

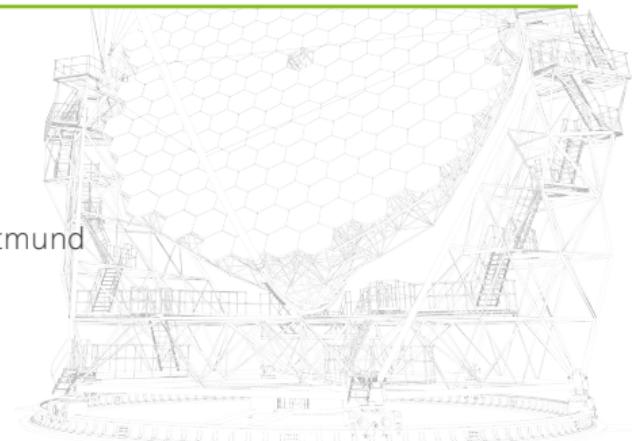
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# Finding optimal hyperparameters for cleaning algorithms for the Cherenkov Telescope Array

Bachelor thesis half-time talk

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July 15, 2022  
E5b Astroparticle Physics  
Department of Physics – TU Dortmund



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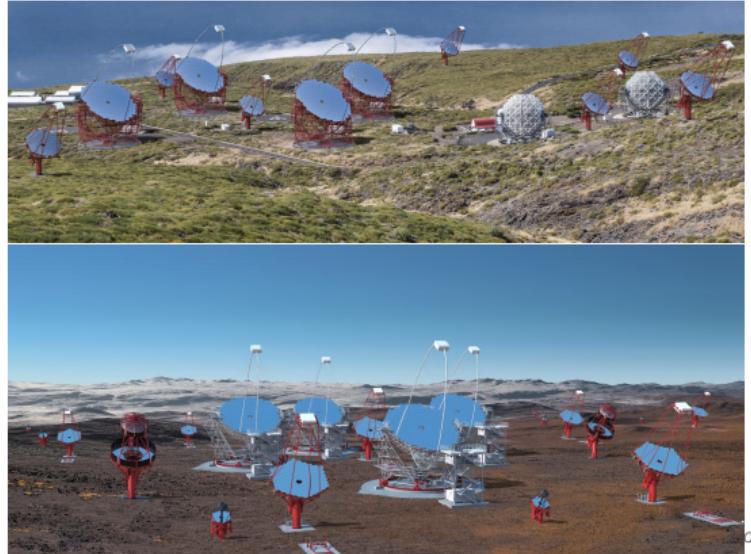
ROC Curves and Metrics  
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## Introduction

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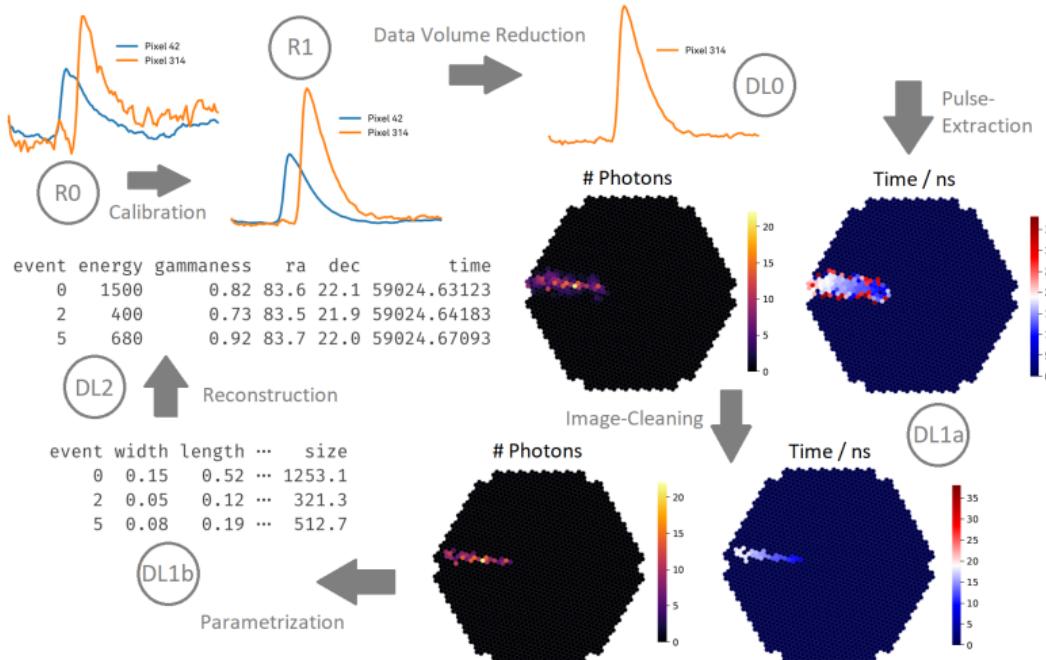
## The Cherenkov Telescope Array (CTA)

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



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

## ctapipe



1

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

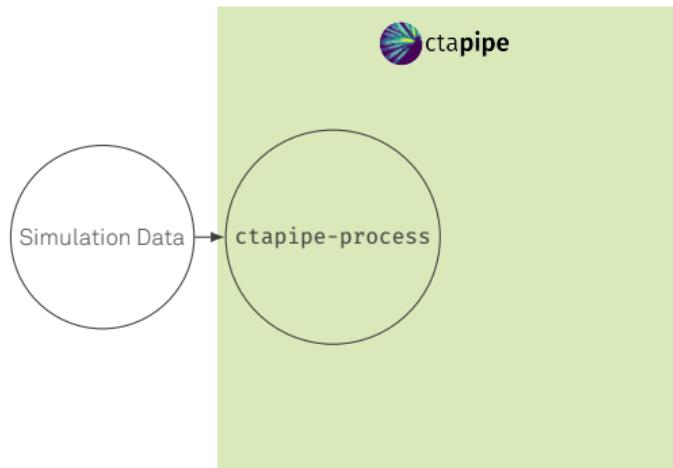


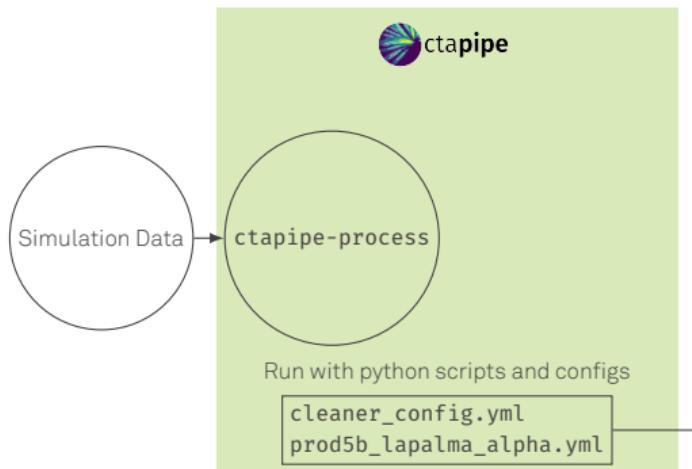
Hackfeld, J. "Analyzing the Data Volume Reduction for the LST-1 Prototype of the Cherenkov Telescope Array." MA thesis. Bochum, 2021.

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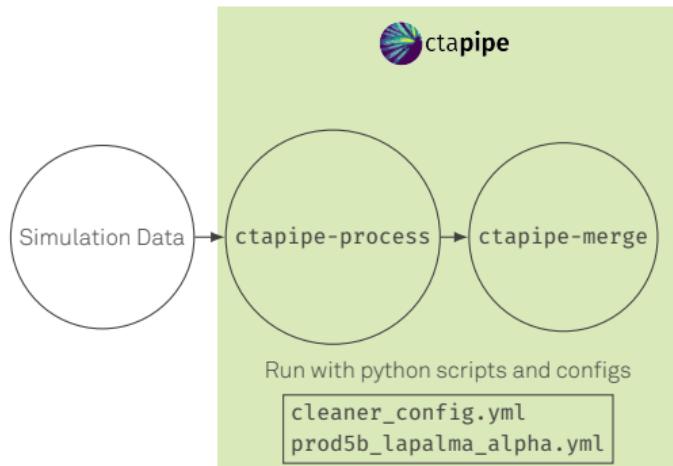
## Data Processing with **ctapipe**

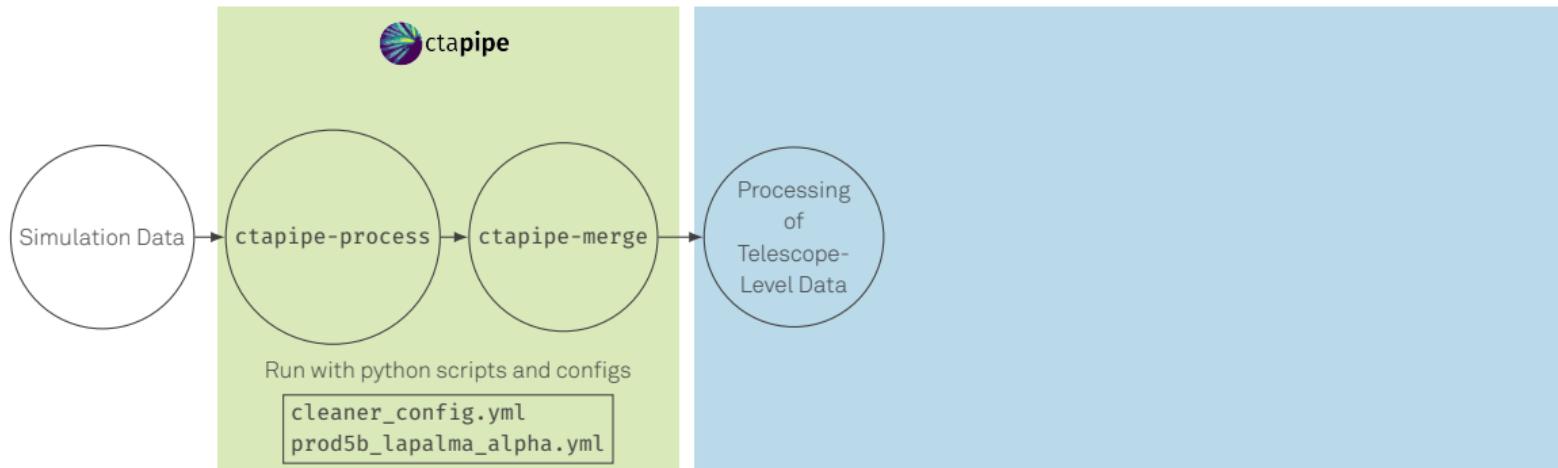


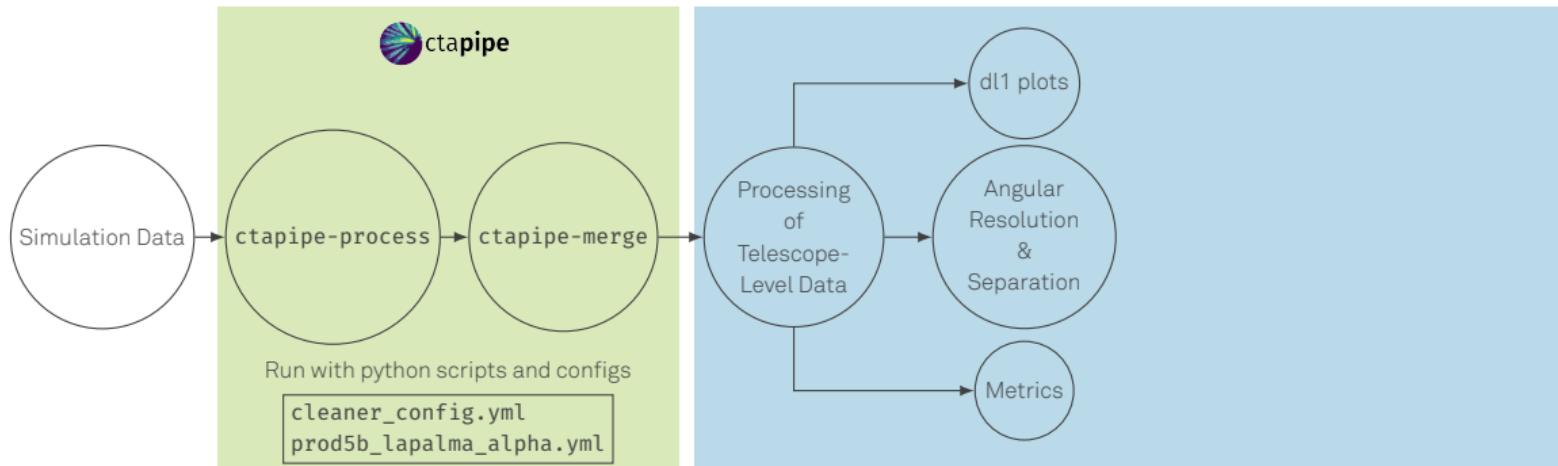


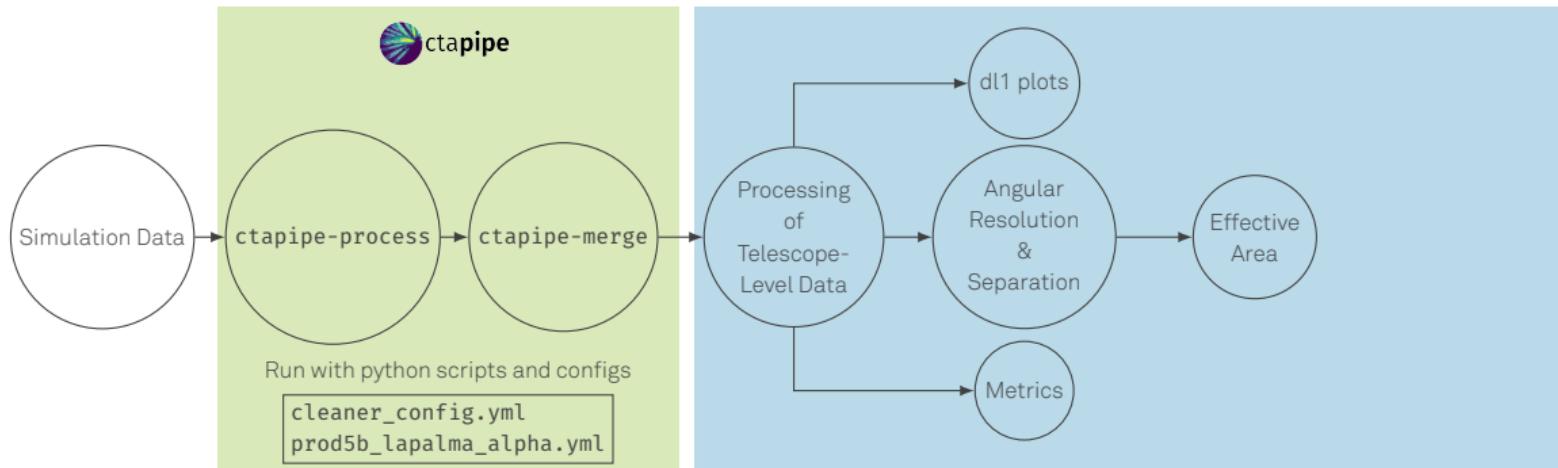


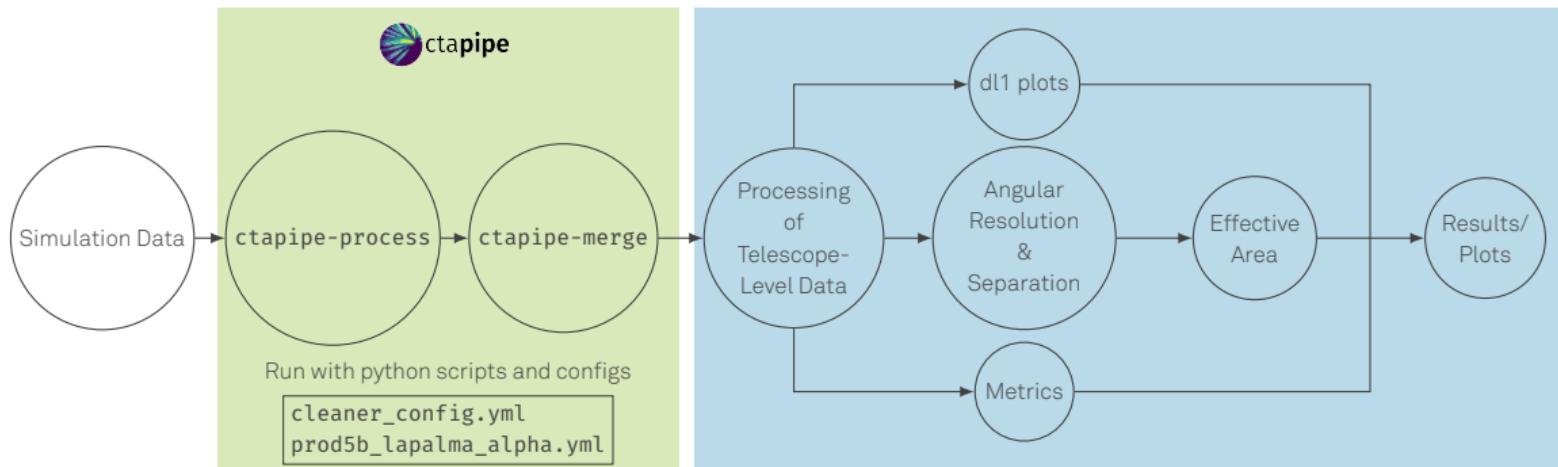
```
ImageProcessor:  
    image_cleaner_type: MARSImageCleaner  
  
MARSImageCleaner:  
    picture_threshold_pe:  
        - [type, "LST*", 8.5]  
        - [type, "MST*NectarCam", 9.0]  
    boundary_threshold_pe:  
        - [type, "LST*", 4.75]  
        - [type, "MST*NectarCam", 4.5]  
    keep_isolated_pixels: false  
    min_picture_neighbors: 2  
  
ImageQualityQuery:  
    quality_criteria:  
        - ["enough_pixels", "np.count_nonzero(image) > 2"]  
        - ["enough_charge", "image.sum() > 50"]
```







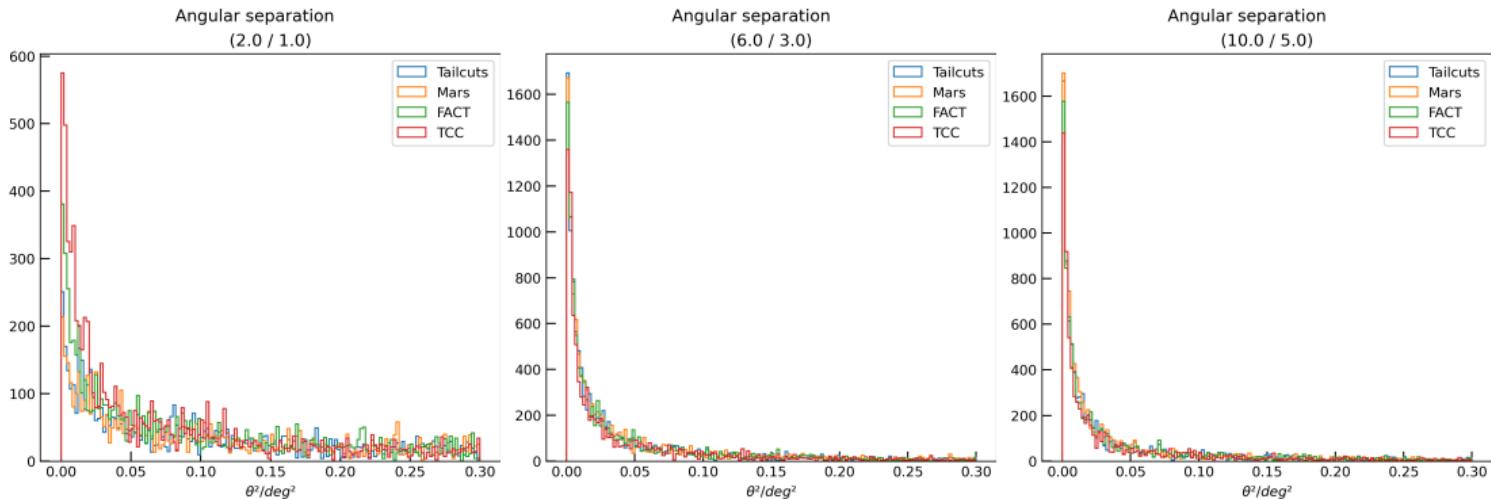




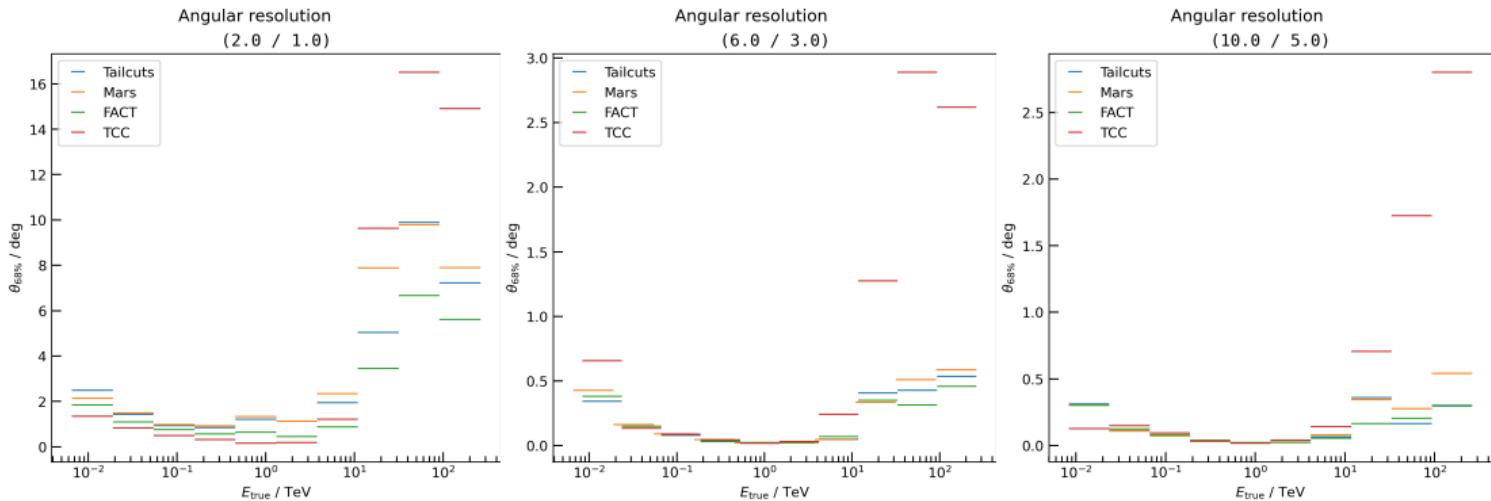
## Results

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## Angular Separation

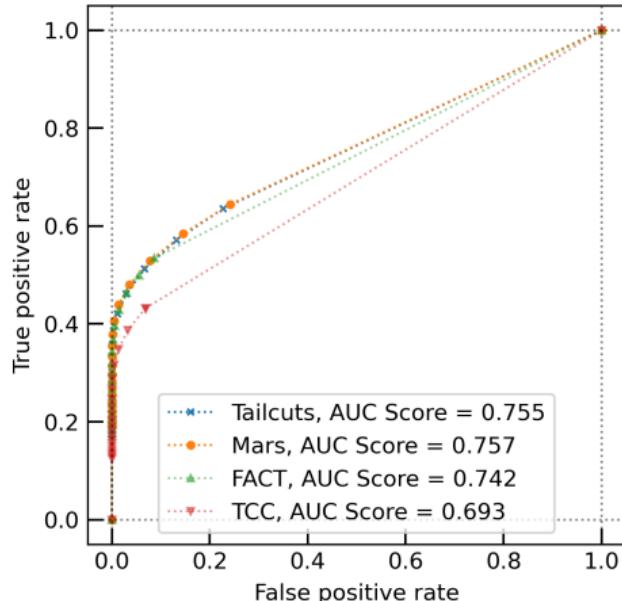


## Angular Resolution

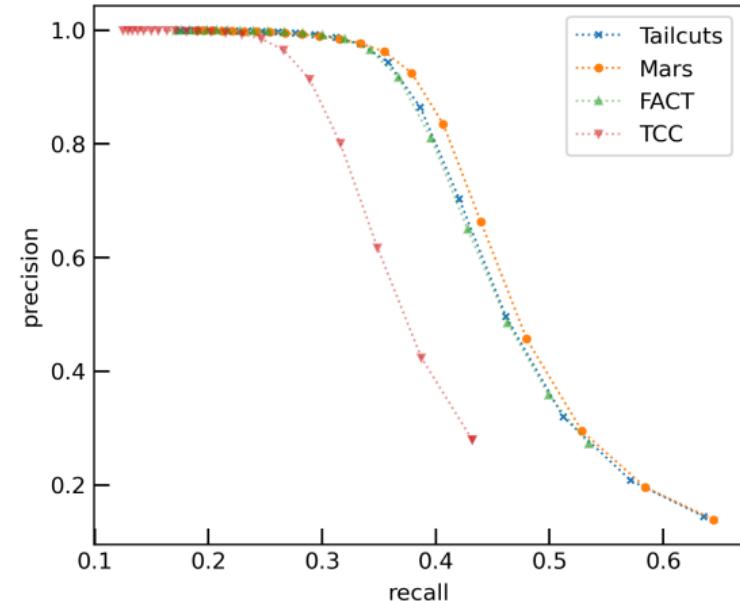


## ROC curves and precision and recall curves

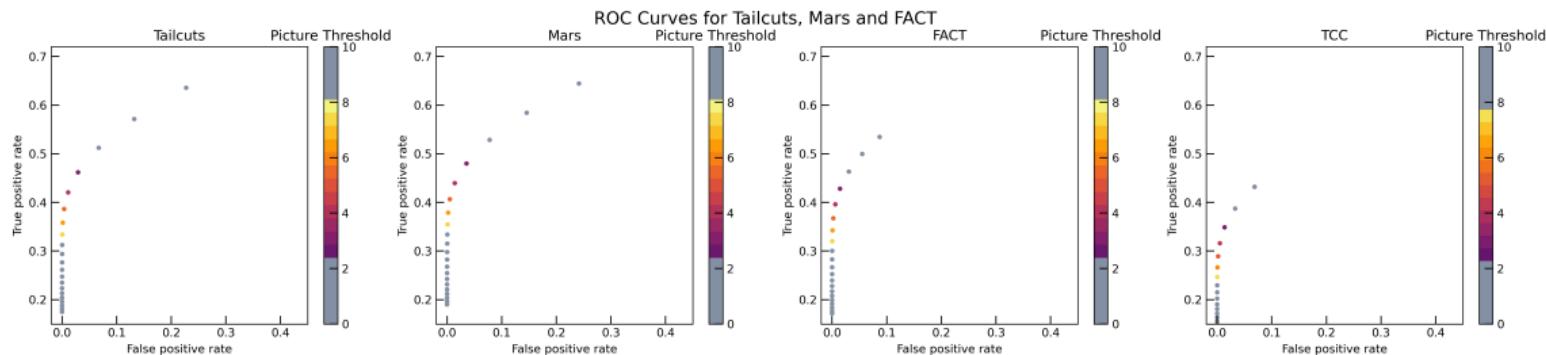
ROC Curves for Tailcuts, Mars, FACT and TCC



Precision and Recall curves for Tailcuts, Mars, FACT and TCC



## Picture Thresholds



## Ratio of Surviving Pixels

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

