Aditya Bhosale

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Education

University of Illinois Urbana-Champaign   *Aug 2021 - Dec 2026**

Ph.D. in Computer Science,   Advisor: Laxmikant Kale   ** Anticipated Graduation Date*

Research interests: Parallel Programming, Cloud Computing, Distributed Runtime Systems

Indian Institute of Technology, Bombay   *Jul 2014 - Aug 2019*

Dual Degree (B.Tech & M.Tech) in Aerospace Engineering,   Advisor: Prabhu Ramachandran

Master's Thesis: A generalized framework for heterogeneous computing

Bachelor's Thesis: Optimal nearest neighbor searching algorithms for particle-based simulations

Professional Experience

NVIDIA   **Santa Clara**

HPC Architect Intern   *May 2024 - Aug 2024*

○ Developed performance prediction models to enable fast runtime prediction of ML workloads based on GPU hardware and network parameters

Lawrence Livermore National Lab   **Remote**

Student Intern   *May 2023 - Dec 2023*

○ Research on ML representations for LLVM IRs for training graph neural networks
○ Constructed a dataset for finding optimal launch parameters for OpenMP GPU offloading

Goldman Sachs   **India**

Associate   *May 2019 - Aug 2021*

○ Handled cloud infrastructure for the market risk pricing framework, contributing to a 10% drop in VaR compute cost by improving the load balancing and runtime prediction model.
○ Received a fast-track promotion from Analyst to Associate in 1.5 years

Advanced Reactors and Fuel Cycles Lab   **Champaign**

Student Intern, UIUC   *May 2017 - Jul 2017*

○ Automated the generation and parallel execution of fuel-cycle simulations on the Blue Waters supercomputer.

Key Research Highlights

Distributed Runtime System for Cloud-Native HPC

○ Implemented resource elasticity in Charm++ for GPU applications by developing a novel in-memory checkpointing method of GPU-resident data and implementing migration of Charm++ actors (chares) with GPU-resident data using GPUDirect RDMA.
○ Developed a resource management framework for running Charm++ applications resiliently on heterogeneous cloud spot instances while handling preemptions with minimal overhead.
○ Wrote a Kubernetes operator for priority-based elastic scheduling of Charm++ jobs to maximize cluster throughput and minimize job completion times.

A Framework for Developing Cloud-Native HPC DSLs

○ Conceptualized and developed CharmTyles, a client-server architecture for cloud-native HPC DSLs with a Python frontend and a parallel Charm++ backend running on heterogeneous cloud resources.
○ Developed a common frontend infrastructure for asynchronous lazy evaluation, operator fusion, dependency tracking, and garbage collection.

Adaptive Cloud-Native HPC Abstractions

○ Led the development of a dense linear algebra DSL built on CharmTyles with a portable Charm++ and Kokkos backend.
○ Developed an adaptive stencil abstraction for multi-node GPUs with kernel fusion, and JIT compilation of CUDA kernels on the backend. Showed significant performance improvement over both cuPyNumeric - a generalized NumPy replacement, and Devito - a specialized stencil abstraction.
○ Developed a Pandas-like adaptive in-memory distributed data analytics abstraction with a Charm++ and Apache Arrow backend.

Publications

○ **An Adaptive Distributed Stencil Abstraction for GPUs**.   2025
  Aditya Bhosale, Laxmikant Kale.
  Supercomputing India 2025 Conference, Bangalore, India. (Accepted) [paper]

○ **An Elastic Job Scheduler for HPC Applications on the Cloud**.   2025
  Aditya Bhosale, Kavitha Chandrasekar, Laxmikant Kale, Sara Kokkila-Schumacher.
  CANOPIE-HPC (SC Workshops '25), St Louis, MO. [paper]

○ **Efficient and Cost-Effective HPC on the Cloud**.   2025
  Aditya Bhosale, Laxmikant Kale, Sara Kokkila-Schumacher.
  FlexScience (HPDC Workshops '25), Notre Dame, IN. [paper]

○ **An Abstraction for Distributed Stencil Computations Using Charm++**.   2024
  Aditya Bhosale, Zane Fink, Laxmikant Kale.
  Workshop on Asynchronous Many-Task Systems and Applications, Knoxville, TN. [paper]

○ **Runtime Techniques for Automatic Process Virtualization**.   2022
  Evan Ramos, Sam White, **Aditya Bhosale**, Laxmikant Kale.
  P2S2 (ICPP Workshops '22), Bordeaux, France. [paper]

○ **Compyle: a Python package for parallel computing**.   2020
  Aditya Bhosale, Prabhu Ramachandran.
  19th Python in Science Conference, Austin, TX. [paper]

○ **PySPH: A Python-Based Framework for Smoothed Particle Hydrodynamics**.   2019
  Prabhu Ramachandran, **Aditya Bhosale**, et al.
  ACM Transactions on Mathematical Software. [paper]

Selected Talks & Posters

2024: **Aditya Bhosale**. *Charm++ on Kubernetes Cloud*. Talk, KubeCon 2024, Salt Lake City

2023: **Aditya Bhosale**, Nikunj Gupta, Zane Fink, Aryan Sharma. *CharmTyles: Large-scale Interactive Charm++ with Python*. Talk, 15th JLESC Workshop, INRIA, Bordeaux

2023: **Aditya Bhosale**, Kavitha Chandrasekar, et al. *Support for Charm++ on Cloud using Kubernetes*. Talk, 15th JLESC Workshop, INRIA, Bordeaux

2020: **Aditya Bhosale**, Prabhu Ramachandran. *Compyle: Python Once, Parallel Computing Anywhere*. Poster, SciPy Conference, Austin.

2017: **Aditya Bhosale**. *GPU Computing using PyOpenCL*. Tutorial, SciPy India Conference, Mumbai

Awards

2020: **Best Poster Award** for *Compyle: Python Once, Parallel Computing Anywhere* at SciPy 2020 Conference, Austin

2016: Awarded the **Undergraduate Research Award** for exemplary research in the undergraduate thesis

Technical Skills

Languages: Python, C/C++

Parallel/HPC: MPI, Charm++, CUDA, OpenCL, OpenMP, Kokkos

Cloud/Infrastructure: Kubernetes

Teaching Experience

Spring 2019: **Data Analysis and Interpretation**, Teaching Assistant, IIT Bombay

Fall 2018: **Aircraft Design Lab**, Teaching Assistant, IIT Bombay