Inference of proto-neutron star physical parameters in core-collapse supernova from gravitational wave data

The explosion of a massive star in a core-collapse supernova is one of the promising sources of gravitational waves among the variety of astrophysical events known today. It is commonly accepted that a large fraction of the gravitational wave emission can be directly related to the oscillations of the proto-neutron star formed during the collapse. Starting from a universal relation that links the frequency of the gravitational wave with the mass and the radius of the proto-neutron star, we demonstrate that it is possible to infer the time evolution of the proto-neutron star properties from its gravitational wave signal. Using signals generated from 2D simulations of core-collapse supernovae that we inject into the network of interferometers LIGO-Virgo-KAGRA, we show that there is a high probability that we will be able to infer the physical properties of the proto-neutron star in the case of a Galactic event during the next observing runs. I will finally present the prospects for detection with the third generation interferometers Einstein Telescope and Cosmic Explorer.