Contribution ID: **12** Type: **Poster**

Explainable autoencoder for neutron star dense matter parameter estimation

In this talk we will present a physics-informed autoencoder designed to encode the equation of state of neutron stars into an interpretable latent space. The input polytropic EoS is encoded in the mass, radius, and tidal deformability values of a neutron star. Unlike traditional black-box autoencoders, our approach incorporates additional loss functions to enforce explainability in the encoded representations. This method enhances the transparency of machine learning models in physics, providing a robust proof-of-concept tool to study compact stars data. We will present our results, which demonstrate that the proposed autoencoder not only accurately estimates the EoS parameters and central density/pressure but also offers insights into the physical connection between equation of state and observable physical quantities. We will also discuss implications for ET, thanks to which neutron-star physics will be largely enriched by new GW observations.

Primary authors: Dr DI CLEMENTE, Francesco (INFN, sezione di Ferrara, Italy - University of Houston, USA); SCIALPI, Matteo (INFN - University of Ferrara); BEJGER, Michal (INFN Ferrara & CAMK PAN)

Presenter: SCIALPI, Matteo (INFN - University of Ferrara)

Session Classification: Poster Session

Track Classification: Observational Science (OSB): Div7