



Contribution ID: 79

Type: Oral Presentation

ASGARD: A deep neural network for the detection of compact sources, extended galaxies, and sidelobes in radio astronomical maps

Source finding is one of the most challenging tasks in upcoming radio continuum surveys with SKA precursors, such as the Evolutionary Map of the Universe (EMU) survey of the Australian SKA Pathfinder (ASKAP) telescope. The resolution, sensitivity, and sky coverage of such surveys is unprecedented, requiring new features and improvements to be made in existing source finders. Among them, reducing the false detection rate, particularly in the Galactic plane, and the ability to associate multiple detected islands into physical objects. To bridge this gap, we developed a new source finder, based on the deep learning Mask R-CNN framework, capable of both detecting, classifying, and segmenting/masking compact sources, radio galaxies, or imaging sidelobes in radio images. The model was trained using ASKAP data, taken during the Early Science phase, and previous radio survey data. The final model achieves Reliability (Precision) above 66% and Completeness (Recall) above 86% on sources and galaxies. This results in an F1 Score of 0.75 across all object classes.

Main Topic

Deep learning

Secondary Topic

Data preparation, generation and augmentation

Participation mode

In person

Primary author: MAGRO, Daniel (University of Malta and INAF)

Co-authors: Dr RIGGI, Simone (Istituto Nazionale di Astrofisica (INAF)); DEMARCO, Andrea (University of Malta); Prof. ZARB ADAMI, Kris (University of Malta, University of Oxford, INAF); SORTINO, Renato (Istituto Nazionale di Astrofisica (INAF)); PINO, Carmelo (Istituto Nazionale di Astrofisica (INAF)); BORDIU, Cristobal (Istituto Nazionale di Astrofisica (INAF)); CECCONELLO, Thomas (University of Milano-Bicocca); SCIACCA, Eva (Istituto Nazionale di Astrofisica (INAF)); Mr FIAMENI, Giuseppe (NVIDIA); UMANA, Grazia Maria Gloria (Istituto Nazionale di Astrofisica (INAF)); INGALLINERA, Adriano (Istituto Nazionale di Astrofisica (INAF)); BUFANO, Filomena (Istituto Nazionale di Astrofisica (INAF)); SPAMPINATO, Concetto; Dr VIZZARI, Giuseppe (University of Milano-Bicocca); VITELLO, Fabio Roberto; BECCIANI, Ugo (Istituto Nazionale di Astrofisica (INAF)); COLLIER, J.D.; MARVIL, J; MICHALOWSKI, M. J.; HOPKINS, Andrew (Macquarie University)

Presenter: MAGRO, Daniel (University of Malta and INAF)

Session Classification: SKA and Precursors