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Numerical Cosmology State of the Art

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In order to get a better understanding of the Large Scale Structure, physics must find a way to account for the observable universe components, given the fact that in order to build a theory of the LSS, it needs to include many of the known phenomena such as hydrodynamics, electrodynamics, spacetime curvature, the behavior of baryonic matter, quantum particle dynamics as well as models for the yet to be explained behavior of dark matter and the accelerated expansion of the universe, to mention some of them. The construction of such theory is a difficult task, here is where the numerical cosmology arises, along with the historical computational advances such as machine learning nowadays, more accurate numerical techniques with the increased precision of the data surveys (LSST, CHIME, CMB-S, the 21 cm IM experiments), as a viable and efficient way to keep progressing towards the understanding of the cosmological models. Therefore, it is worth checking the historical progress, a brief recompilation of the numerical cosmological models starting with the BSSN formalism to the up-to-date concepts, techniques, and approaches are shown to summarize the current state of art of numerical cosmology.

Author: SIERRA, Juan (None)

Presenter: SIERRA, Juan (None)