# Mohsen Gavahi

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**Highlights**: Eight years of experience in High Performance Computing, virtualization, cloud computing, parallel programming, and computer architecture. Looking for a full-time HPC Software Developer position.

## Education

- **Ph.D.** Computer Science, Florida State University, Tallahassee, FL, USA (GPA: 3.72/4)  — 2017 to 04/2023
- **M.Sc.** Computer Architecture — 2010 to 2012
- **B.Sc.** Computer Hardware Engineering — 2004 to 2009

## Professional Experience

- **Graduate Assistant, Optimize Performance of Secure Communication in HPC, FSU, FL** — 08/2022 to Present
  - ➢ Optimized encrypted communication over MPI, using OCB cryptographic scheme.
    - ❖ Accelerated encryption rate up to four times using Intel® AVX extension.
    - ❖ Compared to GCM scheme, proposed approach more valuable for small messages (1B-1KB) due to removal of heavy operations (e.g. generating random numbers) in per communication round.
    - ❖ https://github.com/gavahi/CryptMPI_OCB
  - ➢ Evaluated encryption performance of containerized HPC (DockerSwarm and Kubernetes) — 03/2021 to 09/2022
    - ❖ Applied various CNIs (Calico, Antrea, etc.) to measure encryption rates on HPC application.
    - ❖ Observations show that available container encryption mechanisms impose a non-negligible overhead (an order of magnitude in some cases) which is not acceptable for HPC applications.
    - ❖ Experimental results disclosed **CryptMPI** can handle encrypted communication to decline its overhead up to 5% (depending on message and node factors) on a variant of virtual clusters.
  - ➢ **CryptMPI**: Optimized versions of MVAPICH & MPICH with encrypted communication. — 09/2017 to 10/2021
    - ❖ Focused on collective operations, including Allreduce, Allgather, Alltoall, Bcast, and Scatter.
    - ❖ Designed and implemented novel collective algorithms to optimally incorporate encryption.
    - ❖ Evaluated variant of cryptographic schemes (BoringSSL, OpenSSL, Libsodium, CryptoPP) to recognize best scheme with minimum overhead for HPC environment.
    - ❖ Empirical evaluation on multiple supercomputers (e.g. PSC Bridge) revealed that the proposed algorithms archive up to 10X speedup in comparison to naïve approach.
- **Senior Software Developer, Parallel Processing** — 03/2013 to 09/2017
  - ➢ Implemented scientific modules using GPU and Multicore Programming by CUDA language.

## Research Interests

- High Performance Computing
- Virtualization & Cloud Computing
- Parallel Systems & Multicore Programming
- Computer Architecture and Security

## Technical Skills

**Languages:** C, C++, Python, CUDA, Shell script
**Parallel Prog.:** MPICH, MVAPICH, OpenMP
**Virtualization:** Docker, Singularity, Kubernetes

## Selected Publications

- **Encrypted All-reduce on Multi-core Clusters** (M. Gavahi et al.) — 2021
  - ➢ 40th IEEE International Performance Computing and Communications (IPCCC)
- **Efficient Algorithms for Encrypted All-gather Operation** (MS. Lahijani et al.) — 2021
  - ➢ 35th IEEE International Parallel & Distributed Processing Symposium (IPDPS)
- **An Empirical Study of Cryptographic Libs for MPI Communications** (A. Naser, M. Gavahi et al.) — 2019
  - ➢ 21st IEEE International Conference on Cluster Computing
- **High performance GPU implementation of kNN based on Mahalanobis distance** (M. Gavahi et al.) — 2015
  - ➢ IEEE International Symposium on Computer Sci. and Software Eng. (CSSE)

## Programming Honors

- Ranked **2nd** in the 13th Memocode Hardware/Software Co-design International Contest — 2015
- Ranked **1st** in the 12th Memocode Hardware/Software Co-design International Contest — 2014