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A novel method for the Sky Localisation of Unmodeled Gravitational-Waves using Coherent Null-Energy Maps cleaned with a Spherical Convolutional Auto-encoder

The MLy Gravitational-Wave Transient Burst detection pipeline has entered an advanced stage of development in preparation for its debut in O4. A crucial part of the desired low-latency detection is the rapid generation of Sky Localisation maps in order to allow the opportunity for multi-messenger follow-up. We apply a coherent reconstruction of a linear combination of detectors using the H_+ and $H_\times$ polarisation components of the signal. In the null-energy formalism, we construct coherent statistics to perform a glitch-robust analysis for unmodelled gravitational-wave transients. A combination of this along with the incoherent null-energy can be used, by applying a minimum threshold, to highlight a maximum credible region of source origin. Maps generated using this method can be produced quickly ($<<$1s), as is required for the low latency nature of the pipeline. This method produces a noisy sky map, which is then passed through a denoising autoencoder in order to achieve a clean output. Since such sky localisation maps are spherical, we have utilised spherical Convolutional Autoencoder techniques to achieve this.

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