ICTS Astrophysics & Relativity Seminar

Title : 3D Summation-by-Parts scheme for Linear Wave Equations on Hyperboloidal Slices

Speaker : Anuraag Reddy (Indian Institute of Science Education and Research Pune)

Date : Thursday, 19 February 2026

Time : 3:30 PM (IST)

Abstract : Future null infinity is the asymptotic region of spacetime approached by all outgoing radiation traveling at the speed of light. Gravitational waves propagate toward this region and waveform extraction is free from gauge ambiguities only at future null infinity. Therefore, numerical methods that enable direct access to future null infinity are essential for constructing highly accurate waveform models. One approach is to include future null infinity within the computational domain via hyperboloidal compactification. With this idea, a fully three-dimensional Summation-By-Parts (SBP) scheme is developed for linear wave equations posed on hyperboloidal slices on the Minkowski spacetime extending to future null infinity. The scheme is formulated in spherical polar coordinates and is provably stable. A key strength is the ability to incorporate grid points at the origin, along the symmetry (z) axis, and at future null infinity. The numerical implementation employs second-order finite-difference methods, with straightforward extension to higher-order finite-difference or spectral discretizations.

Venue : Feynman Lecture Hall
Zoom Link: https://icts-res-in.zoom.us/j/93233700547?pwd=lcOAkIRwrH8nwaqhXDEOlJ3o9DP8tX.1
Meeting ID: 932 3370 0547
Passcode: 202030