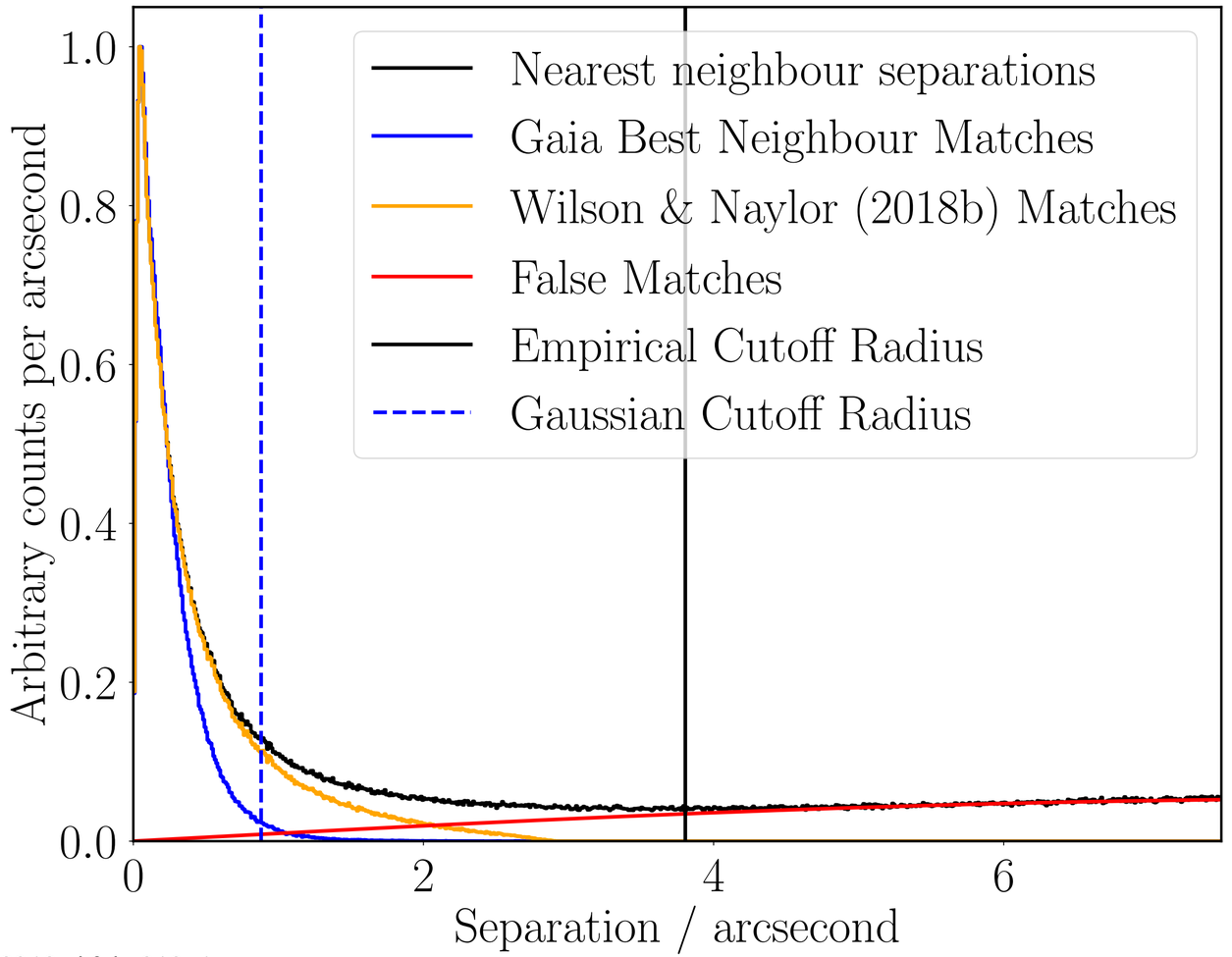
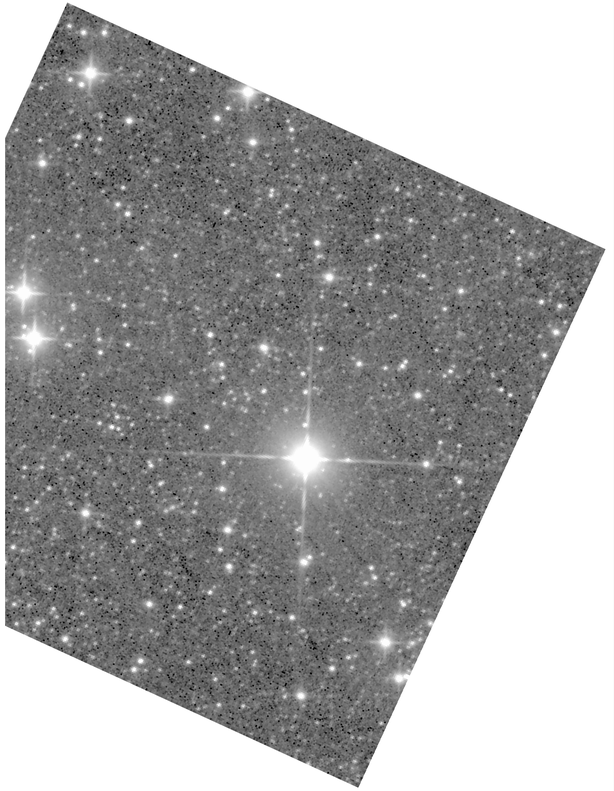
The Effect of Unresolved Contaminant Objects on the Cross-Matching of Photometric Catalogues

Rubin Observatory





Gaia DR2 - Gaia Collaboration, Brown A. G. A., et al. 2018, A&A, 616, 1
Gaia matches - Marrese et al., 2019, A&A, 621, 144
WISE - Wright et al., 2010, AJ, 140, 1868

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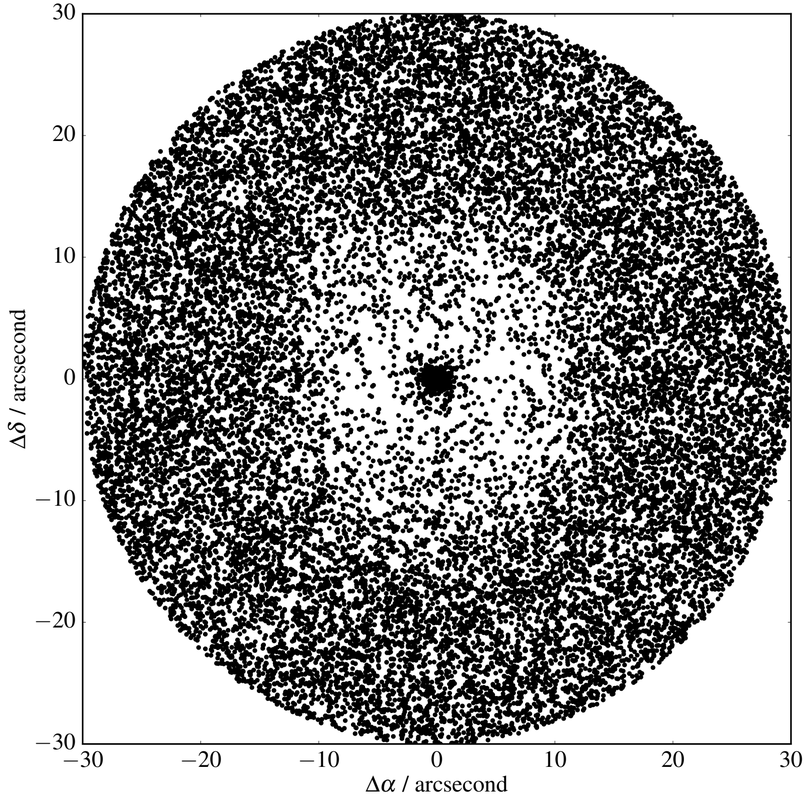

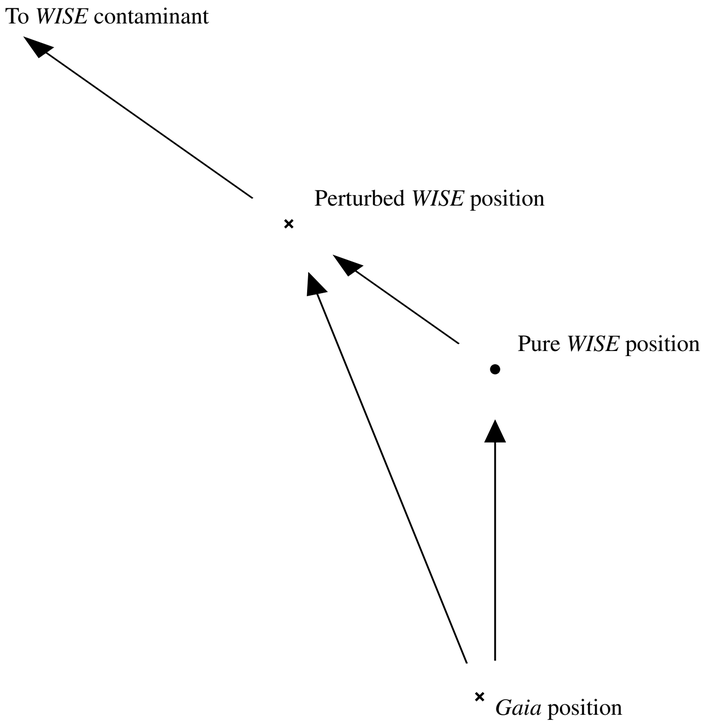

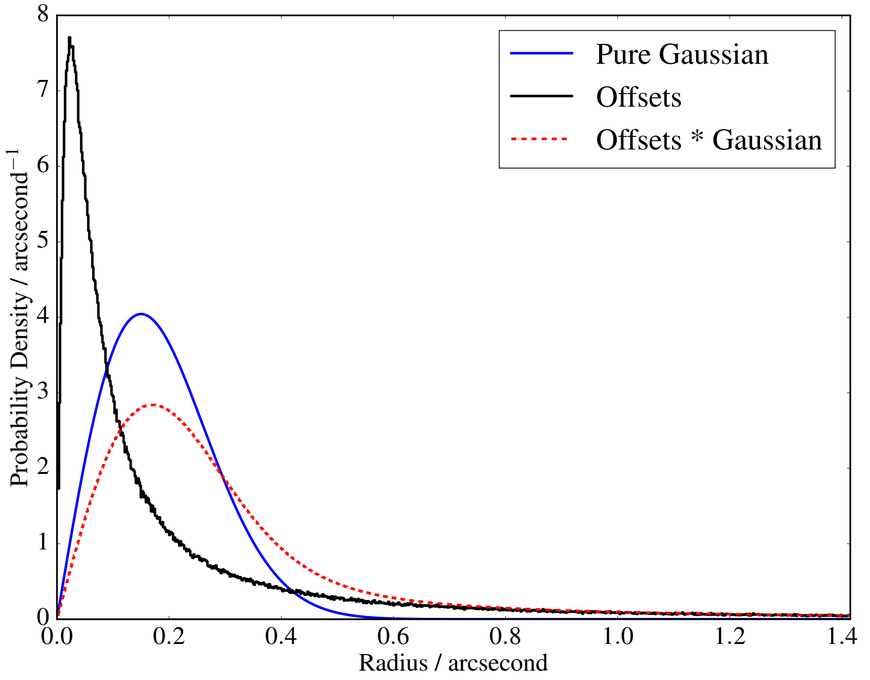

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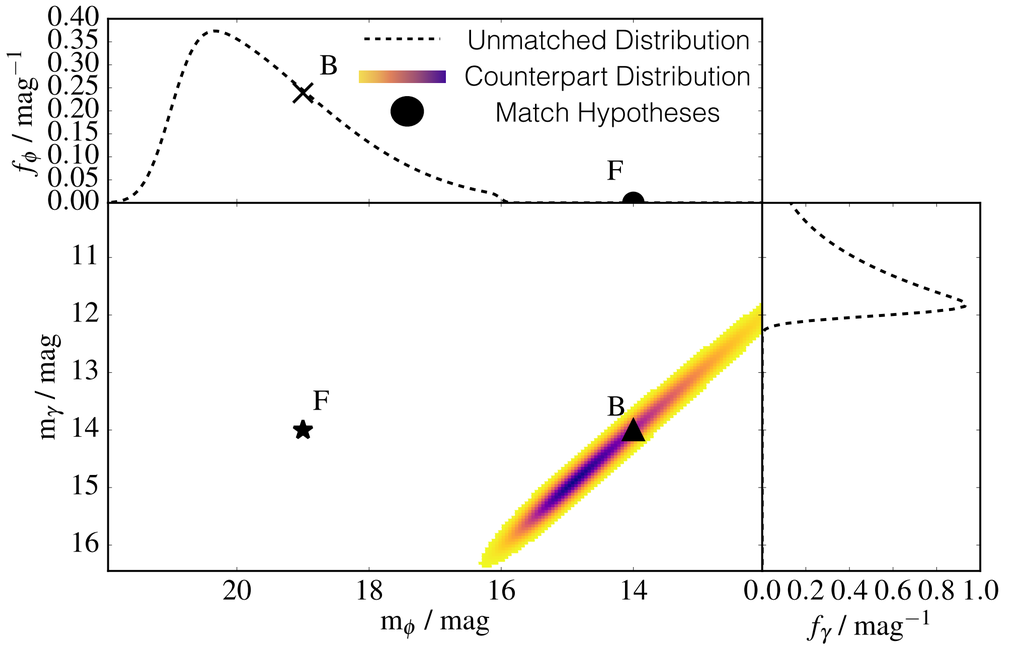
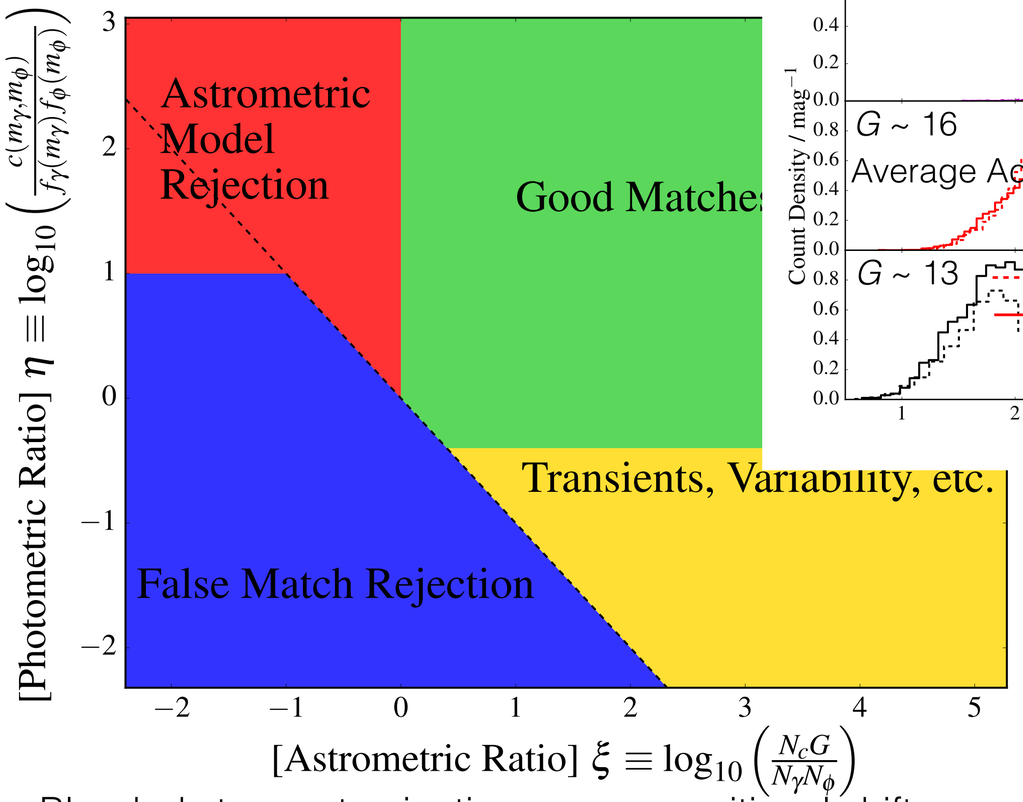
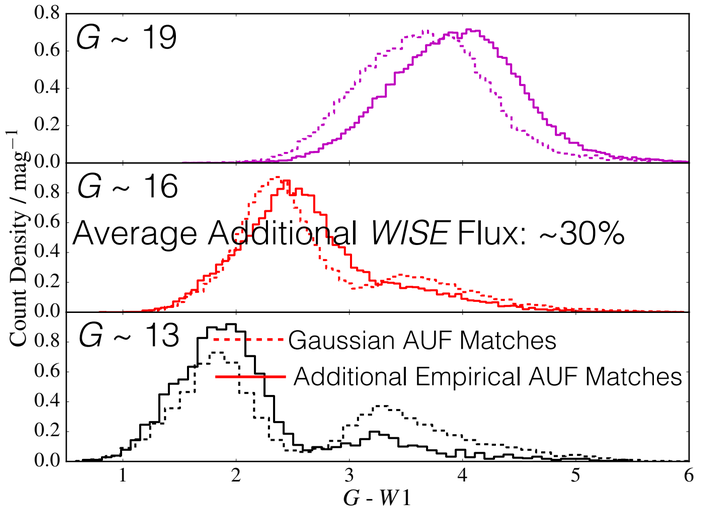


$$g(x_k, y_k, x_l, y_l) = N_c \iint_{-\infty}^{+\infty} h_\gamma(\Delta x_{kl} - x, \Delta y_{kl} - y) h_\phi(x, y)\, dx\, dy$$

$$= N_c \times (h_\gamma * h_\phi)(\Delta x_{kl}, \Delta y_{kl}).$$

Handle Gaussian centroid uncertainty, blending perturbations, *unknown proper motions*, etc. completely naturally





- Blended star contamination causes positional shifts
- *WISE* objects are up to **30% flux contaminated**, with *WFIRST* **with LSST suffering similar blending in the future**
- Disentangle this information with proper treatment of the cross-match algorithm
- Open source code development ongoing at https://github.com/Onoddil/macauff

Wilson & Naylor, 2017, MNRAS, 468, 2517
Wilson & Naylor, 2018a, MNRAS, 473, 5570
Wilson & Naylor, 2018b, MNRAS, 481, 2148

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