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The First High-z Quasar Hunt with Euclid

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Luminous high-z quasars provide direct probes of the buildup of supermassive black holes, the primeval massive galaxies hosting them, and the intergalactic medium during the epoch of reionization. Despite its extraordinary capabilities, a significant challenge remains: the lack of quasar samples at redshift larger than 7. The Euclid space telescope offers a promising avenue to enrich our quasar samples at redshifts around 7 and to explore the unknown regime at z>7.5. The key to finding these quasar samples among the countless sources in the deep, wide Euclid survey is to select and confirm the candidates much more effectively.

In this talk, I will introduce the first result of Euclid high-z quasar search and the methodology used to select the candidates. Our candidate selection method is grounded in Bayesian probability and density estimation with extreme deconvolution. In the density estimation, we incorporate a new generative model for quasar spectra, which is based on a new compilation of low redshift NIR quasar spectra, and integrate the photometric data from WISE and radio survey to boost the efficiency. The subsequent task involves rapid follow-up confirmations using large, ground-based telescopes, for which we have developed a simulation tool to minimize required exposure times and refine observational strategies. Our first follow-up observation is completed in July 2024. Three new high-z quasars were discovered in just 200 square degrees of the Euclid wide survey. In this talk, I will present the preliminary results and show the lessons we have learnt so far.

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