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Construction of initial data sets for relativistic cosmology

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In this talk, we will present an analytical and numerical approach for constructing initial data sets of inhomogeneous cosmological spacetimes with a spatial topology of \mathbb{T}^3 . On the one hand, the analytical part is based on a 2+1 decomposition of the so-called constraint equations, which are a set of tensorial equations that determine the initial data in general relativity, to turn them into a certain hyperbolic system. On the other hand, due to the spatial topology and the periodic boundary conditions, the numerical part is built on a Fourier spectral method, which allows to keep a reasonable accuracy in the numerical computations of the initial data components. We test the suitability of our infrastructure against some well-known initial data sets, and we apply it to construct non-linear perturbations of some cosmological spacetimes such as FRW or Gowdy spacetimes.

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