ABHINAV SINGH

Researcher & Software Engineer with 10+ years of programming experience

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SUMMARY

Ph.D. in Computer Science with expertise in Machine Learning, Distributed Systems, and Scalable Computing. Proven ability to deliver high-performance solutions on large-scale infrastructures using Python, TensorFlow, and C++. Experienced in reducing development time and optimizing for cloud and cluster environments. Passionate about applying cutting-edge ML techniques to solve real-world problems.

EXPERIENCE

Postdoctoral Research Fellow

Computational Science and Engineering Lab, Harvard University

2024–Present Cambridge, MA, USA

- Enhanced and maintained Korali, a large-scale supercomputing reinforcement learning framework, integrating CI/CD pipelines and automated testing.
- Developed scalable RL solutions coupling OpenFPM and Korali for multi-GPU/CPU clusters and cloud platforms.
- Trained transformer-based models for neural data processing, achieving significant cost and runtime efficiency improvements.

Doctoral Research Engineer

MOSAIC Group, Technische Universität Dresden

2019–2024 Dresden, Germany

- Designed a scalable C++ template expression system to solve PDEs, enabling simulations of complex physical models on HPC systems and speeding up development times by 100x.
- Reduced project timelines from years to days by optimizing large-scale 3D simulations using distributed computing and advanced algorithms.
- Maintained and expanded OpenFPM library for scalable numerical computations, adhering to production-quality standards.
- Led interdisciplinary collaborations with biologists and physicists, integrating ML-driven simulation methodologies.

Research Engineer

Indian Institute of Technology Bombay (IITB)

2014–2019 Mumbai, India

- Built GPU-accelerated algorithms for simulating reaction networks, significantly improving computational performance.
- Developed and implemented novel training and inference algorithm for Hidden Markov Models using reaction dynamics.
- Presented findings at international conferences and collaborated on interdisciplinary research projects.

SELECTED PUBLICATIONS

2023

Publication: A numerical solver for active hydrodynamics in three dimensions and its application to active turbulence, Physics of Fluids (Cover Article). News/Media Coverage: PhysOrg, SciTechDaily, Altmetric+12 News articles

2021

Publication: A C++ Expression System for Partial Differential Equations Enables Generic Simulations of Biological Hydrodynamics, Advances in Computational Methods for Biological Physics - The European Physical Journal E. News Link (13 articles)

EDUCATION

Ph.D. in Computer Science (Summa Cum Laude)

Center for Systems Biology
Techniche Universität Dresden, Germany

Aug 2019-2023 Dresden , Germany

Int. M.Sc. Mathematics & Computer Science (Rank 1 - CGPA 8.7/10)

Centre for Excellence in Basic Sciences
University of Mumbai, India

Aug 2014-2019 Mumbai, India

TECHNICAL SKILLS

Programming Languages
C++
Python
Machine Learning
Scikit, Tensorflow, Pytorch
HPC Tools
MPI, OpenMP, CUDA, Boost
DevOps
Git, CI/CD, Docker, Kubernetes
Cloud Platforms
AWS, Google Cloud (GCP)

ACHIEVEMENTS

PDE simulation with over 100 nonlinear terms
Achieved a very challenging task

Delivering applications on time
Continuous research prototyping while coding on various platforms. Taking theoretical research to production quality code.

STRENGTHS

Persistent | Team Leadership | HPC Optimization | Prototyping | Complex Problem Solving | ML Deployment

LANGUAGES

English
Hindi
German