

RAD@home RGB-maker web-tool for citizen science research in multi-wavelength study of AGNs with radio jets

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Abstract. The RAD@home RGB-maker Tool is a python-based web application that enables citizen science research through collaboration using open-source technology. The tool fetches FITS image data from NASA SkyView and generates false colour images in Red-Green-Blue channels with contour. This helps in the basic multi-wavelength understanding and characterization of extragalactic objects, and further analysis along with reporting of potential new discoveries in a uniform format. Students from Universities or science-graduate citizens gain skills in RGB-C image analysis and identify unique features in objects via either one-day online-weekend events or week-long in-person training. Trained citizen scientists in turn are part of rare discoveries such as the jet-galaxy interaction system RAD12. The tool has been successfully used by thousands of citizen scientists in India since its launch on 26th January 2021 and has demonstrated the potential during IAU symposium 375 to be part of citizen science efforts with international participants.

Keywords. Galaxy: evolution, radio continuum: galaxies, methods: data analysis

1. Introduction

Modern citizen science research in astronomy shares the processed data from telescopes with the public via websites, to simply classify the astronomical objects and report any unusual features. This often lacks one-to-one interaction between astronomers and citizen scientists. RAD@home (launched on 15th April 2013) in addition to providing data to the public, also trains them (science students or alumni of any University) through interactive sessions (online and in-person workshops) to discover interesting objects from large image files and then report them for follow-up observation or direct publication (e.g. [Hota et al. 2016](#)).

2. Summary

The RAD-**RGB** maker web-tool[†] uses data from surveys, like DSS2 IR-R-B (optical), WISE22-DSS2 R-GalexNUV (Infrared-Optical-Ultraviolet or IOU), and TGSS-DSS2R-NVSS (Radio-Optical-Radio or ROR) in Red-Green-Blue channels respectively with radio data in contours. Using these RGB-C images citizen scientists develop skills to identify the host galaxies of radio sources and further classification of radio emissions, which can be diffuse, compact or extended radio galaxies (FRI, FR II, DDRG, WAT, etc.).

† <https://radathomeindia.org/rgbmaker>

The tool also helps in the uniform reporting of unusual objects with additional multi-wavelength characterization from open databases and literature. Building on the pre-discovery reports of such unusual objects, the Collaboratory then submits proposals to suitable telescopes for follow-up observations. One recent example is the discovery of RAD12 where the radio jet from one galaxy is interacting and most plausibly bouncing back from the companion ([Hota et al. 2022](#)).

References

- Hota, A., Konar, C., Stalin, C. S., et al. 2016, *JA&A*, 37, 41.
Hota, A., Dabhade, P., Vaddi, S., et al. 2022, *MNRAS* (Letters), 517, L86.