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Random matrix approach in search for weak signals immersed in background noise

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We present new, original and alternative method for searching signals coded in noisy data. The method is based on the properties of random matrix eigenvalue spectra. First, we describe general ideas and support them with results of numerical simulations for basic periodic signals immersed in artificial stochastic noise. Then, the main effort is put to examine the strength of a new method in investigation of data content taken from the real astrophysical NAUTILUS detector, searching for the presence of gravitational waves. Our method discovers some previously unknown problems with data aggregation in this experiment. We provide also the results of new method applied to the entire respond signal from ground based detectors in future experimental activities with reduced background noise level. We indicate good performance of our method what makes it a positive predictor for further applications in many areas.

Submission history

Which authors of this paper are endorsers?