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Introduction to the DESC Bayesian analysis project and to the JAX-cosmo library

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The DESC Bayesian analysis pipeline project recently created aims to coordinate and promote the development of a standardized open source Bayesian Pipeline which ultimately could connect pixels to cosmology. Two subprojects has emerged: one concerning “Pixels to shear” starting from simulated/DC2 images to infer posterior weak lensing shear and convergence fields on the sky (eg. BLISS,...), while the other connect “Shear & LSS to cosmology” throw a Bayesian Hierarchical Model to infer cosmological parameters from tomographic maps of galaxy density and shear using catalogs (eg. BORG, KarMMA,...). This is an extremely challenging task as inference is performed in high dimension while beeing fast & accurate from end-to-end. GPU-accelerated automatically differentiable frameworks will be one keystone of this project. Along this line a small piece is the JAX-cosmo library part of the DifferentiableUniverseInitiative initiated by F.Lanusse et al. JAX-cosmo is a light & proof-of concept equivalent of CCL library written in full JAX (in short an “Autodifferentable-Numpy”) allowing to run code both on CPU & GPU asis. An exercise that will reported has been undertaken to compare different MCMC methods in the context of DES (shear&number counts) Y1 using JAX-cosmo.

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