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Classifier for gravitational-wave inspiral signals in nonideal single-detector data SHASVATH KAPADIA, Univ of Wisconsin, Milwaukee, THOMAS DENT, Albert-Einstein-Institut (Max-Planck-Institut fr Gravitationsphysik), Callinstr. 38, Hannover, Germany, TITO DAL CANTON, NASA Postdoctoral Program Fellow, Goddard Space Flight Center, Greenbelt, Maryland 20771, USA —
Gravitational waves from merging neutron star (NS) black hole (BH) binaries are a high-profile target of LIGO-Virgo searches. However, the sensitivity of templated searches for such signals is limited by "glitches": non-Gaussian noise artefacts in real detector data. These searches typically employ a ranking statistic, such as re-weighted SNR, built from the matched-filter signal-to-noise ratio (SNR) and chi-squared test computed at the time of occurrence of the individual candidate events. We propose instead a Random-Forest multivariate classifier that exploits features from times surrounding each candidate event, as well as properties constructed from two independent searches of the same data: one involving a bank of inspiral templates, and the other involving sine-Gaussian templates. Additional information thus provided to the classifier should significantly enhance its ability to discriminate signals from glitches. Indeed, when evaluated on realistic Advanced LIGO data injected with synthetic NSBH signals, we find that the new classifier detects 1.5-2 times more signals at low false positive rates than re-weighted SNR, without the need to compute the chi-squared test.

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