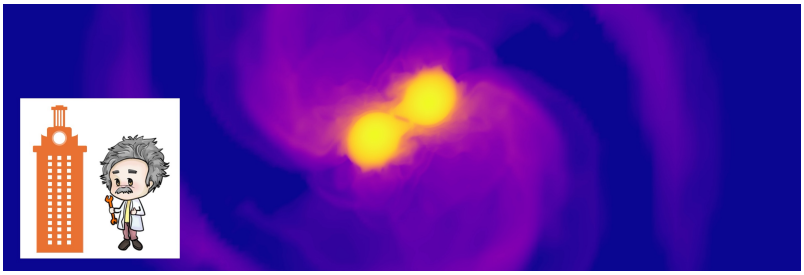

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Neutrino Transport in Binary Neutron Star Mergers with AthenaK

Wednesday 11 June 2025 10:30 (1 hour)

Binary neutron star mergers (BNS) are extraordinary astrophysical events, acting as an important source for the production of a significant fraction of the universe's heavy r-process elements. Neutrinos drive the composition of the ejected matter and play a crucial role in cooling the massive hot remnant formed from the merger of neutron stars, necessitating their accurate modeling in BNS simulations. In this talk, I will describe our efforts to introduce neutrino physics in the numerical code AthenaK. More specifically, I will introduce two approaches – an approximate moment-based approach (M1) and a full Boltzmann treatment with filtered spherical harmonics (FP_N) and finite element methods on geodesic grids (FEM_N), discussing the challenges in solving the full seven-dimensional problem and limitations of the M1 approach. Finally, I introduce a new library for neutrino-matter interaction for use on GPUs.

Presenter: BHATTACHARYYA, Maitraya (Pennsylvania State University)