

Aditya Bhosale

4103 Siebel Center
Urbana, IL, 61801
✉ adityapb@illinois.edu
📄 adityabho.sale

Education

- 2021–Present **University of Illinois Urbana-Champaign, Champaign.**
Ph.D. in Computer Science
Research interests: Parallel programming, scientific computing, compilers
- 2018–2019 **Indian Institute of Technology, Bombay, Mumbai.**
Master of Technology in Aerospace Engineering
Thesis: A generalized framework for heterogeneous computing
- 2014–2018 **Indian Institute of Technology, Bombay, Mumbai.**
Bachelor of Technology in Aerospace Engineering
Thesis: Optimal nearest neighbor searching algorithms for particle based simulations

Publications

- 2023 Evan Ramos, Sam White, **Aditya Bhosale**, and Laxmikant Kale. Runtime Techniques for Automatic Process Virtualization. In *Workshop Proceedings of the 51st International Conference on Parallel Processing (ICPP Workshops '22)*. Association for Computing Machinery, New York, NY, USA, Article 26, 1–10. doi:10.1145/3547276.3548522
- 2020 **Aditya Bhosale**, Prabhu Ramachandran. Compyle: a Python package for parallel computing. In *Proceedings of the 19th Python in Science Conference* (pp. 32 - 39), Austin, Texas. doi:10.25080/Majora-342d178e-005
- 2019 Prabhu Ramachandran, **Aditya Bhosale**, et al. PySPH: A Python-Based Framework for Smoothed Particle Hydrodynamics. *ACM Transactions on Mathematical Software*, 47(4). doi:10.1145/3460773

Talks & Posters

- 2022 **Aditya Bhosale**, Nikunj Gupta, Zane Fink, Aryan Sharma. *CharmTyles: Large-scale Interactive Charm++ with Python*. Talk, 20th Annual Workshop on Charm++ and its Applications, College Park, Maryland
- 2022 **Aditya Bhosale**, Kavitha Chandrasekar, et al. *Support for Charm++ on cloud using Kubernetes*. Talk, 20th Annual Workshop on Charm++ and its Applications, College Park, Maryland
- 2020 **Aditya Bhosale**, Prabhu Ramachandran. *Compyle: Python Once, Parallel Computing Anywhere*. Poster, SciPy Conference, Austin. **Best Poster Award (2/59)**
- 2017 **Aditya Bhosale**. *GPU Computing using PyOpenCL*. Tutorial, SciPy India Conference, Mumbai

Awards

- Fall 2020 **Best Poster** award for *Compyle: Python Once, Parallel Computing Anywhere* at SciPy 2020 Conference, Austin
- Spring 2016 Awarded the **Undergraduate Research Award** for exemplary research in the undergraduate thesis

Research Experience

- Apr 2022 - **CharmTyles: Large-scale Interactive Charm++ with Python, UIUC.**
Present CharmTyles is a set of abstractions working on a client-server model with a python frontend and a Charm++ server on the backend to maintain interactivity while still achieving good performance. Implemented the frontend of a dense linear algebra library with lazily evaluated frontend arrays for message coalescing and reduced temporary array creations. Implemented an abstraction for stencil computations with a backend code generator to enable compiler optimizations such as vectorization and loop fusion.
- Apr 2022 - **Support for Charm++ on cloud using Kubernetes, UIUC.**
Present Worked on supporting Charm++ applications on Kubernetes-based clouds. Developed a Charm++ operator based on MPI operator to launch and manage a Charm++ application on Kubernetes. Wrote a utility tool to allow dynamically adding or removing nodes/pods in a job using the shrink/expand functionality in Charm++. Working on implementing a scheduler that automatically shrinks or expands running jobs when a new job is launched or an existing job completes execution.
- Jul. 2018 - **A generalized framework for heterogeneous computing, IIT Bombay.**
Jun. 2019 Wrote an unstructured point-to-point communication framework in python using CUDA aware MPI modelled on Zoltan. Developed a cell based adaptive distributed recursive coordinate bisection algorithm for dynamic load balancing that works on CPU/GPU hybrid systems while auto adjusting the weight of each process based on execution time of previous iterations. Wrote a python API which, given the transfer routine and the computation kernel, automatically distributes and executes it
- Jul. 2017 - **Compyle: a Python package for parallel computing, IIT Bombay.**
Present Compyle is a DSL that does source-to-source transpilation of pure python to execute in parallel on CPUs or GPUs. Wrote a JIT compiler, added CUDA support, support for low level features such as custom kernels and shared memory, enabled profiling, implemented a tool for accurately measuring FLOPS at runtime. Implemented a molecular dynamics solver to simulate particles in Lennard-Jones potential in under 500 lines of pure python that was about 2x faster than one of the most popular molecular dynamics solvers on a Tesla P100 GPU. Link: <https://github.com/pypr/compyle>.
- Jan. 2016 - **Nearest neighbor searching on GPUs, IIT Bombay.**
May. 2017 Wrote the framework for GPU support in PySPH, a python-based framework for smoothed particle hydrodynamics simulations with CUDA and OpenCL support. Developed a multigrid algorithm achieving a 2x speedup over uniform grids for variable smoothing length distributions. Achieved a 30x speed up over serial execution for a 3D dam break problem on an Nvidia 1070Ti GPU. This project is part of the PySPH repository here: <https://github.com/pypr/pysph>.
- Jul. 2016 - **Optimal nearest neighbor searching algorithms for particle based simulations, IIT**
Nov. 2016 **Bombay.**
Proposed a method based on hierarchy of uniform grids to efficiently find neighbors in case of variable smoothing lengths. Developed an optimized method to search for neighbors at a sub-cell resolution for variable smoothing length distributions. Ran a comprehensive set of benchmarks to find our new method to be 50% faster than a octree on variable distributions. These algorithms are implemented as part of the PySPH repository here: <https://github.com/pypr/pysph>.

Professional Experience

- 2019-2021 **Goldman Sachs, Associate.**
Part of the cloud computing team in the Risk division handling the infrastructure behind market risk pricing framework. Contributed to 10% drop in compute cost for VaR calculations by improving the load balancing and runtime prediction model. Developed the framework for supporting an approximation model for VaR pricing that resulted in a 50% drop in compute cost. Received a fast track promotion from Analyst to Associate in 1.5 years.
- 2017-2017 **University of Illinois Urbana-Champaign, Student Intern.**
Worked at the Advanced Reactors and Fuel Cycles lab at the Nuclear, Plasma and Radiological Engineering department. Developed a combined container image for cyclus, cycamore and rickshaw compatible with Shifter. Automated the generation and parallel execution of numerous cyclus simulations on the Blue Waters supercomputer.

Teaching Experience

- Spring 2019 **Data Analysis and Interpretation**, Teaching Assistant, IIT Bombay
- Fall 2018 **Aircraft Design Lab**, Teaching Assistant, IIT Bombay

Other Achievements

- 2014 All India Rank 1546 in the Joint Entrance Examination - Advanced 2014 out of 150,000 candidates
- 2014 Ranked in top 200 out of 20,000 in the country in the National Standard Exam for Astronomy, the first round for IOAA 2014
- 2014 Ranked in top 1% in the state in the National Standard Exam for Physics, the first round for IPhO 2014