

ICTS Colloquium

Title : Numerical Simulations of Binary Black Holes & Gravitational-Wave Science

Speaker : Prayush Kumar, Cornell University, New York

Date : Wednesday, June 20, 2018

Time : 3:00 PM

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : The discovery of gravitational waves by Advanced LIGO observatories has opened a new window to look through into our Universe. The primary sources for these waves have so far been massive inspiraling binaries of stellar-collapse black holes. Our ground-based detectors are able to observe the last few tens of orbits of these heavy binaries before they merge. These pre-merger orbits are highly relativistic and understanding the non-linearities of this regime requires solving Einstein equations numerically, especially since analytic approximations break down. In this talk I will summarize the methods we use to evolve binary black hole spacetimes in fully nonlinear General Relativity using supercomputers. I will focus on spectral methods that are used for these evolutions by the Spectral Einstein Code (SpEC). I will also summarize the various ways in which these numerical simulations have made possible precision gravitational-wave astrophysics and tests of Einstein's theory of gravity.