Contribution ID: **116** Type: **Oral presentation**

Autoencoder-driven Spiral Representation Learning for Gravitational Wave Surrogate Modelling

We investigate the use of neural networks for surrogate modeling of non-spinning EOB BBH waveforms. Specifically, we use autoencoders to first uncover any underlying structure in the empirical interpolation coefficients and discover a spiral pattern wherein the spiral angle is linearly related to the mass ratio q of the waveforms. We then design a neural spiral module with learnable parameters, which can be added to any fully connected neural network and "informs" the network about the nature of the fitting problem, i.e., about how q is related to the coefficients via a spiral. The proposed spiral module leads to better regression errors as well as to a better mismatch between the surrogate and ground-truth waveforms, compared to baseline models without the addition of this spiral. We finally present a surrogate model for EOBNRv2 waveforms with q ranging from 1 to 8, which can generate millions of coefficients in less than a millisecond on a desktop GPU with median mismatches as low as 10^{-8}.

Primary author: Mrs NOUSI, Paraskevi (Aristotle University of Thessaloniki)

Presenter: Mrs NOUSI, Paraskevi (Aristotle University of Thessaloniki)