

# RadioCAT: Detection Pipeline and Catalogue of Radio Galaxies in EMU Pilot Survey

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We present source detection and catalogue construction pipelines to build the first catalogue of radio galaxies from the  $270 \text{ deg}^2$  pilot survey of the Evolutionary Map of the Universe (EMU-PS) conducted with the Australian Square Kilometre Array Pathfinder (ASKAP) telescope. The detection pipeline uses Gal-DINO computer-vision networks (Gupta et al. 2023a) to predict the categories and bounding boxes for radio galaxies, as well as their corresponding infrared host galaxies. The Gal-DINO network is trained and evaluated on approximately 5,000 radio galaxies and their hosts, encompassing both compact and extended morphologies. We find that the Intersection over Union (IoU) for the predicted and ground truth bounding boxes is larger than 0.5 for 99% of the galaxies on the evaluation set. The catalogue construction pipeline uses the predictions of the trained network on the cutouts of the radio and infrared images based on the `selavy` catalogue components. Confidence scores of the predictions are then used to prioritize `selavy` components with higher scores and incorporate them first into the catalogue. This results in a total of 211,625 radio galaxies, with 201,211 classified as compact galaxies. The remaining 10,414 are categorized as extended radio galaxies, including 582 FR-I, 5,602 FR-II, 1,494 FR-x (uncertain whether FR-I or FR-II), 2,375 R (single-peak resolved) galaxies, and 361 with peculiar morphologies. We cross-match the radio galaxies in the catalogue with the infrared and optical catalogues, finding photometric redshifts for 36% of the galaxies. The EMU-PS catalogue and the detection pipelines presented here will be used towards constructing catalogues for the main EMU survey covering the full southern sky.

## keywords

source finding, cross-matching, machine learning, AGN

## In-person or online?

unsure

## Career level

ECR

**Primary authors:** GUPTA, Nikhel (CSIRO Space & Astronomy); Prof. NORRIS, Ray (CSIRO Space & Astronomy); Prof. HOPKINS, Andrew; HUYNH, Minh; Dr HAYDER, Zeeshan

**Presenter:** GUPTA, Nikhel (CSIRO Space & Astronomy)

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