# Cosmic Evolution of Nearby Radio Active Galactic Nuclei

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## Abstract

Understanding massive galaxy formation is one of major quests in modern astrophysics. Radio emission from active galactic nucleus (AGN) is known to be suppressing stellar growth in the most massive galaxies, thus becoming significant ingredient in modeling galaxy formation process. Radio luminosity function at different cosmic redshifts can be used to measure the evolution of radio AGN, while also providing constraints on galaxy evolution models **[5]**.

In this work, we derived the GHz radio luminosity function for radio AGN at . The radio data was taken from deep VLA observation of Stripe 82 field at angular resolution of " and Jy sensitivity **[2]**. On the other hand, the optical/near-infrared data was taken from Dark Energy Survey DR1 observation in bands with co-added catalog limiting magnitude of **[1]**.

We estimated the photometric redshift (photo-) of each sources by using combined two machine learning algorithms: neural networks and boosted regression trees **[4]**. We successfully performed accurate photo- measurement with average bias , scatter and outlier fraction .

By using $1/V\_{\rm max}$ method, we calculated the luminosity function, then constrained the the evolution of this population via pure density evolution (PDE) or pure luminosity evolution (PLE) model **[3, 5]**. At median , we found the power-law index of PDE is while for PLE is .

Our result is consistent with previous studies and gives better constraint to radio AGN luminosity and density evolution power-law indexes due to larger number of sources (6900) and wider covered sky fraction (92 deg).

## Notes

1. **Photometric bias**, , where and are the photometric and spectroscopic redshift of the galaxy, respectively.
2. **Photometric scatter**, , represents the standard deviation of for a collection of galaxies.
3. **Outlier fraction** of the bias distribution, , defined as the percentage of objects which have a bias larger than some factor, , of .
4. The function to fit is Equation 1 in Smolcic et al (2017). Also, see Table 2 to compare the measured power-law indexes.

## References

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