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Simulating Transient Noise Bursts in LIGO with Generative Adversarial Networks

Friday, November 5, 2021 3:00 PM (20 minutes)

The noise of gravitational-wave (GW) interferometers limits their sensitivity and impacts the data quality, hindering the detection of GW signals from astrophysical sources. Most problematic are transient noise artifacts, known as glitches, that happen a few times per hour and can mimic GW signals. We employ Generative Adversarial Networks (GANs), a state-of-the-art Deep Learning algorithm inspired by Game Theory, to learn the underlying distribution of various glitch classes and to generate artificial populations of glitches. We reconstruct the glitch waveform in the time-domain, providing a smooth input that the GAN can learn. With this methodology, we can create distributions of ˜1000 glitches from Hanford and Livingston detectors in less than one second. This proof-of-concept work will be extended in the future to different hybrid classes of glitches, with the final goal of generating open-source, mock data for better modeling and inclusion in large-scale studies.

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