A Nonparametric Approach to Gravitational-Wave Inference of the Neutron Star Equation of State

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The gravitational waves produced by coalescing neutron stars contain tidal signatures that reveal information about the stars' internal structure, and can therefore be used to infer the unknown supranuclear equation of state (EoS). Existing inference methods adopt a parametric model for the EoS and use gravitational wave data to constrain the parameters. In this talk, I will describe an alternative approach in which the EoS is represented as a Gaussian process conditioned with input from nuclear theory. A nonparametric representation of this kind provides greater flexibility and transparency in setting the prior distribution over viable EoSs, and allows for sophisticated model selection between different features of the nuclear microphysics. An analysis of GW170817 with this novel method yields updated estimates of EoS-dependent source properties like radii and central densities, as well as new constraints on generic properties like the canonical tidal deformability and the maximum mass of nonrotating neutron stars.