Noise-robust strategies for continuous gravitational wave searches: Improvements on the SkyHough all-sky search

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Rapidly-spinning non-axisymmetric neutron stars may emit continuous quasi-monochromatic gravitational waves, which can be detected by ground-based interferometers like the current Advanced LIGO and Advance Virgo detectors. The SkyHough pipeline [1, 2] was developed as a noise-robust data analysis procedure to detect such signals, yielding reliable results under the presence of detector artifacts [3]. We present a novel Robust Statistic which benefits from samplings in the parameter space to mitigate the effect of persistent spectral disturbances on the data. It uses the power-mixing Tau statistic introduced by [4], raising the significance of continuous signals above non-coherent background noise. As a second step, we implement an artificial neural network-based algorithm to deliver continuous wave candidates as clusters of points in the parameter space. This results in a significant increase in sensitivity for the SkyHoug pipeline, with no further computational costs after performing the initial setup.

References

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