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Divyaprakash

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About Me

Computational researcher with expertise in scientific computing, CFD, and parallel programming for fluid-structure interaction (FSI) problems. Skilled in developing high-performance solvers using GPU (CUDA/AMGX), coupling strategies, and machine learning for physics-informed modeling. Experienced in OpenFOAM, SU2, and in-house solvers. Strong academic research background with ongoing contributions to open-source platforms and peer-reviewed publications. PhD expected in 2025.

Skills

Programming: Proficient with Python, Fortran, C/C++ and Git; basic understanding of Web development

Software & Libraries: Proficient in MATLAB and OpenFOAM, gmsh, Paraview; working experience with ANSYS, StarCCM+, FDS, SU2, Uintah, PreCICE and VisIt

Languages: English (fluent), Hindi (native)

Education

Indian Institute of Technology Delhi, PhD in Applied Mechanics – New Delhi, India — Sept 2020 – present
- Cilia–particle interaction modeling in fluid flow using IBM and ML
- CGPA: 9.0/10.0
- Expected Completion in 2025

Indian Institute of Technology Gandhinagar, MTech in Mechanical Engineering – Gujarat, India — Dec 2013 – Sept 2016
- CPI: 8.11/10.0

Dr. Ambedkar Insitute of Technology, BE in Mechanical Engineering – Bengaluru, India — May 2008 – July 2012
- Percentage: 76%, First class with distinction

Experience

Google Summer of Code Contributor, SU2 Foundation – Remote — May 2025 – present
- Developing ML-informed models for fluid property estimation in SU2
- Collaborating with international developers on SU2 codebase

Assistant Professor, Jorhat Engineering College – Assam, India — Sept 2018 – Sept 2020
- Taught undergraduate courses in CFD and Fluid Mechanics
- Part of Technical Education Quality Improvement Program (TEQIP-III) project, funded by the World Bank
- Contributed to capacity-building in a remote region of Northeast India

Assistant Professor, Institute of Technology Gopeshwar – Uttarakhand, India — Jan 2018 – Aug 2018
- Delivered mechanical engineering courses and supported student development
- Contributed under TEQIP-III
- Taught in a remote Himalayan region with limited academic access

Junior Research Fellow, IIT Gandhinagar – Gujarat, India — Oct 2016 – Oct 2017
- Simulated fire suppression using FDS and Uintah and performed experiments

Summer Intern, Institute of High Performance Computing, Singapore – Singapore — May 2015 – July 2015
- Worked on implementing immersed boundary method in OpenFOAM

Graduate Apprentice, Institute for Plasma Research Gandhinagar – Gujarat, India — Aug 2013 – Nov 2013

- Received specialized training in solving conduction heat transfer problems using numerical methods implemented in MATLAB.

Projects

GPU-Accelerated FSI Solver

- Developed a fluid-structure interaction solver implementing the Immersed Boundary Method (IBM)
- Used NVIDIA AmgX library to accelerate the pressure Poisson equation
- Used Fortran and C to implement the solver, MATLAB and Python for postprocessing

LBM Simulation of Falling Ellipse

- Simulated an elliptical disk falling through fluid using Lattice Boltzmann Method (LBM) in MATLAB
- Received 'A' grade for LBM coursework at IIT Delhi

Coupling Fortran Solid Solver with OpenFOAM

- Implemented IBM in OpenFOAM for FSI modeling
- Compiled a custom Fortran-based solid dynamics solver as a shared library and implemented a C-compatible API to enable OpenFOAM to call Fortran routines at runtime
- Achieved two-way coupling between the solid and fluid solvers via direct function calls and data exchange

ML-Estimated Superdroplet Growth Using DNS Data

- Developed a machine learning-based parameterization to improve cloud droplet growth predictions in LES using high-resolution DNS data
- Processed and analyzed large-scale, multivariate datasets for supersaturation and droplet evolution
- Designed custom data pipelines and analysis tools in Python

Publications & Conference Proceedings

Machine Learning-Based Estimation of Superdroplet Growth Rates Using DNS Data Oct 2024
Divyaprakash, Nikita N. Makwana, Amitabh Bhattacharya, Bipin Kumar
10.48550/arXiv.2410.13890

Sensing Particulate Flows Using Arrays of Passive Artificial Cilia July 2024
Divyaprakash, Amitabh Bhattacharya
10.1007/978-981-97-1033-1_30

A Review of Computational Modeling of Fluid-Immersed Flexible Filaments Apr 2024
Divyaprakash, Mohit Garg, Ajeet Kumar, Amitabh Bhattacharya
10.1007/s41745-024-00423-x

Conferences & Poster Presentations

- **preCICE Workshop 2024** (University of Stuttgart, Germany | Sept 2024): 'Cilia as Particle Sensors: From 2D Numerical Models to 3D with preCICE' - *Poster Presentation, Awarded travel grant*
- **ECCOMAS Congress 2024** (Lisbon, Portugal | June 2024): 'Sensing of Particle Shape and Size Using Arrays of Artificial Cilia' - *Oral Presentation, Art & Science Competition Winner*
- **Workshop on Interfacial Engineering at Multiple Spatio-temporal Scales** (IISC, Bengaluru | Jan 2024): 'Computational Study of Cilia-Based Sensing Mechanism for Particle's Shape and Size' - *Poster Presentation, Best Poster Award*
- **Conference on Fluid Mechanics and Fluid Power (FMFP)** (IIT Roorkee | Dec 2022): 'Sensing Particulate Flows using Arrays of Passive Artificial Cilia' - *Oral Presentation*

Leadership and Extracurricular

- Coordinated a team of B-school students (IIM Indore) as a volunteer program leader during the Indiahikes Collaborative Leadership Program 2023, a high-altitude experiential trek in the Himalayas (Brahmatal, Uttarakhand)

- Completed multiple Himalayan treks, building resilience, collaboration, and problem-solving in physically and logistically challenging environments

References

1. Prof. Amitabh Bhattacharya — IIT Delhi — bhattach@iitd.ac.in
2. Prof. Amit Gupta — IIT Delhi — agupta@mech.iitd.ac.in
3. Dr. Bipin Kumar — IITM Pune — bipin.porwal@gmail.com