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Cosmological Parameter Inference Machine Learning Algorithms with Constrained Cosmological Simulations

The ΛCDM model stands as the prevailing framework in cosmology, yet discrepancies between Cosmic Microwave Background (CMB) and late universe probes underscore incomplete understanding of essential cosmological parameters, like Ωm and $\sigma 8$, which govern matter density and density fluctuations in the Universe. To address the limitations of traditional statistical methods, we have developed a novel set of constrained cosmological simulations known as SLOW. These simulations have demonstrated exceptional precision in replicating observed structures within the Local Universe within a cosmological box of size 500 Mpc/h, rendering them an exemplary testbed for diverse cosmological investigations, including the application of Machine Learning techniques for precise cosmological parameter inference within our Local Universe.

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