Divyaprakash

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About Me

I am a computational researcher specializing in scientific computing, and machine learning applications in fluid dynamics. My expertise lies in developing and implementing numerical simulations and computational models to solve complex fluid flow and fluid-structure interaction problems. With several years of teaching experience in fluid mechanics and computational methods at the university level, I combine research with effective knowledge transfer. This CV highlights my research contributions, teaching experience, project involvement, and technical skillset in the field of computational mechanics.

Education

PhD	**Indian Institute of Technology Delhi**, Applied Mechanics	New Delhi, India Sept 2020 – present
	• CGPA: 9.0/10.0 • Working on computational modeling of biological cilia-particle interactions in fluid flow	
MTech	**Indian Institute of Technology Gandhinagar**, Mechanical Engineering	Gujarat, India Dec 2013 – Sept 2016
	• CPI: 8.11/10.0	
BE	**Dr. Ambedkar Insitute of Technology**, Mechanical Engineering	Bengaluru, India May 2008 – July 2012
	• Percentage: 76%, First class with distinction	

Experience

Jorhat Engineering College, Assistant Professor — Assam, India — Sept 2018 – Sept 2020
- Specialized in teaching advanced fluid mechanics and computational fluid dynamics courses

Institute of Technology Gopeshwar, Assistant Professor — Uttarakhand, India — Jan 2018 – Aug 2018
- Taught core engineering courses and established Google-Suite for education at the institute

Indian Institute of Technology Gandhinagar, Junior Research Fellow — Gujarat, India — Sept 2016 – Aug 2017
- Worked on the development of computational simulations for a smart, eco-friendly fire detection and suppression system

Institute of High Performance Computing, Summer Intern — Singapore — May 2015 – July 2015
- Worked on implementing immersed boundary method in OpenFOAM by modifying existing solver for vortex-induced vibration simulations

Institute for Plasma Research, Graduate Apprentice — Gujarat, India — Aug 2013 – Nov 2013
- Received specialized training in solving conduction heat transfer problems using numerical methods implemented in MATLAB.

Projects

ML-Estimated Superdroplet Growth Using DNS Data — 2024 – present

Improved cloud droplet growth modeling in Large Eddy Simulations (LES) by developing a machine learning-based parameterization using high-fidelity DNS data. Achieved an R^2 of 0.9 for predicting supersaturation and droplet growth rates. Results were presented at ICCP 2024 in South Korea.

Cilia-Particle Interaction Modeling with Machine Learning — 2021 – 2024

As part of PhD thesis at IIT Delhi, the sensing mechanism of biological cilia in particle-laden flow environments was investigated. Particle-cilia interactions were simulated using the Immersed Boundary Method, and the generated data was utilized to train an LSTM-based machine learning model with a regression layer. Particle size and aspect ratio were predicted with accuracy within 5%. Research findings were presented at the ECCOMAS Congress 2024 in Lisboa, Portugal.

Numerical Simulation of Vortex Shedding and Scour for Submarine Pipelines 2015 – 2016

As part of M.Tech thesis at IIT Gandhinagar, 2D turbulent flow around submarine pipelines was simulated using OpenFOAM with RANS and k-ω SST models. Pipeline shapes were tested to minimize vortex shedding, and a custom solver with Python/bash scripts was developed for scour prediction, validated against experimental data.

Solid Propellant Fire Suppression Simulation 2018

Simulated detonation/deflagration of a solid propellant for fire suppression was performed using Uintah software from the University of Utah. Fire dynamics were modeled with Fire Dynamics Simulator (FDS), and initial experiments were conducted with team members to compare simulation results with experimental data.

Skills

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

Software: Proficient in MATLAB and OpenFOAM; working experience with ANSYS, StarCCM+, FDS and SU2

Languages: English (fluent), Hindi (native)

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*

Extracurricular Activities

- Program Coordinator (Volunteer), Indiahikes (Oct 2023) - An Experiential Learning Program was coordinated for business school students, fostering leadership skills through a Himalayan trek despite terrain and weather challenges.

References

- Amitabh Bhattacharya, Professor, Indian Institute of Technology Delhi, Email: bhattach@iitd.ac.in ↗

- Pranab Kumar Mohapatra, Professor, Indian Institute of Technology Gandhinagar, Email: pranabm@iitgn.ac.in ↗