

## **ICTS Seminar**

- Title** : Binary black hole simulations: from supercomputers to your laptop
- Speaker** : Vijay Varma, California Institute of Technology, California
- Date** : Thursday, May 16, 2019
- Time** : 3:30 PM
- Venue** : Feynman Lecture Hall, ICTS Campus, Bangalore
- Abstract** : Simulations that numerically solve Einstein's equations are the only means to accurately predict the outcome of the merger of two black holes. The most important outputs from these simulations are the gravitational waveforms, and the mass and spin of the final black hole formed after the merger. The waveforms are used in extracting astrophysical information from detections, while the final mass and spin are used in testing general relativity. Unfortunately, these simulations are too expensive for direct use in data analysis; each simulation can take a month on a supercomputer. Surrogate modeling is a data-driven approach to modeling, that uses machine learning like techniques to interpolate between hundreds of existing simulations. In this talk, I will discuss some recent developments in surrogate modeling, including a new 7-dimensional model that fully captures the effects of precession; the wobbling of the orbit caused when the black holes' spin axes aren't perpendicular to the plane of the orbit. This model reproduces the waveform as well as the final black hole's mass and spin as accurately as the simulations themselves, while taking only a fraction of a second to evaluate on a laptop.