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Machine learning cosmology from void properties

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Cosmic voids are the largest and most underdense structures in the Universe. Their properties have been shown to encode precious information about the laws and constituents of the Universe. We show that machine learning techniques can unlock the information in void features for cosmological parameter inference. Using thousands of void catalogs from the GIGANTES dataset, we explore three properties of voids: ellipticity, density contrast, and radius. Specifically, we train 1) fully connected neural networks on histograms from void properties and 2) deep sets from void catalogs, to perform likelihood-free inference on the value of cosmological parameters. Our results provide an illustration of how machine learning can be a powerful tool for constraining cosmology with voids.

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