Manas Vishal

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Education

University of Massachusetts Dartmouth **2021 – Present**
PhD, Computational Sciences and Engineering (Mathematics) — MS, Data Science *Dartmouth, MA*

- Award: Distinguished Doctoral Fellowship — GPA: 4.0
- Publication: First-author papers on highly efficient simulation of astrophysical objects (arXiv:2503.11523, 2307.01349)

Indian Institute of Science Education and Research Kolkata **2016 – 2021**
Bachelor and Master of Science, Physics *Kolkata, India*

- Award: Merit-based scholarship (KVPY) — GPA: 3.5

Experience

High Performance Computing Facilitator **Jun 2025 – Present**
Center for Scientific Computing and Data Science Research, UMassD *North Dartmouth, MA*

- Developing a Retrieval-Augmented Generation (RAG) chatbot for university program queries, integrating LLMs, NLP, and vectorized search for efficient retrieval.
- Benchmarked GPU-accelerated solvers for the Teukolsky equation using Julia and Float64x2 arithmetic; tuned memory-bound kernels on Nvidia A100, GH200 and AMD MI250.
- Led an AI-driven credit card fraud detection project, utilizing XGBoost, Logistic Regression, and Neural Networks for predictive modeling.
- Completed DOE ATPESC 2025, gaining hands-on training in MPI, OpenMP, Kokkos, SYCL, scalable I/O, and profiling tools on systems like Frontier and Aurora.

Research Assistant **Sep 2021 – Present**
Department of Mathematics, UMassD *North Dartmouth, MA*

- Developed and implemented a mathematical model with advanced algorithms for astrophysical binary simulations, enhancing computational efficiency and scalability.
- Evaluated GPU performance for extended precision solvers; profiled throughput, memory usage, and register pressure on modern architectures.
- Accelerated MATLAB code runtime by 90x and improved accuracy by 10^8-fold, surpassing existing benchmarks in astrophysical simulation accuracy.
- Mentored junior researchers in numerical methods, profiling, and scientific software practices.

Software Developer and Data Scientist **Jun 2023 – Jul 2023**
Albert Einstein Institute, Max Planck Institute of Gravitational Physics *Potsdam, Germany*

- Accelerated the simulation time of binary black holes using a data driven approach
- Analyzed time series datasets in frequency domain for a faster and efficient surrogate approach
- Refined the algorithms to enhance performance to generate black hole physics data 6 times faster

Research Computing Facilitator trainee (NSF CAREERS) **May 2023 – Jun 2023**
Center for Research Computing, Yale University *New Haven, CT*

- Translated a prototype code into an efficient C++ codebase, utilizing Git for version control.
- Benchmarked & profiled C++ codebase across multiple platforms by deploying high performance computing techniques.
- Implemented unit and regression tests to ensure codebase reliability and functionality
- Deployed Bash scripts for MPI & Slurm jobs on different clusters, one of them being the new MGHPCC cluster Unity.

Awards

Dissertation Research Award (May 2024): University of Massachusetts Dartmouth - Recognition for exceptional performance in doctoral research in Physics
LISA Symposium Travel Grant (Apr 2024): National Aeronautics and Space Administration (NASA) - Grant offered to highly motivated scientists to attend the space-borne telescope, LISA, symposium in Dublin, Ireland
Distinguished Doctoral Fellowship (Sep 2021): University of Massachusetts Dartmouth - Highest fellowship offered to only 10 students by UMass Dartmouth that aided my doctoral research in black hole physics

Skills

Programming Languages: Julia, Python, C++, MATLAB, Bash, C, R, HTML & TeX, SQL & PHP
HPC Systems & Tools: Frontier, Aurora, MGHPCC Unity, Slurm, MPI, Nsight, Spack, Singularity

Leadership and Outreach

Hackathon Organizer: University of Massachusetts Dartmouth (Apr 2024) - Organized the first ever hackathon
Multimedia and Web Technology Team Lead: Inquivesta Science Festival - Led team for largest science fest, developed Android app
First Prize Winner: Brown University Hackathon - Developed AR/VR black hole simulations using Python (ipyvolume, numpy, matplotlib, scipy, scikit-learn, pandas)