Source detection through semantic segmentation with convolutional neural networks

Maxime Paillassa*[1,2], Emmanuel Bertin[3], and Herve Bouy[4]

[1]Division of Physics and Astrophysical Science, Graduate School of Science, Nagoya University – Japan
[2]Laboratoire dÁstrophysique de Bordeaux [Pessac] – Université de Bordeaux, Institut national des sciences de lÚnivers, Centre National de la Recherche Scientifique : UMR5804, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut National des Sciences de l'Univers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚnivers, Institut national des sciences de lÚniv

national des sciences de lÚnivers, Institut national des sciences de lÚnivers – France

Abstract

The upcoming wide-field imaging surveys are expected to gather unprecedented amounts of data. Thus it is essential to have at our disposal efficient and reliable, fully automated image analysis tools. In particular, source detection is crucial for many subsequent astrophysical studies. We present a new source detection method based on semantic segmentation with convolutional neural networks (CNNs). Our CNN detector is trained to identify source footprints at the pixel level in different output maps so that individual objects can be retrieved through connected component analysis. We build training data using cosmological simulations to incorporate a wide diversity of galaxies in the images. We compare the performance of the CNN to that of the SExtractor detector and show that it reaches better completeness at any given reliability threshold. We also show that the CNN detector can be made robust to the presence of contaminants in images by using the appropriate training dataset.
Slides: in PDF
Video: https://youtu.be/D1QVKQrasgw

Keywords: Source detection, Convolutional neural networks, Large scale surveys

*Speaker