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Perturbation theory emulator for cosmological analysis

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The data from the new generation of cosmological surveys, such as DESI (DESI Collaboration et al. 2022), have already started taking data, and even more will arrive with Euclid (Laureijs et al. 2011) and the LSST of Vera Rubin Observatory (Ivezić et al. 2019) starting soon. At the same time, the classical methods of analysing RSD and BAO with 2-point statistics provide less strenuous constraints than for example a full-modelling analysis (Ivanov et al. 2020). Such an analysis does however require much more computational power.

We present an emulator based on the feedforward neural network which allows us to significantly speed up analytical computations of the 2-point statistics in both Fourier and configuration space (Trusov et al. in prep). Our approach is based on emulating the perturbation theory (PT) quantities, which are later combined with bias terms to produce the non-linear prediction of the 2-point statistics for any galaxy sample. We compare the performance of our approach against publicly available PT codes using mocks based on the AbacusSummit simulations (Maksimova et al. 2021, Garrison et al. 2021), where our tool performs significantly faster without any noticeable loss of precision.

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