as well as 32'000 CPU cores

Teaching Experience

Teaching Assistant – ELEC 470: Computer System Architecture – Jan-May 2023

Teaching Assistant – ELEC 374: Digital Systems Engineering – Jan-May 2022

Technical Skills

Programming Languages – C/C++, Python, Bash, GNU Autotools

HPC Tools – OpenMPI, UCX, UCC, CUDA, Hwloc, OSU-Microbenchmarks, Slurm

Deep Learning Tools – Horovod, Pytorch, NumPy, Numba, OpenCV

Professional Experience

Undergraduate Student Researcher – Queen's University Parallel Processing Research Lab, 2020

Software Engineering Intern – Security Compass, 2019