ICTS | INTERNATIONAL CENTRE for THEORETICAL SCIENCES

TATA INSTITUTE OF FUNDAMENTAL RESEARCH

ICTS Thesis Defense Seminar

Title : Influence of particle geometry on hydrodynamic and electrostatic interactions

Speaker : Harshit Joshi (ICTS-TIFR, Bengaluru)

Date : Friday, 19 December 2025

Time : 2:30 PM (IST)

Abstract : In this talk, I will show how geometric asymmetry introduces new dynamical features in Microhydrodynamics and Electrostatics. We begin with the sedimentation of a single body in Stokes flow. Breaking just one plane of symmetry in an ellipsoid unlocks complex behaviors—from drifting to spiraling and quasiperiodic settling. I'll outline a classification of these dynamics and the origin of quasiperiodicity. Next, drawing on the analogy between Microhydrodynamics and Electrostatics, I'll show how tools from the former can be adapted to study electrostatic interactions between anisotropic particles, highlighting the role of electrostatic torque. We then examine how particle geometry affects collective sedimentation. While a line of settling spheres is unstable due to hydrodynamic clustering, discs introduce a distinct mechanism driven by drag anisotropy and characterized by non-modal growth. I'll show how this shapes the resulting cluster structures. If time permits, I'll briefly touch on how suspended particles affect two-dimensional turbulence.

Venue : Emmy Noether Seminar Room

Zoom link: https://icts-res-in.zoom.us/j/95161128884?pwd=scxKPAjD78d33rM2hc3KbbSzBbq4Ww.1

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