# Unknown Unknowns: Hybrid machine learning and template based photometric redshifts

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## Abstract

Wide-area imaging surveys are one of the key ways of advancing our understanding of cosmology, galaxy formation physics, and the large-scale structure of the Universe in the coming years. These surveys typically require calculating redshifts for huge numbers (hundreds of millions to billions) of galaxies - almost all of which must be derived from photometry rather than spectroscopy. In this talk we discuss recent work improving machine learning photometric redshift estimates when the test data set has a dramatically different colour-magnitude distribution than the training data. We also discuss different methods to combine the machine learning based photometric redshifts with template based photometric redshift methods. These developments are illustrated using data from deep optical and near infrared data in two separate deep fields, COSMOS and XMM-LSS. We will also highlight our research into the quantification of "unknown unknowns" with hierarchical Bayesian models, as well as how our machine learning research in astronomy is having an impact in other areas of physics and industry.
Video: https://youtu.be/dXpsGzH5Wq8
Poster: in PDF

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