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Lifting weak lensing degeneracies with field-based inference

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With Euclid and the Rubin Observatory starting their observations in the coming years, we need highly precise and accurate data analysis techniques to optimally extract the information from weak lensing measurements. However, the traditional approach based on fitting some summary statistics is inevitably suboptimal as it imposes approximations on the statistical and physical modelling. I will present a new method of cosmological inference from shear catalogues, BORG-WL, which is simulation-based and uses a full physics model. BORG-WL jointly infers the cosmological parameters and the dark matter distribution using an explicit likelihood at the field level. By analysing the data at the pixel level, BORG-WL lifts the weak lensing degeneracy, yielding marginal uncertainties on the cosmological parameters that are up to a factor 5 smaller than those from standard techniques on the same data. I will discuss the current status and ways to meet the challenges of this approach and compare it to simulation-based inference with implicit likelihoods.

Auteur principal: PORQUERES, Natalia (Imperial College)

Co-auteurs: Prof. HEAVENS, Alan (Imperial College); Dr MORTLOCK, Daniel (Imperial College); Dr LAVAUX, Guilhem (IAP)

Orateur: PORQUERES, Natalia (Imperial College)

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