

StarbugII - A JWST PSF photometry tool optimised for complex crowded fields

The stunning high-resolution images from JWST are often dominated by complex backgrounds and diffuse emissions from interstellar dust. In these complex regions, source detection and photometry can pose significant challenges for which many established tools developed for optical and/or ground-based observatories were not designed to handle. Additionally, we now see our stellar surveys littered with background galaxies and a myriad of faint sources that were previously lost to background noise. This unprecedented depth and sensitivity require our photometry tools to be optimised for these complex fields.

StarBugII is a new photometry tool written around an astropy-photutils core, optimised for the NIRCam and MIRI images from JWST. It contains a suite of routines with tunable parameters and a simple interface. Using an ensemble of background subtraction techniques, StarBug detects the sources in a range of environments and removes likely non-stellar objects. The source list can be used as is or improved with background estimation and PSF photometry and artificial star testing. The code accommodates catalogue matching between exposures, JWST pipeline calibration stages, filter bands and imaging instruments.

We have used these tools on JWST data of NGC346 and NGC 6822, recovering upwards of 10 times the number of sources that the JWST stage three pipeline does.