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Photometric redshifts for high-z quasars in the era of LSST

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Though only making up 0.1% of all known quasars, high redshift (z>5) quasars are vital to understanding the formation and evolution of galaxies, the growth of supermassive black holes, and the changing ionisation state of the early Universe. The Vera Rubin Observatory Legacy Survey of Space and Time (LSST) is expected to increase the number of known high-z quasars from ~1000 to 10,000, enabling precise quantification of their evolutionary parameters. However, conventional methods for identifying high-z quasars are prone to high false-positive rates and require resource-intensive spectroscopic follow-up; more efficient methodologies are needed for the upcoming influx of data from LSST.

We introduce a robust approach to identifying and characterising high-z quasars via optical and infrared spectral energy distribution (SED) fitting, with an emphasis on reliable photometric redshifts. Our method will combine LSST photometry with infrared (1-4 microns) photometry from VISTA surveys including VHS, VIKING, VIDEO and VEILS (http://casu.ast.cam.ac.uk/vistasp/overview) and WISE. We present results using optical photometry from DECAM Legacy Survey and Subaru HyperSuprime-Cam Subaru Strategic Program as proxies for LSST. We use the parametric quasar model from Temple et al. 2021 to characterise quasar candidates by redshift, host galaxy contribution, intrinsic reddening, and luminosity. We also present an updated empirical model for intergalactic hydrogen absorption. By comparing SED fits between quasar, foreground galaxy, and foreground galactic star models, we estimate and reduce rates of foreground contaminates. This methodology shows promise in identifying high-z quasar candidates and measuring reliable redshifts and properties of these objects, presenting an efficient avenue for studying quasars in the early Universe from the first data release of LSST.

Funding request, please specify

I am requesting for my registration fee for the meeting (€150) to be waived. I am a second-year PhD student with a limited travel budget from my funding body meant to cover all conferences and meetings over the course of my program. Assistance paying for the registration fee would help me afford this meeting and allow me to attend more in the future. Thank you for your consideration.

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