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Boltzmann solvers in the era of cosmological tensions: symbolic implementation of extensions in PyCosmo

Sunday 11 September 2022 16:00 (10 minutes)

In this talk, we will show how the cosmology code PyCosmo, developed by the Cosmology Group at ETH Zurich, can be easily extended to beyond ΛCDM models. We will present how we added dark energy with a constant equation of state and massive neutrinos to the Boltzmann solver of PyCosmo. The possibility to easily extend the equation system is a core feature of PyCosmo, enabled by the SymPy symbolic representation of the equations and is of crucial importance when tensions in the cosmological model indicate the possibility of new physics beyond the standard model. The symbolic expressions are translated into efficient C/C++ code by the sympy2c library. We will show how we compare our results for the different models with CLASS, both in terms of accuracy and computational speed. We find a comparable runtime and good agreement for all models, to better than 0.1% when using high-precision settings.

Presenter: Ms MOSER, Beatrice (ETH Zurich)