
Finding optimal hyperparameters for cleaning algorithms for the Cherenkov Telescope Array

Bachelor thesis half-time talk

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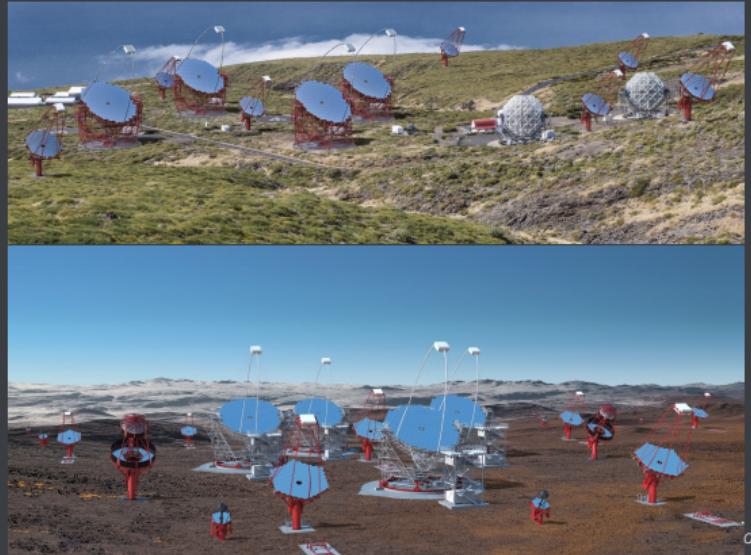
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Introduction

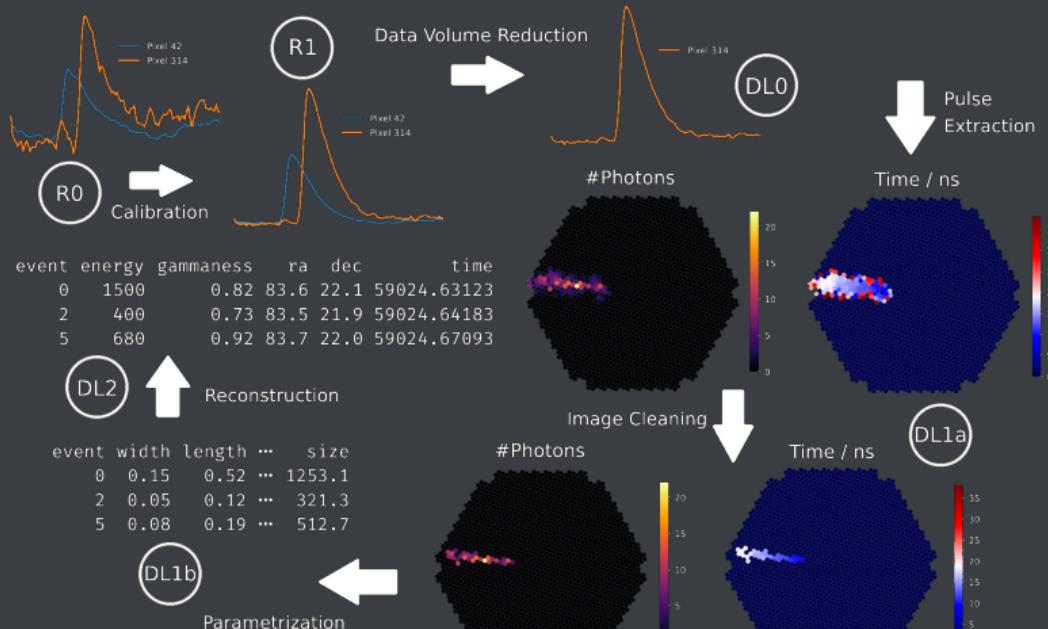
The Cherenkov Telescope Array (CTA)

- 2 sites: CTA North and CTA South
- 3 types of telescopes:
 - Small-Sized Telescope (SST)
 - Medium-Sized Telescope (MST)
 - Large-Sized Telescope (LST)



^aG. Pérez Diaz. CTA/IAC. 2016. URL:
<https://www.cta-observatory.org/about/how-cta-works/>
(visited on 07/10/2022).

ctapipe



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¹J. Hackfeld. "Analyzing the Data Volume Reduction for the LST-1 Prototype of the Cherenkov Telescope Array." MA thesis. Bochum, 2021, Adapted from.

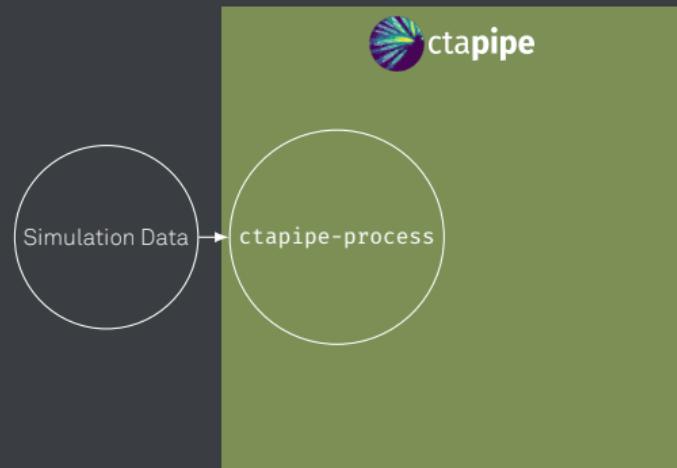


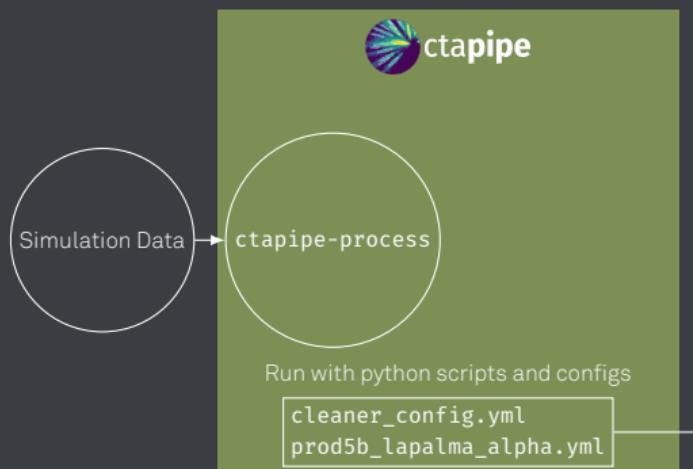
Hackfeld, J. "Analyzing the Data Volume Reduction for the LST-1 Prototype of the Cherenkov Telescope Array." MA thesis. Bochum, 2021.

Pérez Diaz, G. CTA/ IAC. 2016. URL: <https://www.cta-observatory.org/about/how-cta-works/> (visited on 07/10/2022).

Data Processing with **ctapipe**



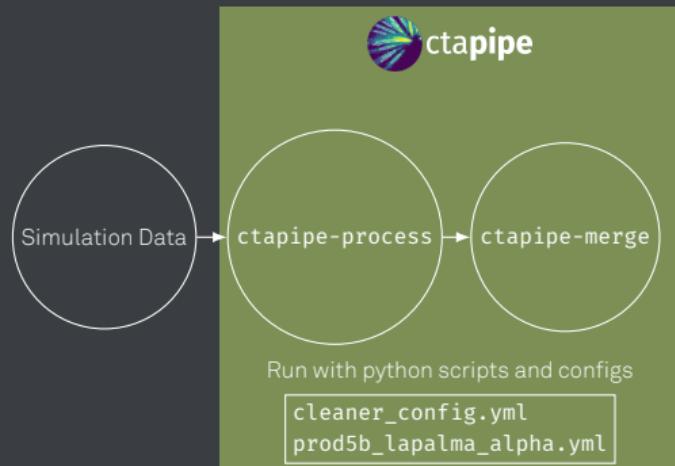


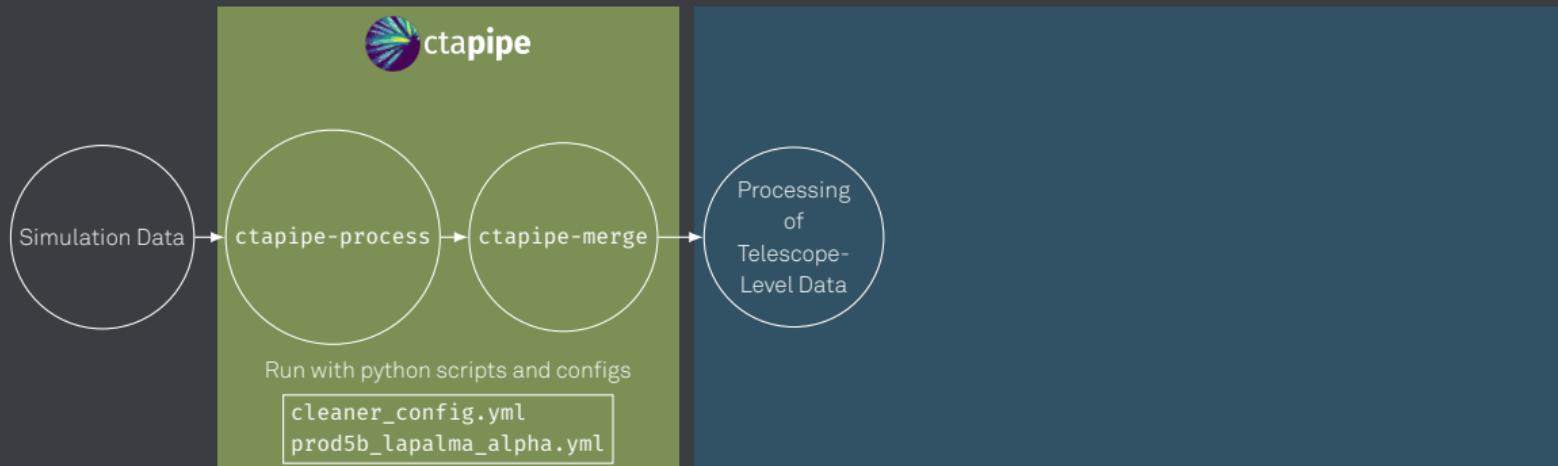


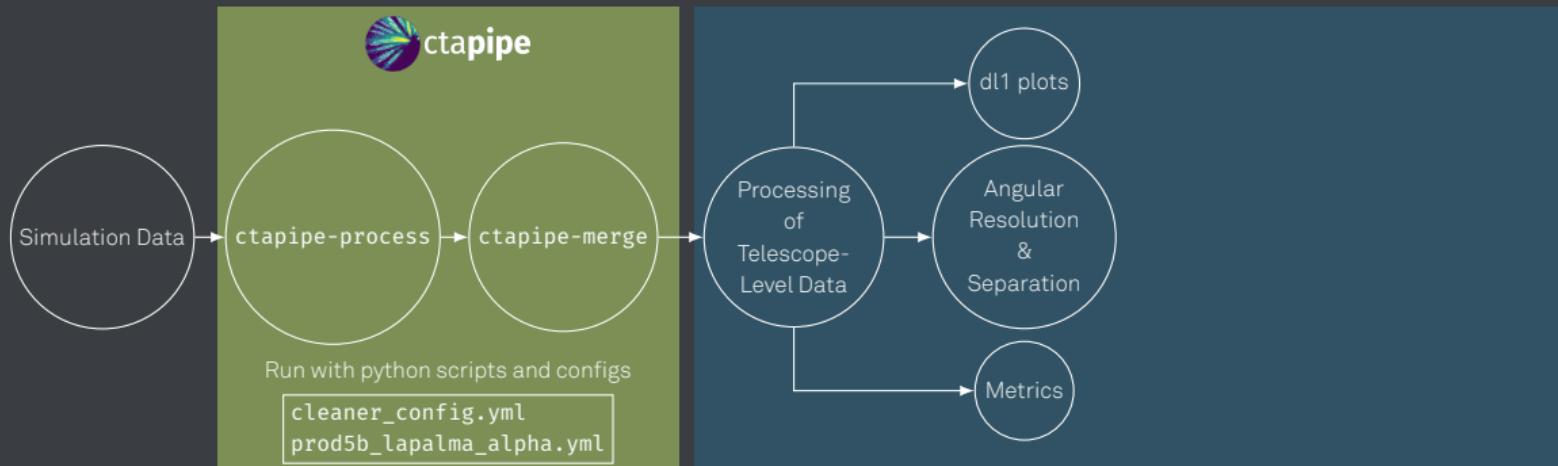
```
ImageProcessor:  
  image_cleaner_type: MARSImageCleaner
```

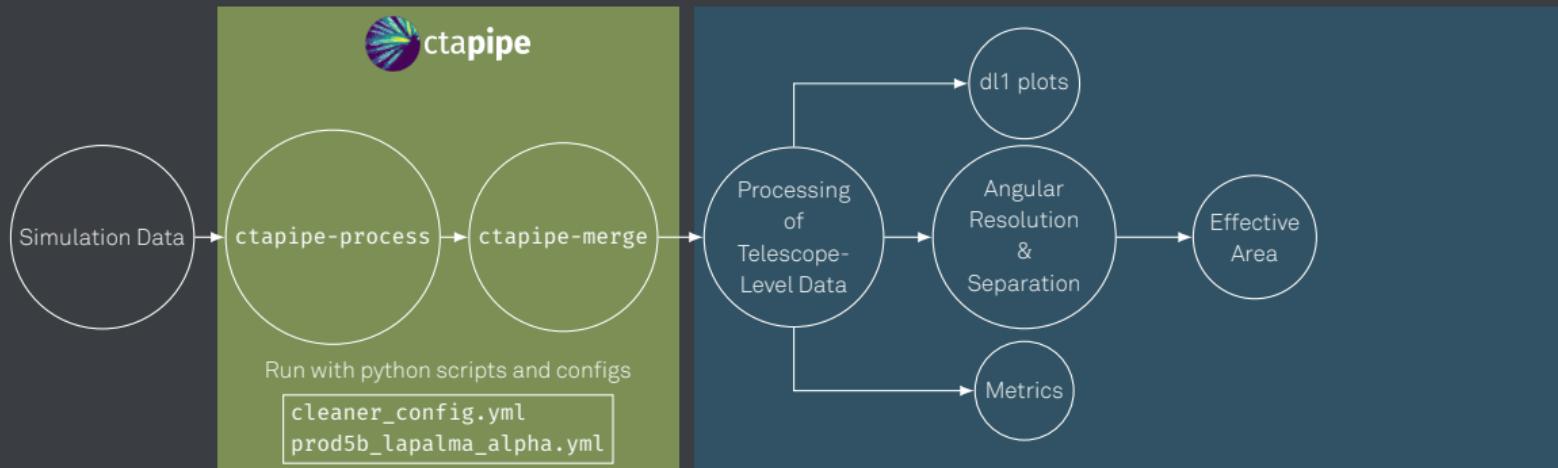
```
MARSImageCleaner:  
  picture_threshold_pe:  
    - [type, "LST*", 8.5]  
    - [type, "MST*NectarCam", 9.0]  
  boundary_threshold_pe:  
    - [type, "LST*", 4.75]  
    - [type, "MST*NectarCam", 4.5]  
  keep_isolated_pixels: false  
  min_picture_neighbors: 2
```

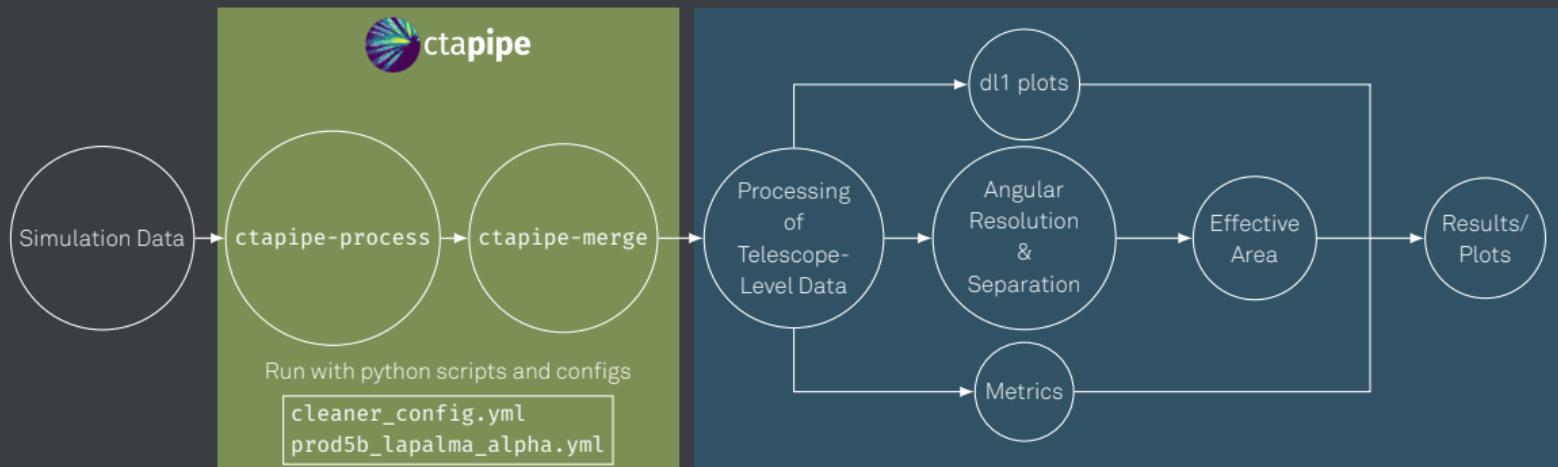
```
ImageQualityQuery:  
  quality_criteria:  
    - ["enough_pixels", "np.count_nonzero(image) > 2"]  
    - ["enough_charge", "image.sum() > 50"]
```





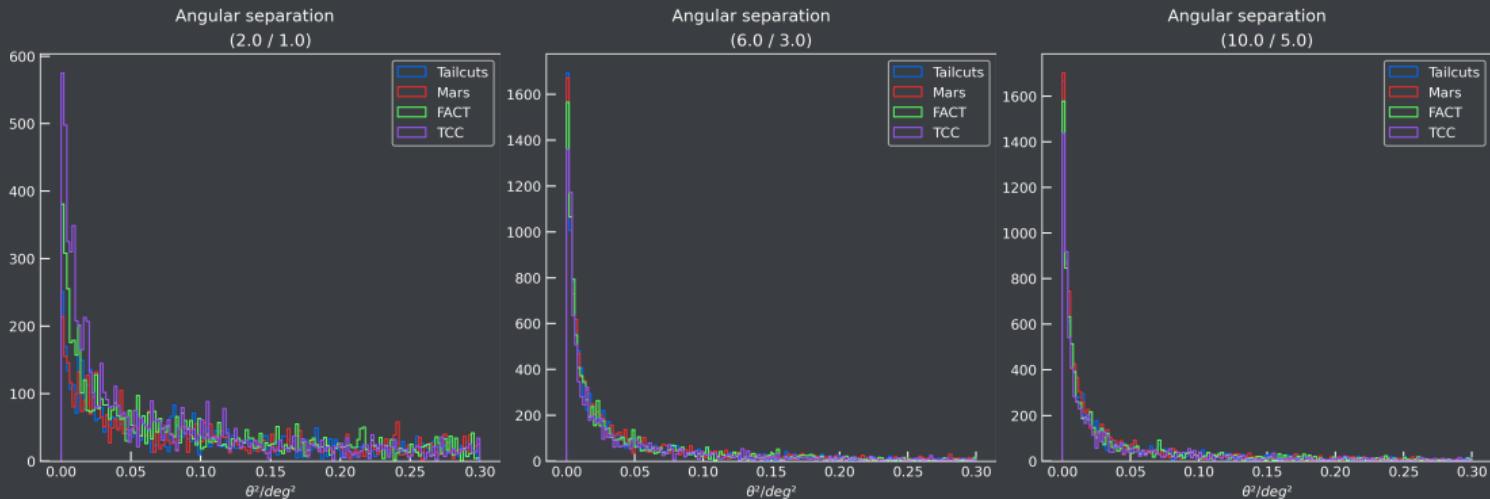




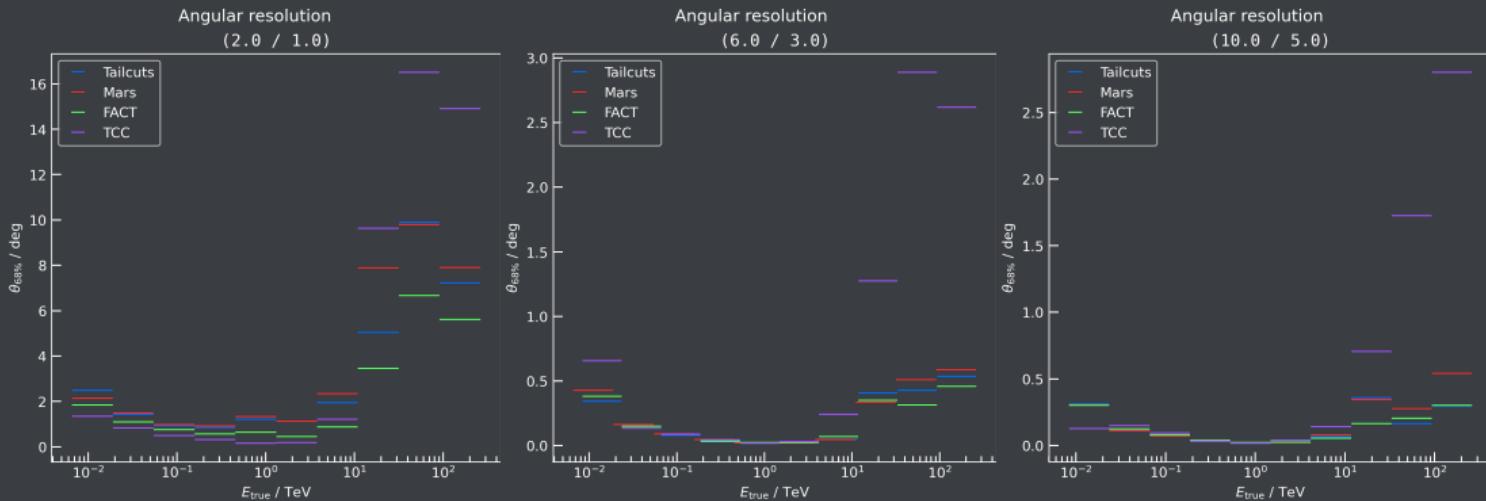


Results

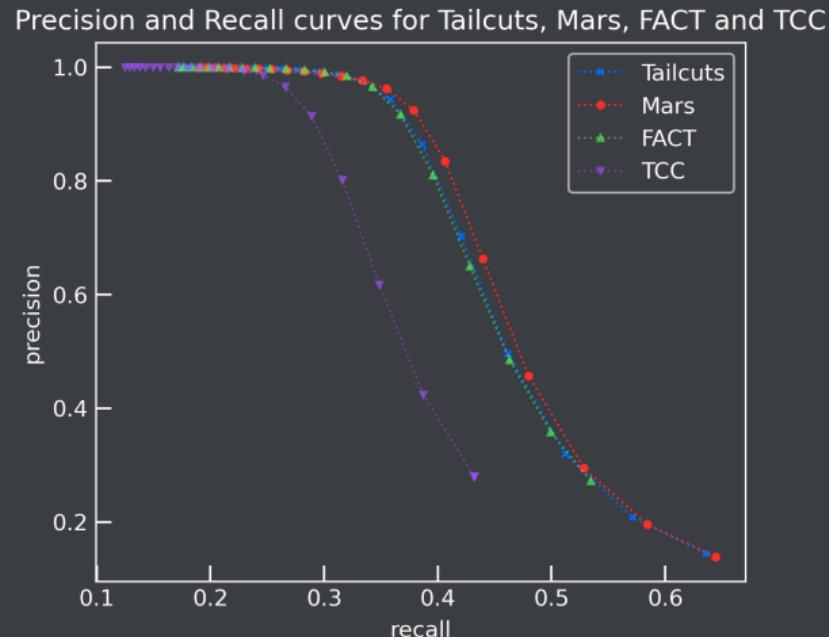
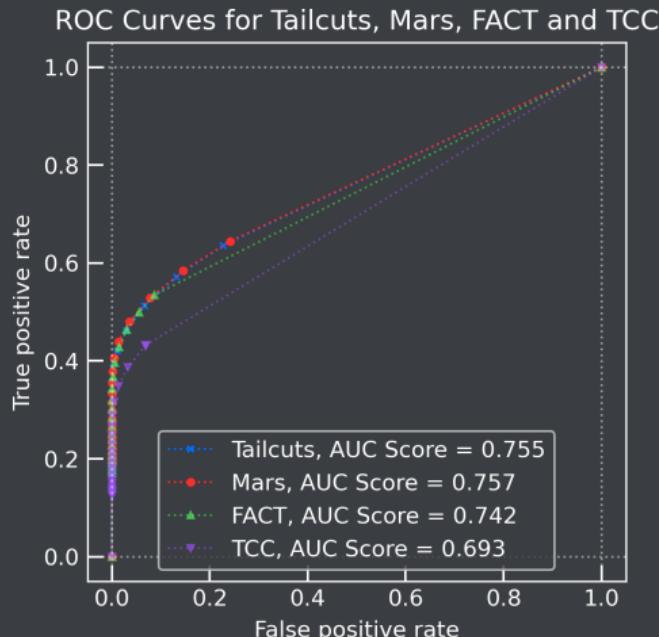
Angular Separation



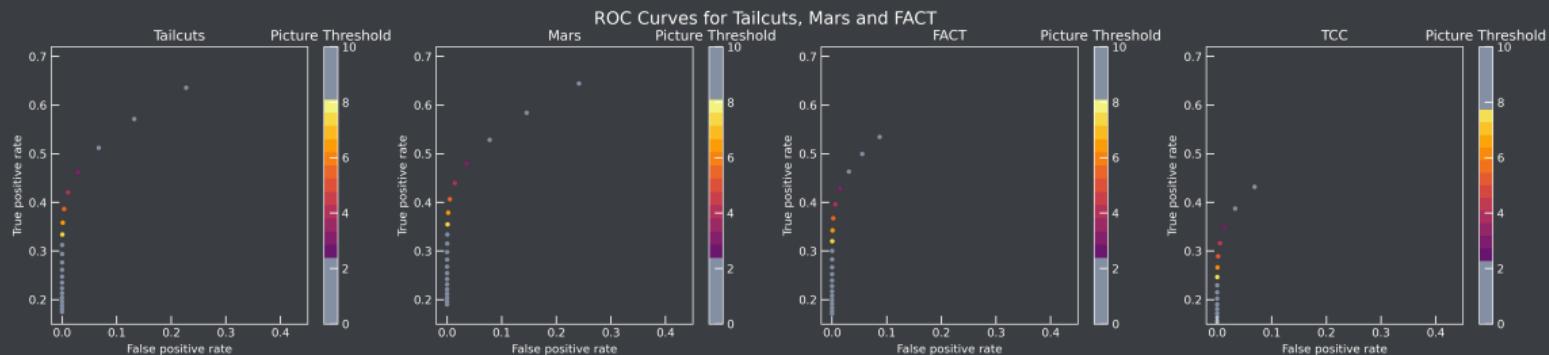
Angular Resolution



ROC curves and precision and recall curves



Picture Thresholds



Ratio of Surviving Pixels

Ratio of surviving pixels for Tailcuts, Mars, FACT and TCC

