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Neural networks for gravitational-wave trigger selection in single-detector periods

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The search for gravitational waves transient sources with LIGO and Virgo is limited by non-Gaussian transient noise artefacts coming from a wide variety of provenances, such as seismic, acoustic and electromagnetic disturbances. The contamination by these "instrumental glitches" can be partially mitigated by requesting temporal coincidence in two or more detectors as their accidental co-occurrence probability is low. When only one detector is operating this strategy cannot be used. During the past science runs, the single-detector time corresponds to a significant amount of observing time and we are focusing on this special condition.

Glitches vary widely in rate, duration, frequency range and morphology. For this reason, the statistical modelling of the non-Gaussian and non-stationary component of the noise has not been feasible, so far. We propose machine learning strategies, and in particular deep learning, to separate the glitches from the astrophysical signal. In this presentation, we show the performances of deep learning algorithms to select triggers and reduce the impact of transient noise during single-detector data taking periods.

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