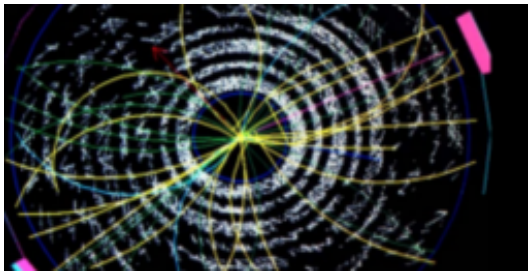

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Deep Learning for Hidden Signals—Enabling Real-time Multimessenger Astrophysics

Monday, 5 June 2017 14:45 (15 minutes)

We developed a new method for end-to-end time-series signal processing, based on deep convolutional neural networks, which can rapidly identify and extract signals much weaker than the background noise. We applied this method for analyzing gravitational waves from mergers of black holes and demonstrated that it significantly outperforms conventional machine learning techniques, is far more efficient than matched-filtering allowing real-time processing of raw big data with minimal resources, and extends the range of gravitational waves that can be detected by advanced LIGO. This initiates a new paradigm for scientific research which uses massively-parallel numerical simulations to train artificial intelligence algorithms that exploit emerging hardware architectures. Our approach offers a unique framework to enable coincident detection campaigns of gravitational wave sources and their multimessenger counterparts.

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