

USING A RANDOM FOREST OF BAGGED DECISION TREES TO RANK-ORDER POTENTIAL GRAVITATIONAL-WAVE EVENTS

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One of the biggest challenges for the LIGO compact binary coalescence group is to develop robust methods for separating signal from background; this is especially important for LIGO, which has yet to detect a gravitational-wave signal. LIGO data is passed through an analysis pipeline, which identifies gravitational-wave event candidates based on their signal-to-noise ratio. After that, we perform a series of follow-ups to help determine the likelihood that this candidate is an actual gravitational-wave event. Multivariate classification methods produce a rank-ordering statistic that takes into account the correlations between the many parameters that describe a candidate event, yielding much improved discrimination between background and (simulated) signals. In particular, a random forest of bagged decision trees produces an extremely powerful statistic.