Optimization of Multi-band Galaxies Cataloguing

Description of the Data Management Pipeline

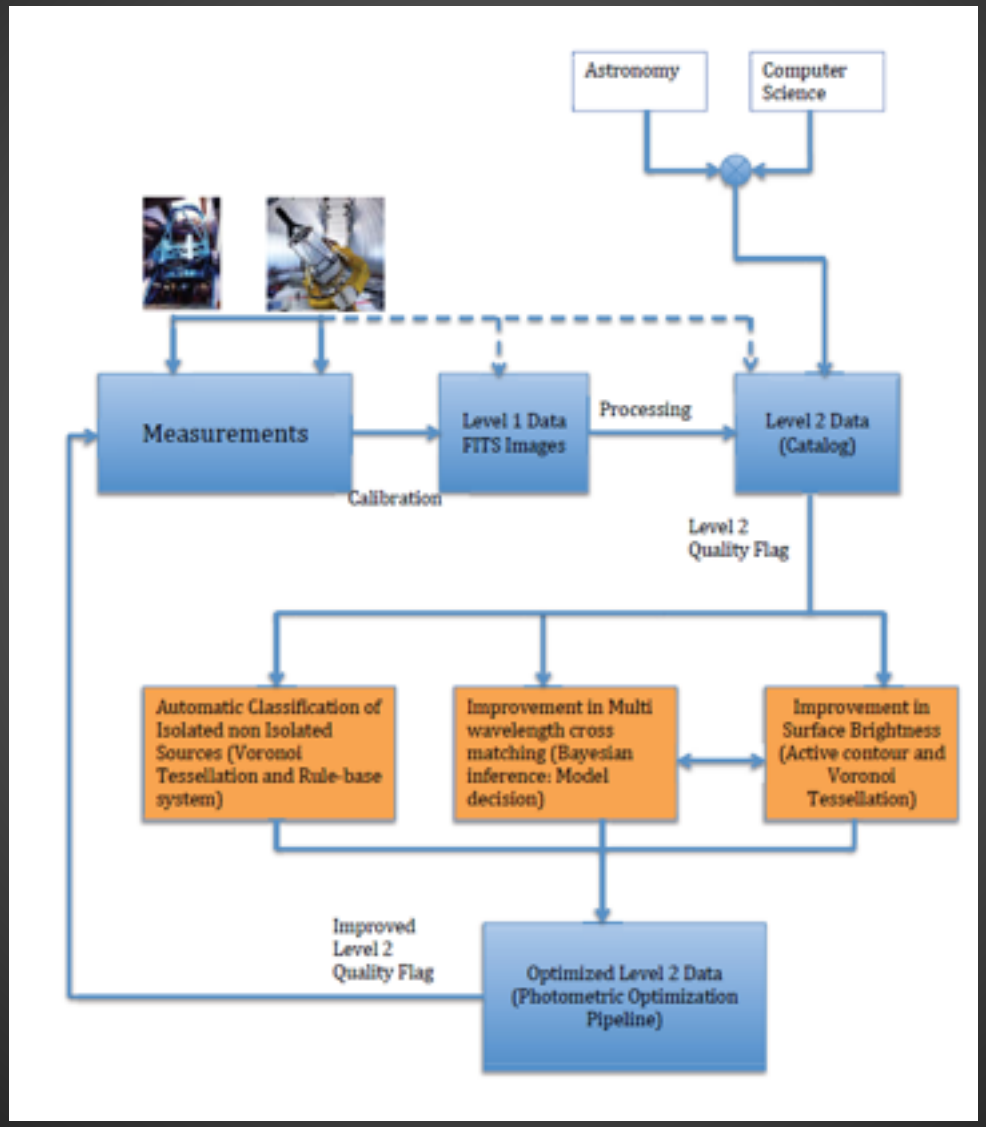
Introduction

- Problem Description: objectives
- Astronomical Data Management: A New Pipeline for Galaxies Classification.
  - ➢ Development Methodology
  - ➢ Validation of the Pipeline
- Summary of Relevant Results
- Conclusions

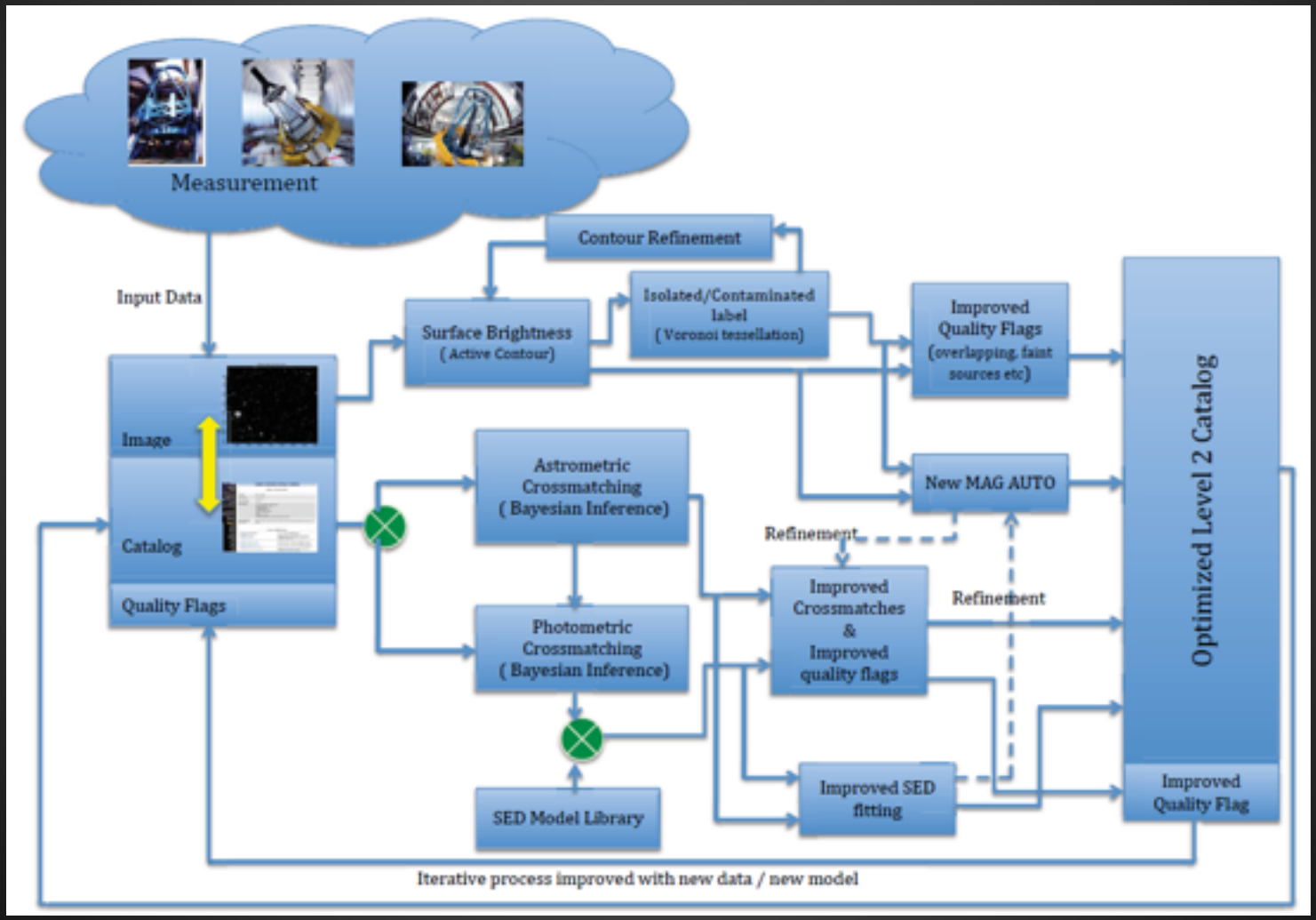
Problem Description: Objectives

- To improve the quality and effectiveness of the identification of the same astronomical source across multiple wavelength image exposures with crowded populations. → Bayesian Inference
- To improve the effectiveness and accuracy of the surface brightness computation of extended astronomical sources from any kind of astronomical FITS image. → Active Contour
- To create an effective automatic classification system of isolated versus non-isolated astronomical sources of diverse catalogues and FITS images. → Voronoi

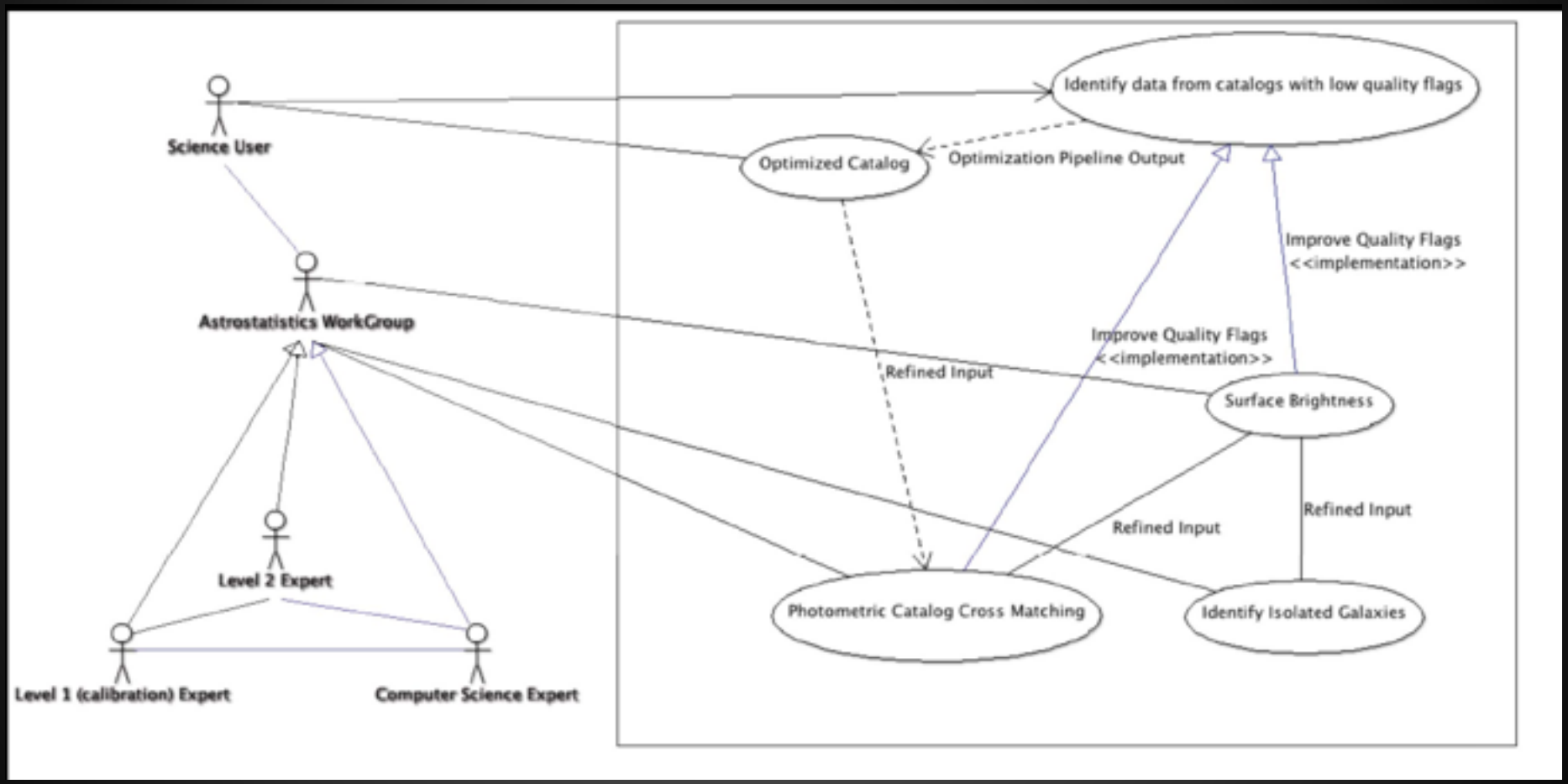
Description of the Pipeline (I)



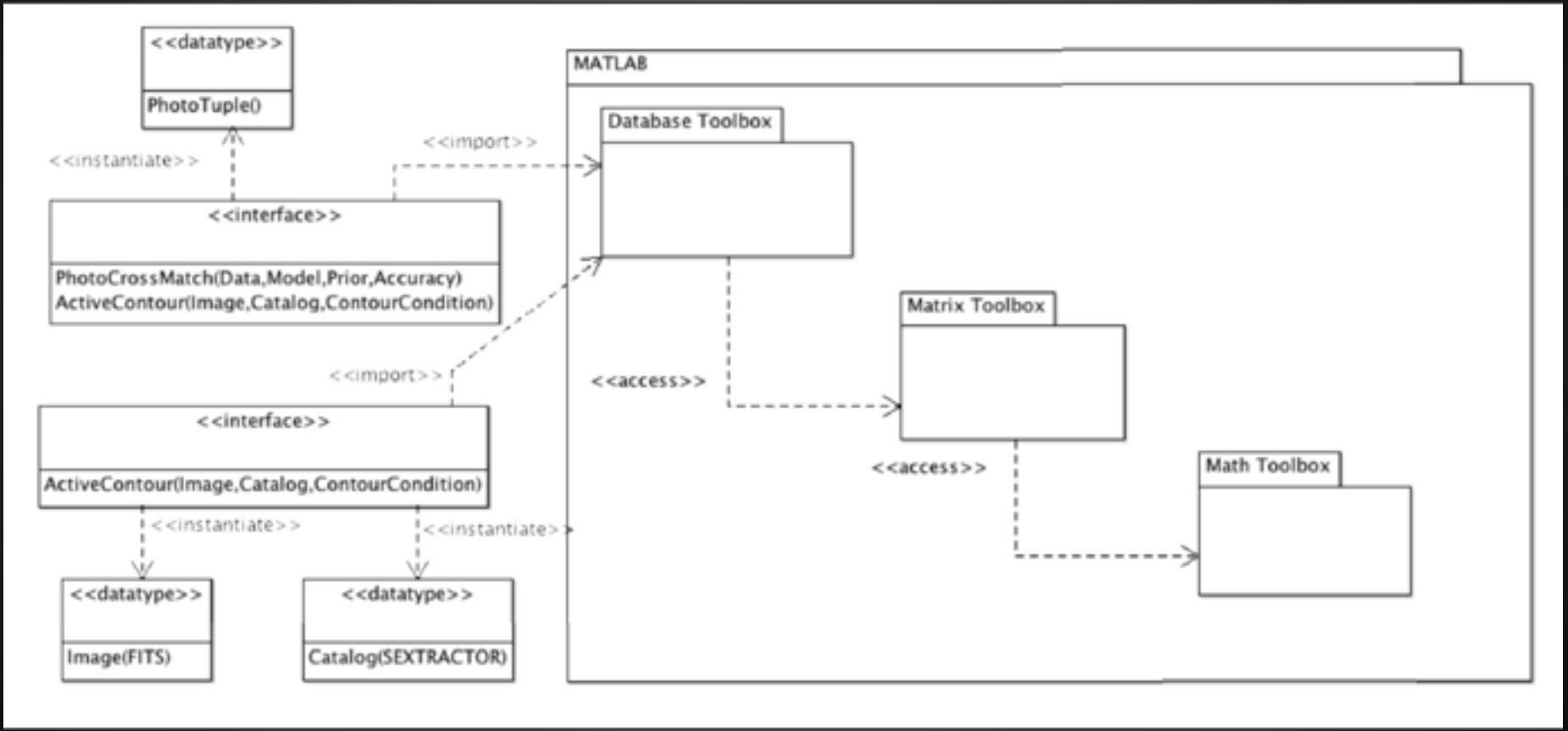
Description of the Pipeline (II)



Development Methodology (I)

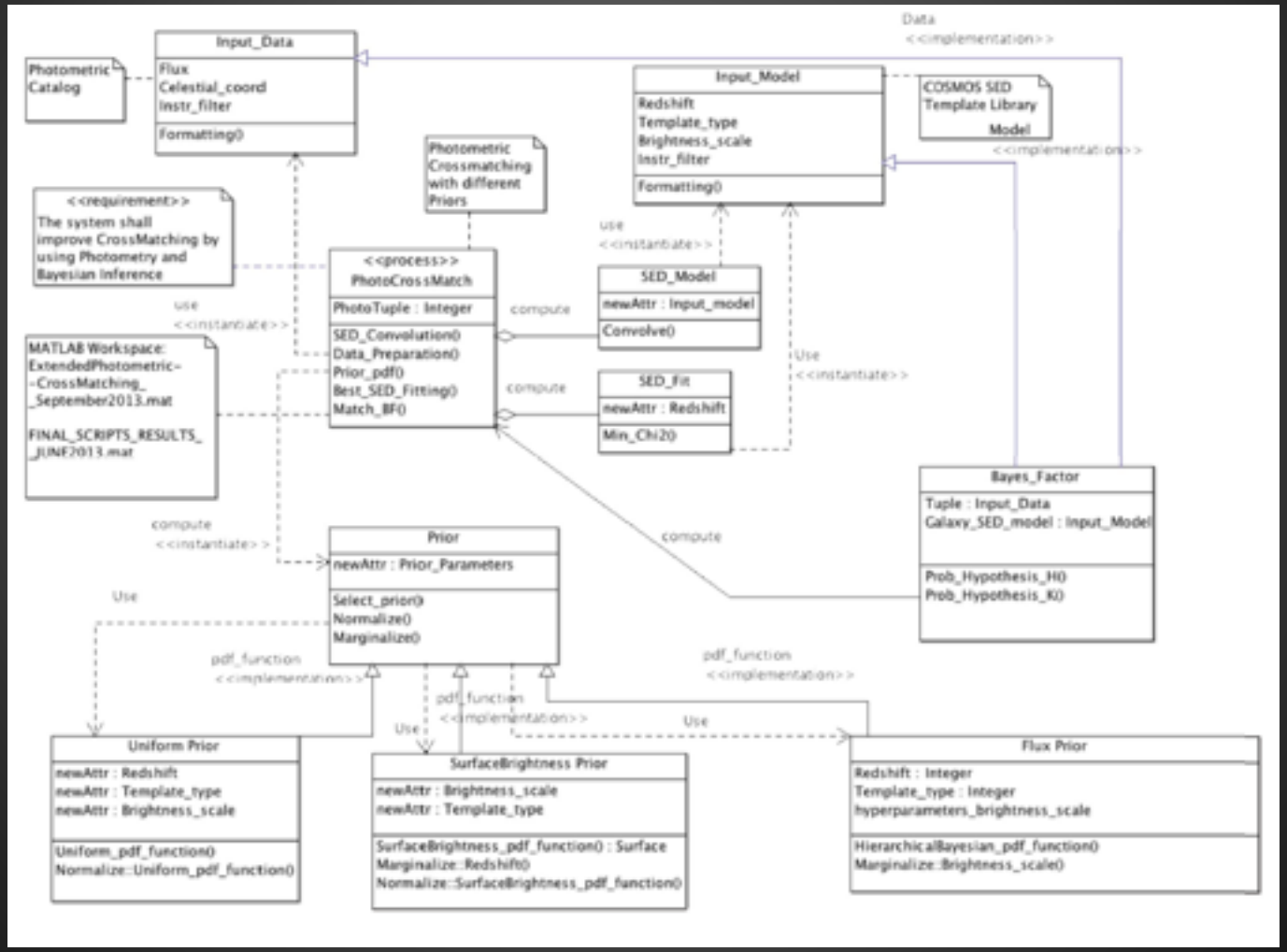


Development Methodology (II)



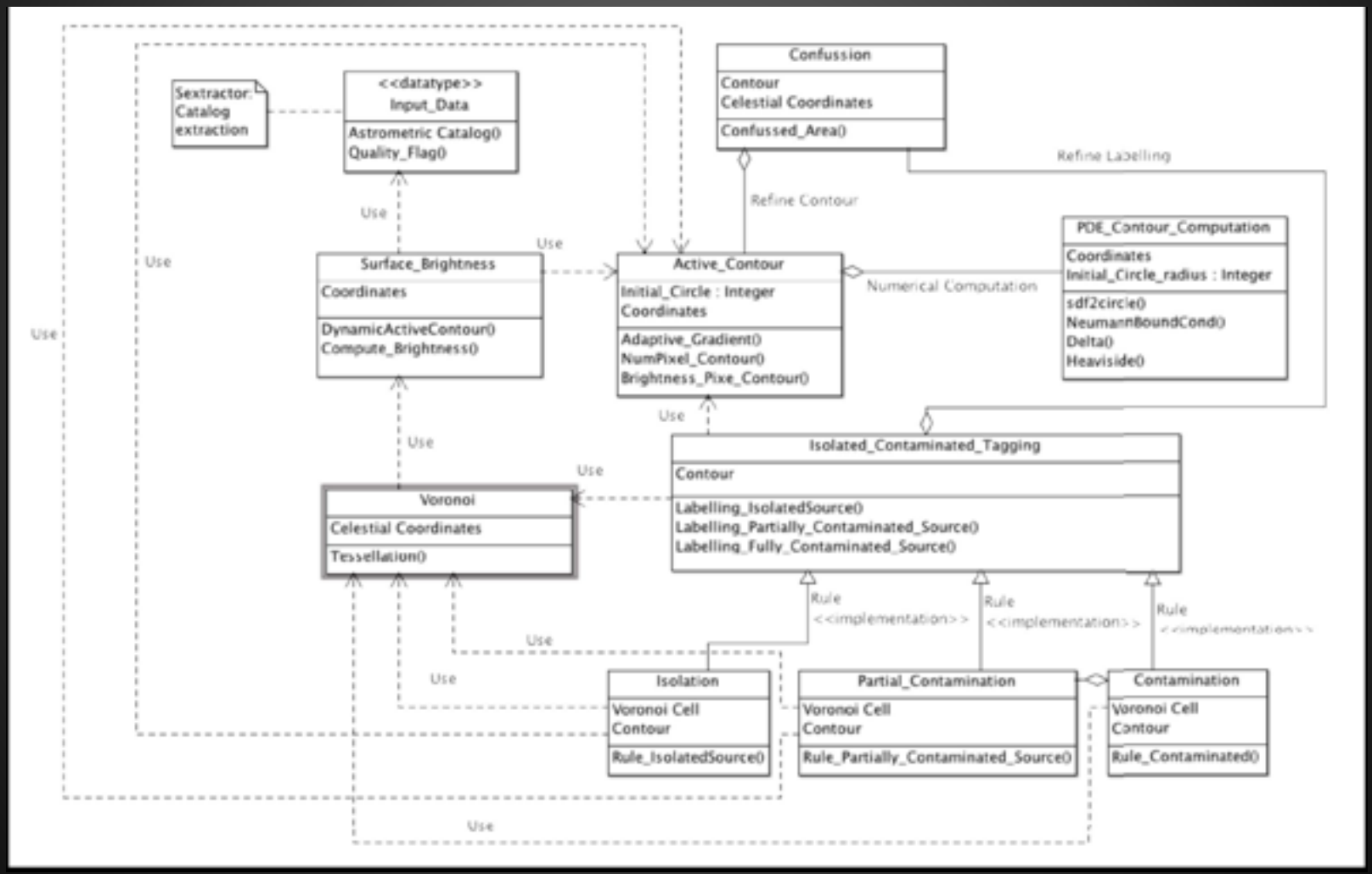
Development Methodology (III)

Photometric Cross-Matching

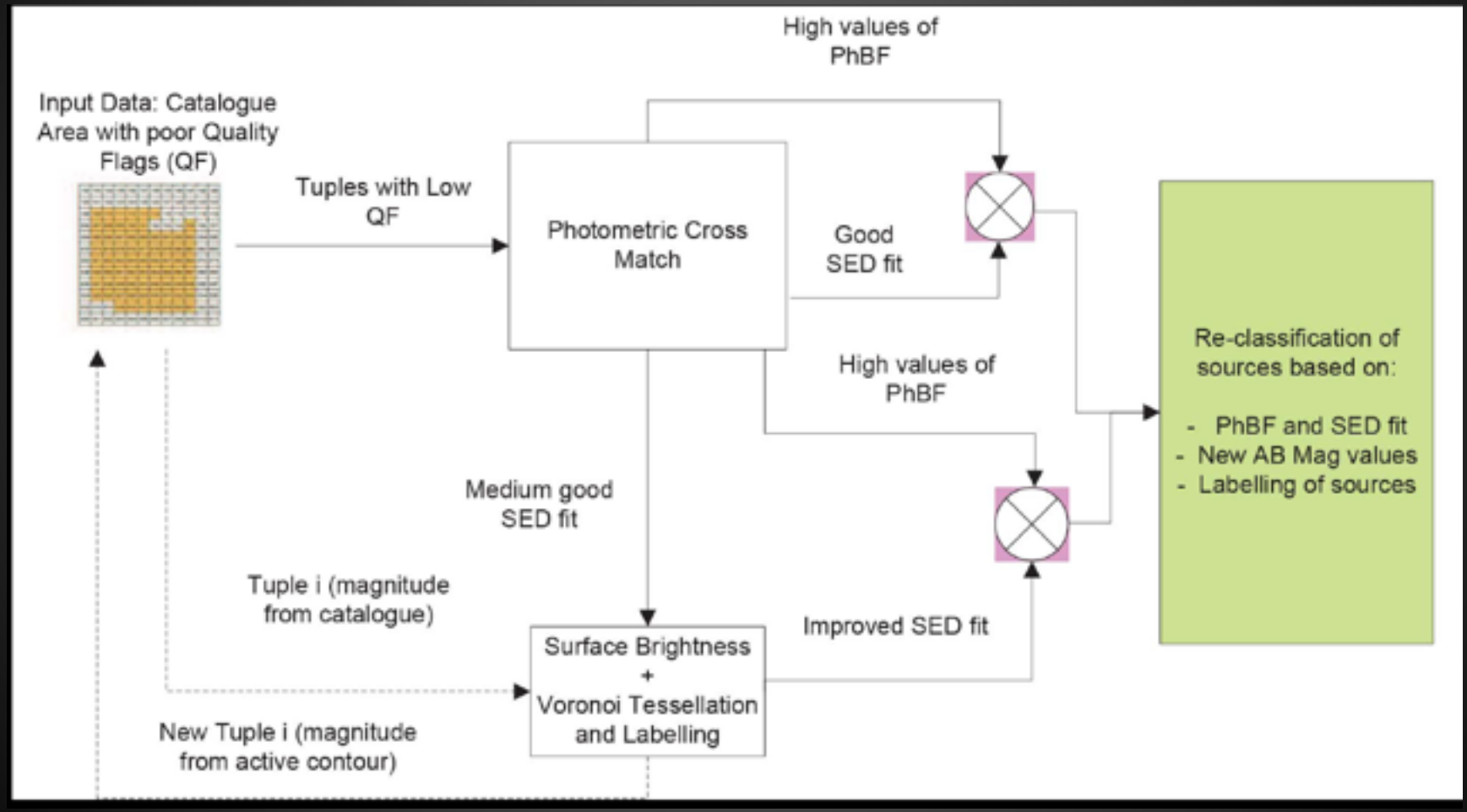


Development Methodology (IV)

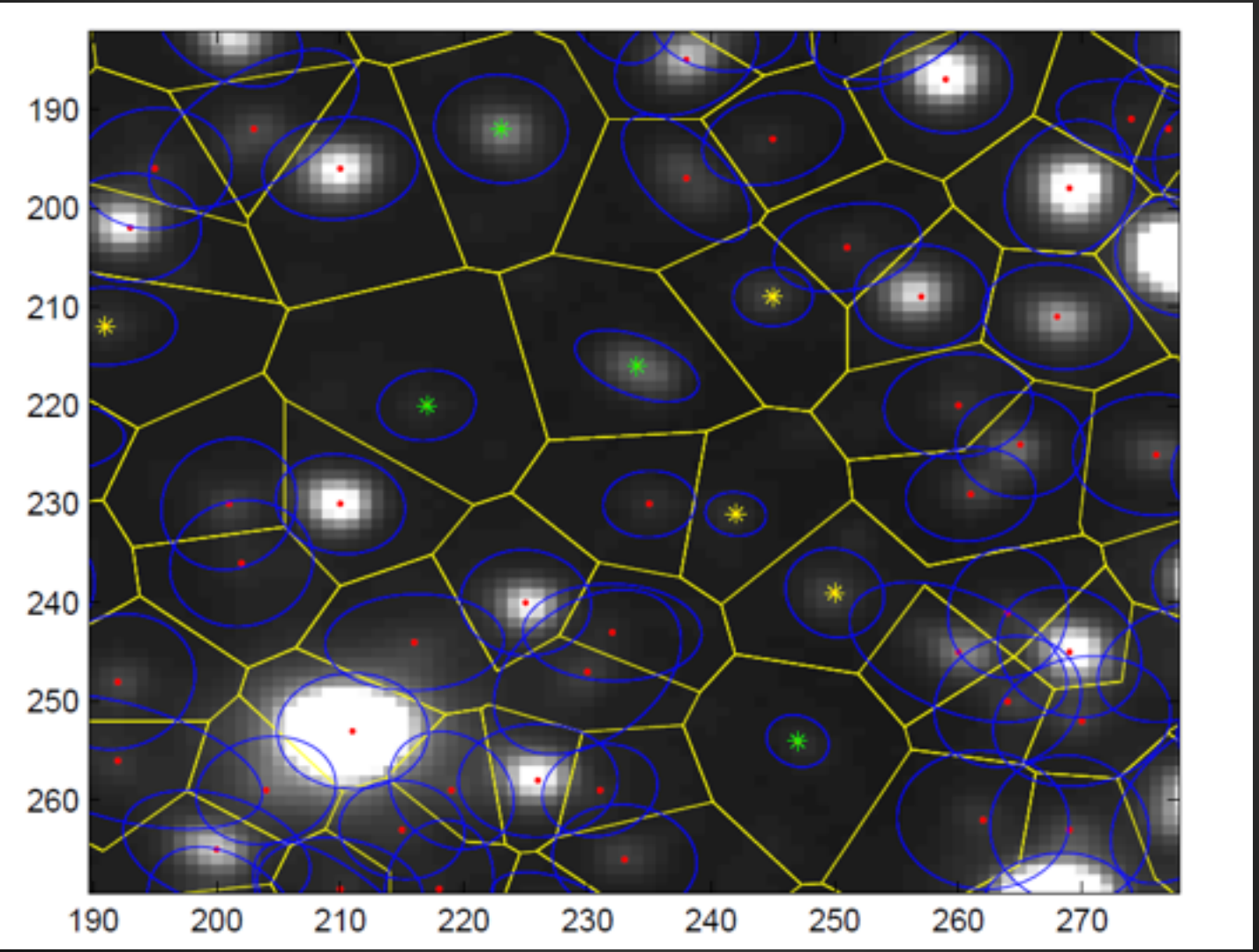
Surface Brigthness



Practical Run of the Pipeline

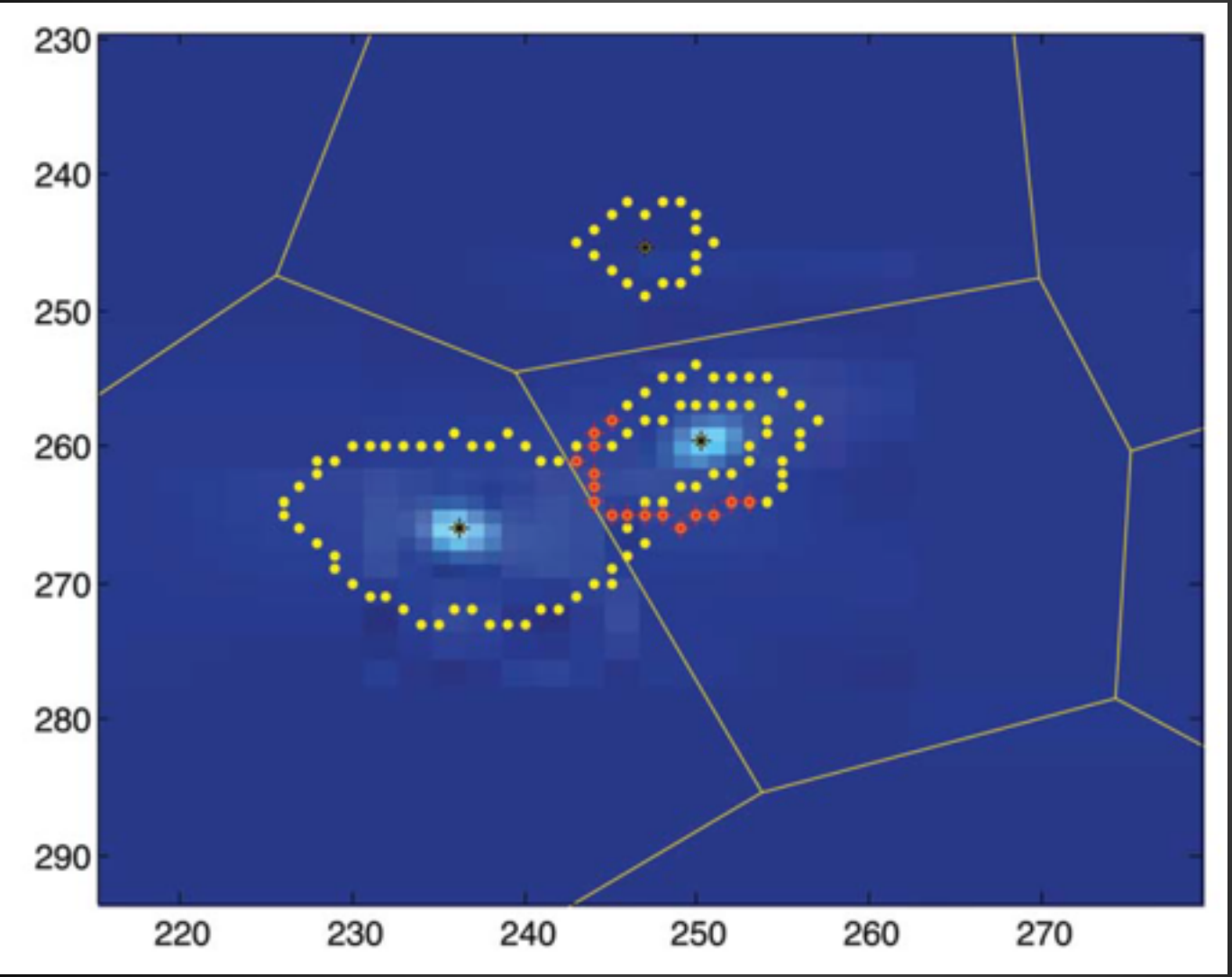


Validation of the Pipeline: Isolated/ Contaminated Classification



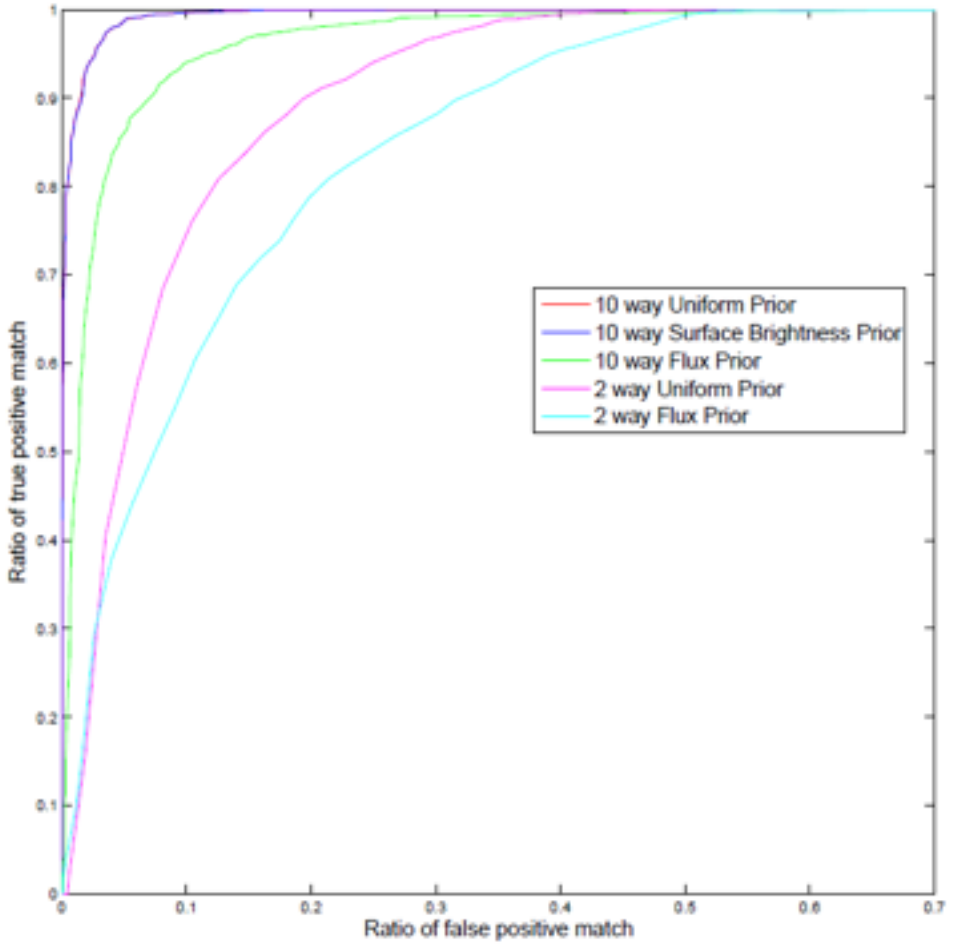
ISBN 978-1-4614-3322-4. Springer Science +Business Media New York, 2012, p. 181

Validation of the Pipeline: Surface Brightness



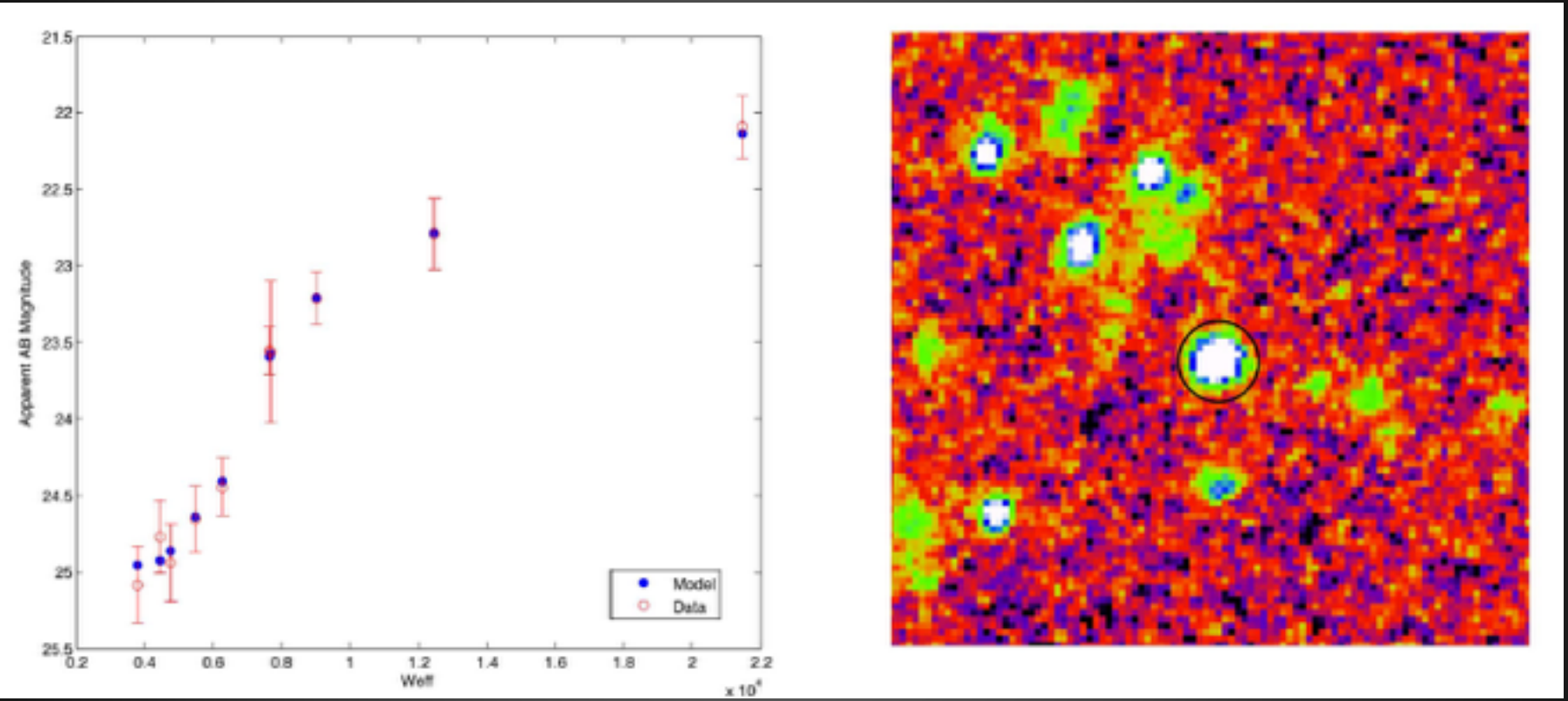
IRAF artificial source following Hubble distribution and Poisson noise with S/N = 6. Voronoi cells and active contours in confussed areas. Promising results in defining boundaries of confussed areas.

Validation of the Pipeline: Photometric Cross-matching



Improving cross-identification of galaxies using their photometry, Astronomy and Astrophysics 563 · January 2013 DOI: 10.1051/0004-6361/201322625

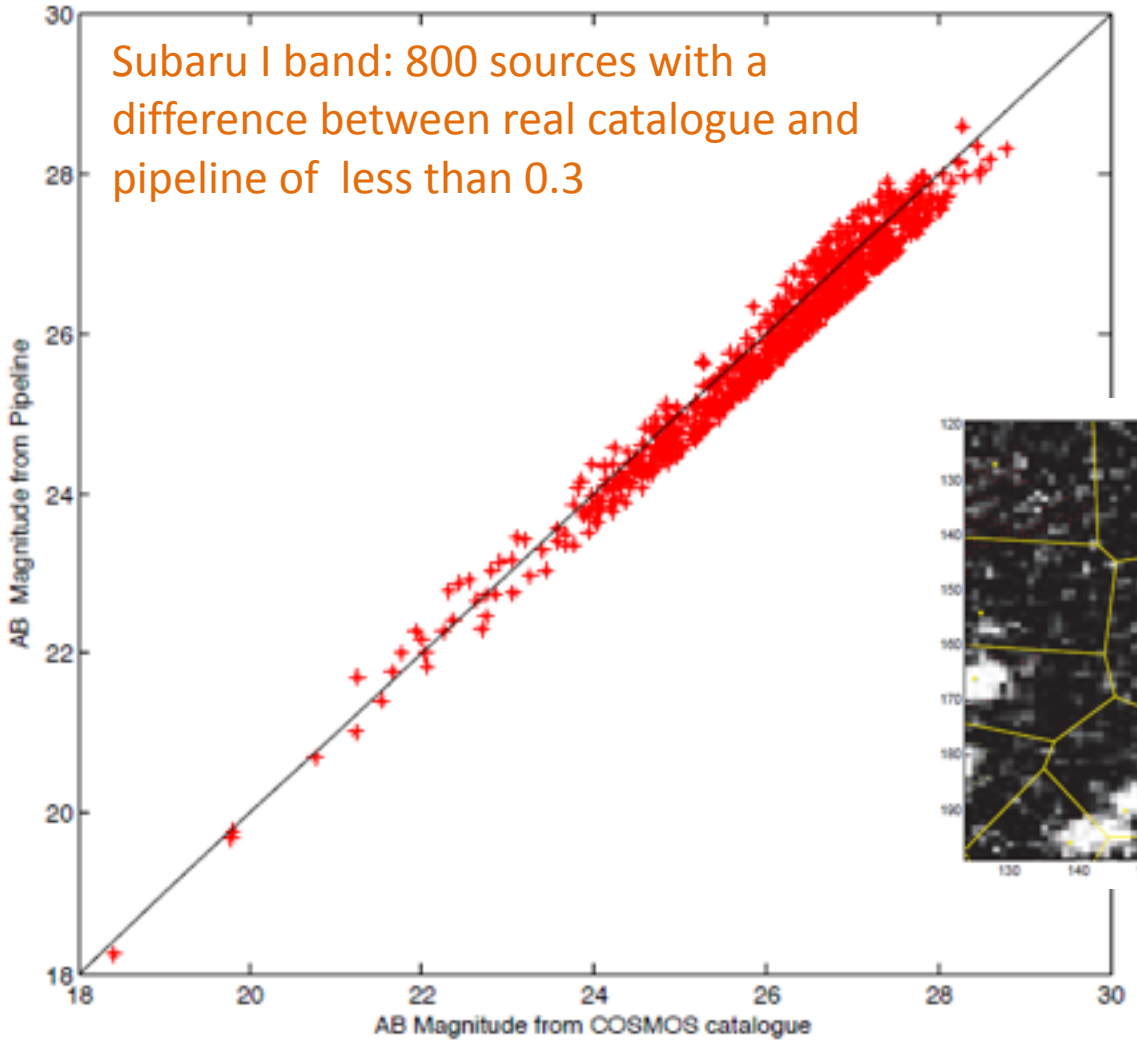
Summary of Results with Real Data (I)

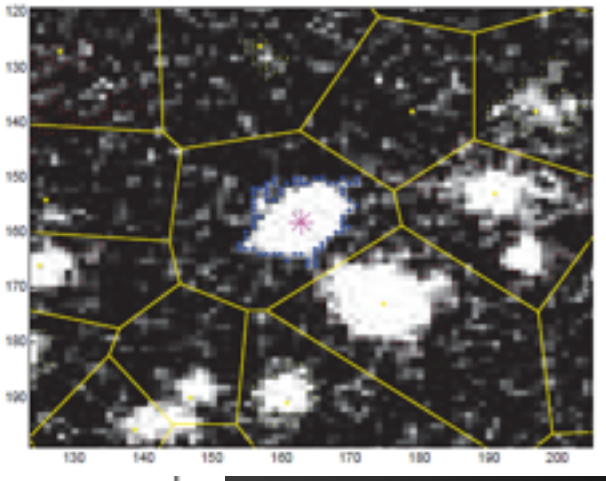


COSMOS Tile 78 Source ID 1263670. Figure on the left shows good SED and Photometric Cross Match. Figure on the right shows the IRSA NASA cutout for Subaru B. Our pipeline yields very good correspondence with the official data from NASA / IRSA Web Site

Summary of Results with Real Data (II)

Subaru I band: 800 sources with a difference between real catalogue and pipeline of less than 0.3





Subaru B band.
Source 1254882

Conclusions:

- The capabilities of the pipeline presented here are demonstrated with real COSMOS dataset.

- Promising results are obtained wit this pipeline. The need for these kind of processing framework is evidentiated throughout new projects (e.g.“Tractor” (by Lang &Hogg)).

- The computation of the surface brightness with active contours presents the most challenging part of the pipeline especially for the cases of crowded areas of the sky where the confussion factor impacts clearly in the effectiveness of any approach used.

- Computational cost is not to be underestimated when dealing with astronomical dataset.

THANK YOU VERY MUCH FOR YOUR ATTENTION

QUESTIONS?