



## ICTS Colloquium (HYBRID)

**Title** : Recent Progress in Non-linear Geometric PDEs.

**Speaker:** Puskar Mondal (Harvard University)

**Date** : Tuesday, 05<sup>th</sup> March 2024

**Time** : 04:00 PM (IST)

**Abstract :** Nonlinear PDEs play a fundamental role in describing physical processes starting from atmospheric circulation to Einstein's gravity. While they are ubiquitous in physics, they play a pivotal role in modern differential geometry. For example, Hamilton's Ricci flow equations that arise as the 1-loop renormalization group flow equation for the non-linear sigma model in physics (or wave map in mathematics literature) gave us proof of the Poincare Conjecture. The study of vacuum Riemannian Einstein's equations made a significant contribution to the field of complex geometry through Yau's resolution of the Calabi Conjecture. One of the most important aspects (and notoriously difficult) in the study of non-linear PDEs from a physical ground is understanding the notion of singularity or for evolutionary equations, long-time dynamics i.e., whether the smooth solutions of these equations exist for all time or blow up in finite time. Here I will talk about the most recent advances in the study of non-linear evolutionary PDEs as well as my recent work on some of these equations. I will focus on Einstein, Yang-Mills, and incompressible Euler equations. Towards the end, I will discuss how the latter can be cast into a system of geometric PDEs (a type of geodesic equation on an infinite-dimensional Lie group) and how such geometric formulation yields sharp new estimates that is conducive to addressing long-time dynamics and otherwise inaccessible without a geometric formulation.

**Venue** : Offline: Emmy Noether Seminar Room

Online: Please click on the below link to join the seminar

<https://icts-res-in.zoom.us/j/92902870678?pwd=dldIR0UvQkVDaDZiY1lpQ3ZOdXN2Zz09>

Meeting ID: 929 0287 0678

Passcode: 050607