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Title: "Machine Learning in Cosmology"

Abstract:

"Machine learning (ML) algorithms have revolutionized the way we interpret and analyze data in cosmology, as they can help us remove biases due to a priori chosen models. Furthermore, near future surveys like Euclid and LSST will gather vast amounts of data, hence it will be necessary to perform model independent tests to check for possible tensions that could be due to systematics or new physics. Popular ML algorithms include neural networks and genetic algorithms, each with its own strengths and weaknesses and while the former can be used for image or model classifications, the latter are ideally suited for data reconstructions.

The aim of this project is to use ML methods to search the cosmological data for hints of new physics. Concretely, neural networks will be trained on fiducial CMB spectra based on a grid of cosmologies and then using real data from the Planck survey searches will be performed to detect novel physics. On the other hand, current genetic algorithms codes will be extended to take into account as much of the currently available data as possible and then perform joint analysis to constrain the properties of dark energy."