

# Charul Gupta

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## Research Interest

Moving contact line dynamics, Microhydrodynamics, Turbulent flows, Pattern recognitions, Large scale flows.

## Qualification

- PhD (2018- pursuing) from IIT Hyderabad

**Research area:** An experimental study of flow patterns very near a moving contact line.

Advisor: [Harish N Dixit](#) and [Lakshmana D. Chandrala](#)

- Masters in Thermal engineering (2016-2018) from NIT Warangal
- Graduation in Mechanical engineering (2011-2015) from MNNIT Allahabad

## Skills

- Expertise in designing and developing experimental setup.
- Performed PIV techniques and other image processing techniques in flow visualization problems in fluid mechanics.
- Experience of solving benchmark problems and developing my own solver in OpenFoam.
- Have experience of working with MATLAB for data analysis in research work and python for performing pattern recognition.
- Developed CFD codes on the benchmark problems of fluid mechanics in C programming and MATLAB.

## PhD Thesis: An experimental study of flow patterns very near a moving contact line

The present study investigates the flow dynamics very near the moving contact line using experimental tactics. The flow configurations emerging near the contact line are captured by a high speed camera and quantified using particle image velocimetry (PIV) technique. Other quantitative features involving interface shapes and interfacial speed are also quantified to test the earlier theoretical models rigorously. The decades old unresolved problem of singularity also seems to be resolved by identifying the low speed region very near the contact line.

## MTech. Project: Effect of MHD on inertial focusing: A Numerical Study

The study is based on the motivation of removing the impurities from a liquid. We investigated the problem numerically using ANSYS fluent software. We started with the analysis of a flow through a rectangular channel mixed with particles uniformly. The particles do not respond to the flow until exposed with the magnetic and electric fields acting perpendicular to each other. As a result, four different locations are obtained where the particles get focused. The study is also carried out with different geometries.

## Publications

- Gupta, C., Choudhury, A., Chandrala, L. D., & Dixit, H. N. (2023). An experimental study of flow near an advancing contact line: a rigorous test of theoretical models. [arXiv preprint arXiv:2311.09560](#). (**Accepted in J. Fluid Mech.**).
- Gupta, C., Chandrala, L. D., & Dixit, H. N. (2024). An experimental investigation of flow fields near a liquid-liquid moving contact line. [arXiv preprint arXiv:2401.09347](#). (**Accepted in Eur. Phys.J. Special Topics**)
- "An experimental study of flow near a moving contact line at high contact angles" (Manuscript under preparation).
- "Universality of slip flow near a moving contact line " (Manuscript under preparation).

## Conferences

- 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)
- International Conference On Multiphase Flow 2023 (ICMF 2023) at Kobe, Japan on the topic "An experimental study of flow patterns near a moving contact line". (presented a talk)
- Gupta, C., Chandrala, L., & Dixit, H. (2022). An experimental study of flow patterns near a moving contact line. *Bulletin of the American Physical Society*.
- "A study of flow patterns near moving contact lines over hydrophobic surfaces". (**Accepted in Conference on Fluid Mechanics and Fluid Power, 2022**).
- Fluid Mechanics And Fluid Power 2022 (FMFP 2022) at IIT Roorkee on the topic "Flow patterns in the vicinity of a moving contact line: an experimental study". (presented a talk)
- 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)
- 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).
- Thermal Analysis And Engineering Systems 2018 (ICTASE) at HiCET, Coimbatore on topic "Effect of MHD on inertial focusing: A Numerical Study". (presented a talk)

## Experience/Training

- Participated in the Nptel+ workshop "optical measurement techniques in fluid mechanics" (Nov 2023).
- Teaching assistance for Nptel course on "Interfacial fluid phenomena" conducted by IIT madras (2023) and IIT bombay (2022).
- Participated in Indian National Young Academy of Sciences (INIAS) Flagship Event for Post-PhD Opportunities 2022
- Industrial Training at Shree Grinding Unit Lakshar (Shree Cement Ltd.), Haridwar. (2013)

## Interests

- Reading books (started the journey with self-help books to understand myself, now also interested in having deep understanding of the science)