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# The halo model in the era of precision Cosmology and accurate Astrophysics

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The halo model has become a standard framework to interpret the clustering statistics and the weak lensing signal of dark matter dominated structures, like galaxies or clusters of galaxies. I will review the halo model formalism and discuss how on-going optical wide area surveys like KiDS, DES, HSC and complete spectroscopic surveys like GAMA allow to test in great details some of the main assumptions of the model. I will also discuss how the halo model framework can be extended to account for the fact that the galaxy-halo connection might not only be governed by the halo mass but also by the formation time of halos and how it can be optimised to reproduce the matter power spectrum in highly non-linear regimes, eventually including also effects coming from baryon feedback at small scales.

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