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Morphological classification of radio sources in star-forming regions

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Radio continuum emission at centimeter wavelengths is found in association with young stellar objects (YSOs) throughout all stages of star formation, from deeply embedded Class 0 protostars to pre-main sequence Class III objects and thus, radio observations provide crucial insights into the formation and evolution of stars. In this work, we present a new approach implementing machine learning techniques for morphology classification of radio sources in star-forming regions, using data obtained from the Very Large Array (VLA).
Our study focuses on the development of a model for image classification aimed at determining the morphology of radio sources within these regions. We employ Stochastic Gradient Descent (SGD) as the classifier due to its efficiency and scalability with large datasets. Preliminary results demonstrate promising performance in classifying the morphology of radio sources based on VLA observations.
Furthermore, we discuss the ongoing efforts to enhance the model's capabilities by incorporating additional observations with higher angular resolution. As part of our future work, we also expect to integrate more information, such as the radio spectral index, and consider the emission at other wavelengths, since the classification based only on morphology can be ambiguous due to the coexistence of different radio emission mechanisms. The inclusion of more datasets and additional information is expected to improve the model's accuracy and robustness in morphology classification, providing deeper insights into the complex structures within star forming regions.

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