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Source-Agnostic Gravitational-Wave Detection with Recurrent Autoencoders

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We present an application of anomaly detection techniques based on deep recurrent autoencoders to the problem of detecting gravitational wave signals in laser interferometers. Trained on noise data, this class of algorithms could detect signals using an unsupervised strategy, i.e., without targeting a specific kind of source. We develop a custom architecture to analyze the data from two interferometers. We compare the obtained performance to that obtained with other autoencoder architectures and with a convolutional classifier. The unsupervised nature of the proposed strategy comes with a cost in terms of accuracy, when compared to more traditional supervised techniques. On the other hand, there is a qualitative gain in generalizing the experimental sensitivity beyond the ensemble of pre-computed signal templates. The recurrent autoencoder outperforms other autoencoders based on different architectures. The class of recurrent autoencoders presented in this paper could complement the search strategy employed for gravitational wave detection and extend the reach of the ongoing detection campaigns.

Significance

Demonstrated that a recurrent autoencoder architecture should be explored for any kind of anomaly detection in time-series data

References

https://arxiv.org/abs/2107.12698

Speaker time zone

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