Seventeenth Marcel Grossmann Meeting

Contribution ID: **238** Type: **Talk in a parallel session**

A neural networks method to search for long transient gravitational waves

Friday 12 July 2024 17:30 (15 minutes)

I will illustrate a new method to search for long transient gravitational wave signals, like those expected from fast spinning newborn magnetars, in interferometric detector data.
Because of the fast frequency variation of these signals, matched filter techniques used for standard semi-periodic persistent signals are computationally unfeasible.
We explored a different approach by means of machine learning paradigms, with the goal of a fast and inexpensive procedure
We develop a classifier that is able to discriminate between the presence or absence of a signal in time-frequency maps.
To help with the classification task, we also developed a denoiser, i.e., a model able to reduce the noise of the time-frequency map while preserving at best the track of the signal.
We have studied the performance of both networks with simulated colored noise, according to the design noise curve of LIGO interferometers.
Simulated long transient signals from newborn magnetars, have been generated and added to the detector noise.
I will show that the combination of the two neural network models is crucial to increasing the chance of detection.
In addition, I will demonstrate that our method is robust with respect to changes in the exponent of the power law describing the time evolution of the signal frequency.
To conclude, our results highlight the computationally low cost of this method to generate triggers for long transient signals and lay the foundations for further improvements to perform systematic searches.

Author: ATTADIO, Francesca (Roma Sapienza, Virgo group)

Co-authors: Dr PALOMBA, Cristiano (INFN Roma, Virgo group); Dr SERRA, Marco (INFN Roma, Virgo group)

Presenter: ATTADIO, Francesca (Roma Sapienza, Virgo group)

Session Classification: Galactic and extragalactic magnetars: recent observations and theoretical progress

Track Classification: Compact Objects and Stellar Evolution (CO): Galactic and extragalactic magnetars: recent observations and theoretical progress