Optimal Control of the 2D Constrained Navier-Stokes Equations and Translation Invariant Diffusions and Stochastic Partial Differential Equations in $\mathcal{S}'$

Sangram Satpathi

Abstract

The talk will be organized in two parts. Firstly, we will investigate the 2D Navier–Stokes equations under a constraint that ensures energy conservation. By employing the Galerkin approximation method, we establish the existence and uniqueness of a global solution for the constrained Navier–Stokes equation on the torus $\mathbb{T}^2$. Additionally, we analyze the linearized system associated with the 2D-constrained Navier–Stokes equations, demonstrating the Lipschitz continuity and Fréchet differentiability of the control-state mapping. Using the formal Lagrange method, we derive the first-order necessary optimality conditions. Secondly, we will discuss key results from the article on Translation Invariant Diffusions and Stochastic Partial Differential Equations in $\mathcal{S}'$, along with examples illustrating the applicability of these findings.We will conclude by addressing our ongoing problem: determining the drift and diffusion terms of the SPDE for the process $|X_t - \cdot|$ in higher dimensions.