# Deblending

### LSST/Euclid data sprint

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PARIS DIDEROT

### A lot like HSC data (<u>hsc-release.mtk.nao.ac.jp/hscMap2/</u>) !



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## An issue for LSST

### Why is it an issue?

- Order 50% of galaxies are blended by a star or another galaxy
- Depends on the definition of "blended"
- Affects both photometry and shapes
  - $\Rightarrow$  deblend or increase error bars by  $\sqrt{2}$  (and bias?)



### Why is it hard?

- Modelling morphology+colors of objects
- Success metric non-unambiguously defined

## **Existing deblenders**

- SExtractor : segmentation via thresholding
- SDSS deblender : symmetry constraint, only one band
- Inpainting techniques (Zhang+15, Connor+17)
- MuSCADeT (Joseph+16) : source separation with sparse spatial constraint
- SCARLET (Melchior, Moolekamp+18)





- symmetry and monotonicity constraints on A<sub>k</sub>
- bS-DMM constrained minimization
- uses all bands
- $\lambda$ -dep PSF + correlated noise

• new methods : full deep-learning techniques

## **Deblending with deep neural networks**

### Deblender based on auto-encoders for single galaxies

(Arcelin, Doux, Roucelle, Aubourg)

• COSMOS parametric+noisy images



Multi-band (*ugrizy*) noiseless + multiple blends



## **Ground** + space

### LSST + Euclid

- Euclid's high space resolution
  - undetected blends (Dawson+16)
- Euclid near IR band
- joint photo-z's + shape measurements
  - see Alex, Robert and Matt's talks



HSC

HST



### **Ground + space**

DES data - Peter Melchior's slides

### **Ground + space**

CLASH WFC3/IR data - Peter Melchior's slides