Abstract:
I will talk about my ongoing and planned research based on gravitational lensing by large scale structure. This includes the optimal production of galaxy shape catalogues for weak lensing in the Kilo-Degree Survey (KiDS) where we use image simulations to calibrate biases in the shape measurements of noisy CCD images of galaxies. For the ESA Euclid mission we currently develop a versatile and accurate broad-band model of the Euclid PSF, another key ingredient to every unbiased shape measurement. Mapping the distribution of structure in the sky is the essence of the second project and I will present possible applications. Our latest mass mapping techniques are able to consistently combine mass tracers which reside in different length and wavelength regimes and while doing so optimally adapt to the distribution of input constraints. The morphological interpretation of such optimal mass maps defines the third branch of my research. Classical approaches to characterise structure on various scales involve e.g. 2-pt correlation functions on wide fields or parametrised functional forms of a radial density profile of single haloes, which potentially oversimplify the information contained in state-of-the-art observations. Here, I will showcase a purely data-driven approach to characterised structure which derives from visual pattern recognition. This results in less data compression and superior sensitivity to the underlying model of structure formation, but comes at the price of a full dependence on numerical simulations for calibration.