



ICTS Thesis Defense Seminar

Title : Inertial particles in unsteady hydrodynamic environments: theory and numerics

Speaker : Divya Jaganathan (ICTS-TIFR, Bengaluru)

Date : Friday, 28 February 2025

Time : 10:30 AM (IST)

Abstract : Inertial particles move differently from the suspending flow due to their finite-time response to hydrodynamic forces. Likewise, the surrounding fluid, with its own finite inertia, responds dynamically to the particle's motion. We examine particle transport using the unsteady Stokes model, which captures the non-instantaneous relaxation of both the particle and fluid.

First, we revisit the classical problem of a settling sphere under the unsteady model, highlighting the emergence of memory effects and comparing results with experiments. To address the computational challenges of memory effects on particle evolution in general flows, we develop a memoryless framework which leads to an explicit, self-starting integrator to solve the Maxey-Riley-Gatignol (MRG) equation with time-independent computational costs. We numerically investigate memory effects on non-interacting particles in rotating vortical flows, finding an enhanced likelihood of collision. Finally, we describe a 2D two-particle model with fluid-mediated interactions in the unsteady Stokes regime, setting the framework for developing an MRG analogue that includes interactions.

Venue : Online

Zoom Link: <https://icts-res-in.zoom.us/j/94212977089?pwd=waj158NMWbdhrCb6akZYx7CJS2qBQM.1>

Meeting ID: 942 1297 7089

Passcode: 282829