Contribution ID: **3** Type: **Talks**

Insights on the neutron star matter equation of state from different model perspectives

Monday 26 January 2026 10:00 (45 minutes)

The composition of the core of neutron stars is still under debate. Agnostic descriptions of the equation of state are a powerful tool to determine the allowed region in the pressure-energy density or mass-radius space defined by observations and theoretical ab-initio calculations. These methods, however, cannot really give information on the neutron star composition. Understanding the microphysics that spanns the regions determined by agnostic descritpions is, therefore, necessary. In particular, we are interested in identifying signatures of the onset of exotic degrees of freedom or quark matter. With the next generation of GW observatories it is expected that the postmerger waveforms will bring information on the equation of state.
We will consider the predictions of agnostic descritpions and discuss how they translate into the possible existence of hadronic and hybrid stars. Microscopic models are used to describe the different phases of matter, including RMF models, chiral symmetric models, and quark models, considering Bayesian inference to determine their parameters. Within these microscopic models, the properties of neutron stars and nuclear matter are calculated and the effect of different compositions of matter are discussed. Different compositions of neutron stars are compatible with current observational data. The implications of possible information on the local derivatives from the mass-radius diagram in neutron star matter are analysed. Some effects of dark matter on the neutron star properties will also be referred. It is expected that the next generation of gravitational wave and electromagnetic detectors will allow the determination of the neutron star radius and mass with a small uncertainty, which will have an important impact on the information that can be extracted about the high density equation of state of baryonic matter. The possible role of machine learning methods to recover the equation of state will be referred.

Author: PROVIDÊNCIA, Constança (University of Coimbra)

Presenter: PROVIDÊNCIA, Constança (University of Coimbra)