



## ICTS Mathematics Seminar

**Title** : On Learning PDEs

**Speaker** : Siddhartha Mishra (ETH Zürich, Switzerland)

**Date** : Thursday, 02 January 2025

**Time** : 3:00 PM (IST)

**Abstract** : Partial Differential Equations (PDEs) model a wide range of interesting phenomena in physics. In the absence of analytical solution formula, numerical methods are the dominant paradigm for simulating PDEs. However, their prohibitive computational cost and other drawbacks has necessitated the extensive development of machine learning (ML) based surrogates, particularly for learning the underlying solution operators from data. In this talk, we start by presenting some latest developments in the field of neural operators which are currently the most popular framework for learning PDEs. However, these neural operators are not sample efficient. We address this issue by presenting Foundation models for Physics and demonstrating how they can reduce sample complexity considerably, while being able to generalize to unseen physics. Extensions in the form of Graph neural networks for PDEs on arbitrary domains and generative AI algorithms such as conditional score based diffusion models for PDEs with chaotic multiscale solutions will also be considered.

**Venue** : Chern Lecture Hall

Zoom Link: <https://icts-res-in.zoom.us/j/96467540991?pwd=UgiqpXgazXcZlo4J4rOHE9zbmbE7nm.1>

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