NASSP MSc project 2024
North West University

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Lyman-break galaxies around a population of hyper-luminous, obscured, extremely red quasars.

Problem statement: Hyper-luminous quasars, which reside in environments characterized by galaxy mergers and high rates of gas accretion, are often associated with high-density regions. Several studies have observed overdensity around different kinds of luminous quasars, while others have identified under-density environments. However, no such studies have been conducted for cases of extremely red quasars (ERQs).

The project: ERQs a population of hyper-luminous quasars with extremely red IR-to-optical colors identified by combining SDSS and WISE (Ross et al. 2015). Assef et al. (2022) posits that extremely luminous quasars start as hot dust obscured galaxies (Hot DOGs) and then evolve to ERQs on their way to becoming a regular type 1 quasar by removing gas and dust. Unfortunately, no ERQ has been targeted to study such aspects, hence it is impossible to place them in the context of the studies of environments of radio galaxies, quasars and Hot DOGs reported in the literature (see Fig. 1; Zewdie et al. 2023). It is therefore crucial to study the evolutionary state of the environment of ERQs and to probe the role the environment plays in the formation of these extremely luminous AGN. To achieve this goal, we propose searching for Lyman-break galaxies (LBGs) around ERQs using deep Magellan/IMACS imaging in g, r, and i-bands, to better characterize the richness and evolutionary state of the environment. Hence, this project serves as a pilot study, and we plan to extend similar surveys to a large number of ERQs and follow up on bright LBG candidates. The MSc student will learn photometric data reduction and analysis (Python, SExtractor, ds9), and the project will be considered based on the candidate's interest, expecting to lead to a paper.

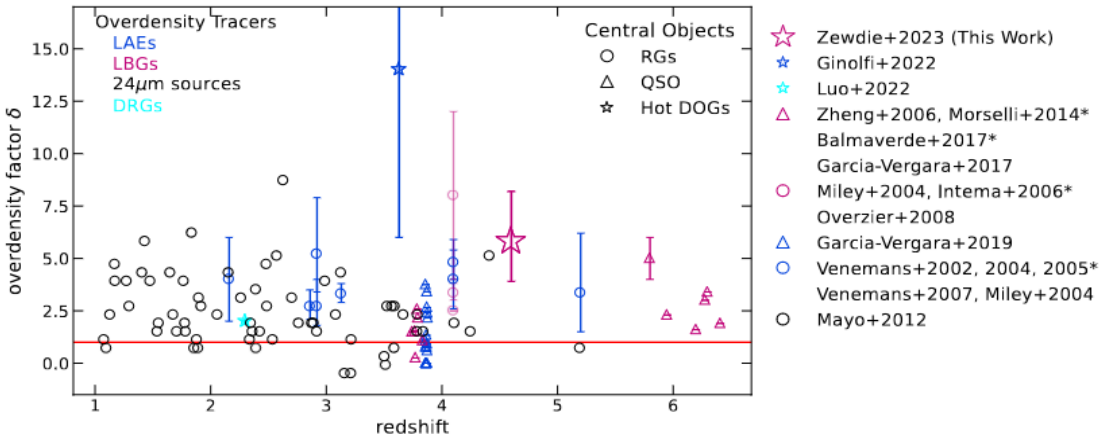

Figure 1. Adopted from Zewdie et al. (2023) the overdensity around high redshift radio galaxies, quasars, and Hot DOGs as a function of redshift.