Charul Gupta

Researcher in Fluid Dynamics

Contact

charul.gupta229@gmail.com
+91 9461510599
Google Scholar | LinkedIn | Website

Research Interest

Geophysical Fluid Dynamics, Interfacial Fluid Flows, Cavitation, Machine learning, Turbulence

Education

PhD in Thermo-Fluids Engineering, Indian Institute of Technology Hyderabad, India (2018 – 2024)
Thesis: An experimental study of flow dynamics near a moving contact line.
Advisor: Harish N Dixit and Lakshmana D. Chandrala

MTech. in Thermal engineering, National Institute of Technology Warangal, India (2016-2018)
BTech. in Mechanical engineering, Motilal Nehru National Institute of Tech. Allahabad, India (2011-2015)

Academic & Research Experience

Postdoctoral Researcher, Indian Institute of Technology Hyderabad, India (July 2024- Dec 2024)

- Studied interaction of cavitation bubble with air bubble in blind hole using spark discharge experiments.
- Applied high-speed imaging, machine learning pattern recognition, and OpenFOAM simulations.

Doctoral Researcher, IIT Hyderabad, India (2018-2024)

- Designed and developed optimized experimental setups to investigate moving contact line dynamics.
- Performed PIV/PTV-based flow field measurements and interfacial velocity quantification.
- Provided benchmark experimental datasets for validating theoretical models.
- Published papers in peer-reviewed journals (JFM, EPJ-ST) and presented research in leading conferences (ICMF)
- Collaborated with my supervisor to establish an experimental fluid dynamics research lab from the ground up.

Industrial experience:
Lead analytical engineer, Zahroof Global Pvt. Ltd. (Jun 2025 – July 2025)

- 3D modeling of mechanical components using Creo Parametric
- Foundational knowledge of reciprocating compressors and valve operations
- Experience in valve design and related manufacturing processes

Publications

- **Gupta, C.**, Choudhury, A., Chandrala, L. D., & Dixit, H. N. (2024). An experimental study of flow near an advancing contact line: a rigorous test of theoretical models. *Journal of Fluid Mechanics*, 1000, A45.
- **Gupta, C.**, Chandrala, L. D., & Dixit, H. N. (2024). An experimental investigation of flow fields near a liquid–liquid moving contact line. *The European Physical Journal Special Topics*, 233(8), 1653-1663.

- Ghosh, S., Dutta, J., Garlapati, K. K., Parvin, M., **Gupta, C.**, Dixit, H. N., & Martha, S. K. (2024). LiF/LixPOy/LixPOyFz-based artificial interface on graphitic cathode for improving the cycle life of dual ion batteries. *Journal of Power Sources*, *623*, 235440.
- **Gupta, C.**, Sangadi, A., Chandrala, L. D., & Dixit, H. N. (2022, December). A Study of Flow Patterns Near Moving Contact Lines Over Hydrophobic Surfaces. In *Conference on Fluid Mechanics and Fluid Power* (pp. 339-349). Singapore: Springer Nature Singapore.
- **Gupta, C.**, Chandrala, L., & Dixit, H. (2022). An experimental study of flow patterns near a moving contact line. *Bulletin of the American Physical Society*, *67*.
- Choudhury, A., **Gupta, C.**, & Dixit, H. N. (2019, November). Flow field near Contact Lines: Role of Inertia. In *APS Division of Fluid Dynamics Meeting Abstracts* (pp. M04-023).
- **Gupta, C.**, Chandrala, L. D., & Dixit, H. N. (2024). An experimental study of flow near a moving contact line at high contact angles (Under submission, *Phys. Rev. Fluid*).
- Gunda P., **Gupta, C.**, Chandrala, L. D., & Dixit, H. N., Badarinath K. (2024). Interaction of an air bubble with a cavitation bubble in a blind hole: Experiments and Simulations (Under preparation, *J. Fluid Mech.*)
- **Gupta, C.**[*], Sangadi, A.[*], Chandrala, L. D., & Dixit, H. N. Anomalous flow patterns near a moving contact line. (Under preparation, target journal: *Nature Phys.)*.
- "Universality of slip flow near a moving contact line " (Under preparation, target journal: *Phys. Rev. Lett.)*.

Skills

- Experimental: PIV, PTV, PLIF, Shadowgraphy, Flow Visualization.
- Experimental setup development: Arduino / Microcontrollers Automation, Optical Systems.
- Computation: MATLAB (data analysis), Python (pattern recognition), CFD (OpenFoam, C, MATLAB).
- Other: Sensors and Actuators Integration, Image Processing.

Teaching & Mentorship

- Supervised and trained master's students in Fluid Physics Lab, IIT Hyderabad.
- Teaching assistant: NPTEL courses on "Interfacial Fluid Mechanics" conducted by IIT Bombay (2022) and IIT Madras (2023).

Conferences Talks

- Complex Fluids and Soft Matter Conference 2023 (CompFlu 2023) at IIT Madras on the topic "Determining the flow fields near a moving contact line: comparison between experiments and theory". (poster presentation)
- ME@75 Research Frontiers Conference 2022 at IISc on the topic "An Experimental study of flow patterns near a moving contact line". (presented a talk)
- Complex Fluids and Soft Matter Conference 2021 (CompFlu) at IIT Gandhinagar on the topic "Flow patterns in the vicinity of a moving contact line: an experimental study". (presented poster)
- Thermal Analysis and Engineering Systems 2018 (ICTASE) at HiCET, Coimbatore on topic "Effect of MHD on inertial focusing: A Numerical Study". (presented a talk)

Workshops & Training

- NPTEL+ workshop: Dispersed Multiphase Flow Fundamentals (2024)
- NVidia NSM DLI 2024 workshop: HPC and Deep Learning (2024)

- ICTS summer school: Dynamics of Biological Systems (2024)
- NPTEL+ workshop: Optical Measurement Techniques in Fluid Mechanics (2023)

References

Prof. Harish N. Dixit,
Professor,
hdixit@mae.iith.ac.in,
Department of Mechanical & Aerospace Engineering,
Indian Institute of Technology Hyderabad

Dr. Lakshmana D. Chandrala,
Assistant professor,
lchandrala@mae.iith.ac.in,
Department of Mechanical & Aerospace Engineering,
Indian Institute of Technology Hyderabad