

Self-Supervised Learning for MeerKAT Images

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Self-supervised techniques which leverage very large datasets have become standard in computer vision research, yet they are only now being applied to astrophysics. A major limitation is the characteristics of the data. In radio astronomy, flux values span a large dynamic range, and even the reduced size of the data in the image plane can be much larger than is typically used in computer vision problems.

This work addresses the simplified problem of radio continuum images, as observed or simulated to be observed by the SKA precursor MeerKAT. We experiment with various preprocessing steps, augmentations, and architectures to determine the optimal self-supervised learning approach for this type of data.

Our goal is to demonstrate that such techniques can produce meaningful embeddings which can serve as a starting point for many common data analysis tasks. Specifically, we examine object detection for continuum source detection, and similarity search.

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