Beitrag ID: **21** Typ: **Talk**

How effectively can Neural Posterior Estimation infer the Neutron Star Equation of State?

Mittwoch, 17. September 2025 17:50 (15 Minuten)

The equation of state (EoS) of neutron star matter encodes the relationship between pressure and density at supranuclear densities, fundamentally governing the star's structure and observable macroscopic properties, such as mass, radius, and tidal deformability. In this work, we apply Neural Posterior Estimation (NPE) with conditional normalising flows to infer the EoS from synthetic observational data. We consider a model-agnostic EoS family and train our models on mock mass-radius and mass-radius–tidal deformability datasets with varying noise levels. We evaluate reconstruction performance in terms of pressure and squared speed of sound across baryonic densities, and quantify the impact of including tidal deformability information. Our results demonstrate that tidal measurements significantly reduce inference uncertainty, particularly for pressure, and confirm that NPE-based models can accurately capture physical constraints. The framework also generalises well to previously unseen EoS parametrisations, highlighting the robustness of the approach for future multimessenger astrophysical analyses.

Autor: CARVALHO, Valéria (Universidade de Coimbra)

Co-Autoren: Prof. PROVIDÊNCIA, Constança (Universidade de Coimbra); Dr. BEJGER, Michał (Nicolaus Copernicus Astronomical Center); Dr. FERREIRA, Márcio (Universidade de Coimbra)

Vortragende(r): CARVALHO, Valéria (Universidade de Coimbra)

Sitzung Einordnung: Talks