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Bayesian study of quasi-universal relations for neutron stars normal modes

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Gravitational wave asteroseismology is a promising approach for studying neutron stars' characteristics and constraining dense matter equation of state (EoS). Several quasi-universal empirical relations have been developed to link the frequencies of normal modes to various stellar properties such as mass and radius. These relations allow us to extract macroscopic information about the stars from a detected signal. However, their universality is typically tested using a small number of distinct nuclear models.

We use Bayesian inference employing the so-called meta-modeling technique to investigate a large set of equations of state that are compatible with astrophysical constraints, nuclear-physics experimental data, and current theoretical estimates from chiral effective field theory. To this aim, we employ a Markov chain Monte Carlo algorithm for the sampling of the posterior with high statistics. The modes are, then, evaluated using the Cowling approximations for all the equations of state making possible to test the universality for a large set of EoS compatible with the aforementioned constraints.

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