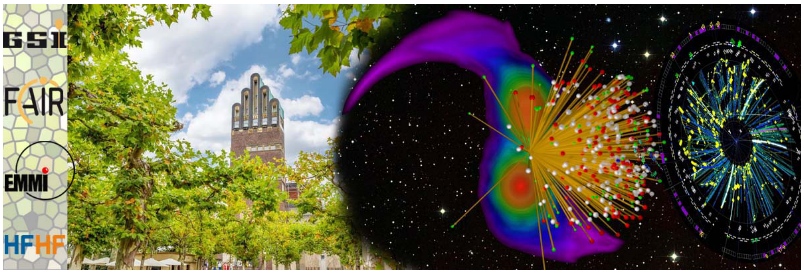

Contribution ID: **70** Type: **Oral**

Multi-messenger astrophysics and the nuclear symmetry energy (online)

Thursday, 21 September 2023 11:30 (30 minutes)

The last few years have seen tremendous progress in multi-messenger observations of neutron stars (NS) that have constrained their global properties such as their masses, radii and tidal deformabilities. These constraints could be used to obtain valuable information on the nuclear symmetry energy. However, in order to do so, we require rigorous theoretical nuclear physics inputs to interpret the data. The main focus of my talk will therefore be the interplay between these theoretical models and experimental NS observations that allow us to infer the nuclear symmetry energy. On the theory side, I will discuss the metamodel- a powerful approach that allows us to model the symmetry energy in a model-agnostic manner as well as chiral effective field theory- the dominant state-of-the-art approach that allows for ab-initio constraints on the low-density equation of state. I will show how an approach that combines the two methods provides stringent constraints on the symmetry energy at relatively low density ($n \leq n_{\rm sat}$). As an offshoot, I will discuss properties of NSs that are directly impacted by the low-density symmetry energy, such as the crust of NSs. Finally, I will show how these theoretical models can be used together with multi-messenger observations, such as gravitational wave and X-ray observations, to probe the symmetry energy at larger densities explored in the inner cores of NSs.

Primary author: SOMASUNDARAM, Rahul

Presenter: SOMASUNDARAM, Rahul

Session Classification: Combined analysis of nuclear and astrophysics information, Bayesian approach, and machine learning

Track Classification: Combined analysis of nuclear and astrophysics information, Bayesian approach, and machine learning