

Classification of gravitational-wave glitches via dictionary learning

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Abstract. We present a new method for the classification of transient noise signals (or glitches) in advanced gravitational-wave interferometers. The method uses learned dictionaries (a supervised machine learning algorithm) for signal denoising, and untrained dictionaries for the final sparse reconstruction and classification. We use a data set of 3000 simulated glitches of three different waveform morphologies, comprising 1000 glitches per morphology. These data are embedded in non-white Gaussian noise to simulate the background noise of advanced LIGO in its broadband configuration. Our classification method yields a 96% accuracy for a large range of initial parameters, showing that learned dictionaries are an interesting approach for glitch classification. This work constitutes a preliminary step before assessing the performance of dictionary-learning methods with actual detector glitches.

Keywords: gravitational waves, detector characterization, machine learning