# ICTS Fluid Dynamics Seminar

**Title** : Genetic Algorithm-Based Training of a smart Triangular Swimmer

**Speaker** : Ruma Maity (Technische Universität Wien, Austria)

**Date** : Friday, 12 December 2025

**Time** : 11:30 AM (IST)

**Abstract** : Natural microswimmers use diverse gaits to move through low Reynolds-number environments for tasks such as finding nutrients, avoiding predators, or capturing prey. Their propulsion often relies on non-reciprocal shape changes that enable motion in viscous fluids. Inspired by these mechanisms, artificial microswimmers are being designed for applications like targeted drug delivery.

In this work, we train a two-dimensional triangular microswimmer to move in a chosen direction using distinct propulsion gaits. Its motion is controlled by adaptive neural networks that map internal degrees of freedom to generated forces, with network structures optimized through the NEAT algorithm.

Building on earlier studies of one-dimensional three-bead swimmers, we now examine the more complex two-dimensional triangular case, which exhibits flapping, chiral, and walking-like propulsion modes. Because simple displacement rewards fail in 2D, we introduce an improved reward function incorporating displacement, rotation, and shape factors.

The resulting neural controllers remain simple yet differ structurally across swimming gaits.

**Venue** : Emmy Noether Seminar Room
Zoom Link: https://icts-res-in.zoom.us/j/99834963760?pwd=eao2GbabSumG0hu5Sq6oI6wndNtSG5.1
Meeting ID: 998 3496 3760
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