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Machine Learning for gravitational waves at APC

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Despite the breakthrough discoveries of multiple gravitational wave (GW) events made by the LIGO and Virgo detectors, the exploitation of the gravitational-wave data is still limited by the non-Gaussian transient noises, called "glitches"that contaminate the data and mimic the astrophysical signal. Separate the glitches from the astrophysical signal is a very challenging task, since glitches vary widely in duration, frequency range and morphology. The glitches complex and time-evolving nature make their identification and reduction an ideal case to apply machine learning, and in particular deep learning, algorithms.

At APC we are working on two projects that uses machine learning to ease data analysis acting on the background of the searches.
One project focus on the data taken when a single GW detector is active. In this case it is not possible to use the temporal coincidence in two or more detectors that allows to avoid the contamination by glitches, so these data are not completely assessed. We propose a classifier based on convolutional neural network to separate glitches from the astrophysical signal.
The other project is a denoising autoencoder-based search algorithm dedicated to the search for coalescing compact binaries plunged in real GW detectors data.

In the presentation I'll give an overview of the two projects.

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