Improving Signal to Noise in the Direct Imaging of Debris Disks with MLOCI

Zahed Wahhaj[1]

[1]*European Southern Observatory, Chile*

We present a new algorithm designed to improve the signal to noise ratio (SNR) of point and extended source detections around bright stars in direct imaging data. One of our innovations is that we insert simulated point sources into the science images, which we then try to recover with maximum SNR. This improves the recovery SNR of real point sources elsewhere in the field. The algorithm, based on the Locally Optimized Combination of Images (LOCI) method, is called Matched LOCI or MLOCI. Earlier we showed with Gemini Planet Imager (GPI) data on HD 135344 B and Near- Infrared Coronagraphic Imager (NICI) data on several stars that the new algorithm can improve the SNR of point source detections by 30-400% over past methods (Wahhaj et al. 2015). Here, we discuss the MLOCI reduction of the NICI data for the HD 32297 debris disk. The debris disk is recovered with improved signal to noise by a factor of 3, and detected as close to the star as $0.3''$ (33 AU). We discuss new features found in the disk and their physical implications.