

ATLAS

Transient Stream and Virtual Research Assistant

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Schmidt Sciences

Observation Strategy

4x30sec separated by 15 minutes

Orange and cyan filter

(on different observation streaks - you won't have 2 in o and 2 in c)

Magnitude Limits

19.7 (AB mag) for cyan and orange

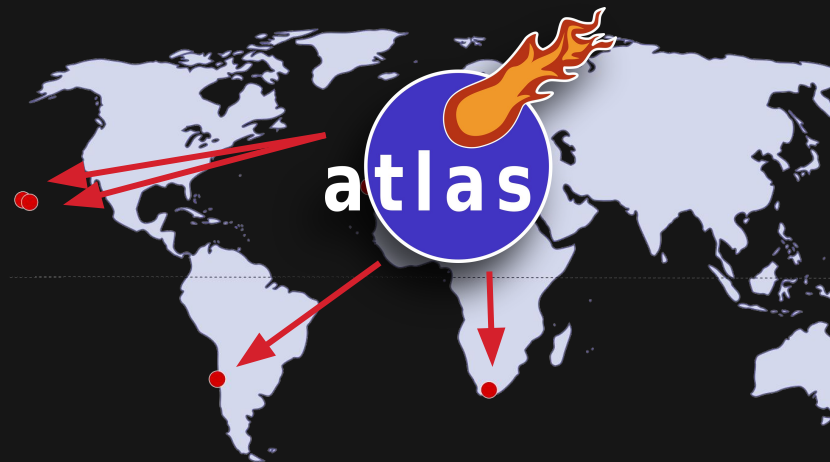
(5 sigma detection for 30 sec exp.time)

Saturation: ~12.5 mag

The Main goal is discovery and follow up of SSOs - led by another team.

4 Units

Hawaii (x2), Chile, South Africa



THE SPECS

Data reduction

on-site



Difference imaging

Centralised in Hawaii



Data
sent to
QUB

DATA PROCESSING

References

[Smith et al. 2021](#)

Alert Processing

1) Quality cuts:

5 sigma detection in 3 out of 4 exposures

2) Match to existing source or give new ID

3) X-match with catalogues (Sherlock)

4) Remove Variable stars

(data NOT deleted - just removed from pile of transient alerts)

5) Real bogus classifier

6) Prioritise (VRA)



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EYEBALLERS

Cross-matches alert position to astrophysical catalogues

Sherlock Classes

Variable Star
Cataclysmic Variables
Bright Star
Active Galactic Nucleus
Nuclear Transient
Supernova

Known
variability

Orphan
Unclear

Associated with galaxy.
Offset w.r.t nucleus determines class

+ annotates alerts with possible GW associations

SHERLOCK

References

[GitHub](#)

[Smith et al. 2021](#)

(p9)



Dave Young

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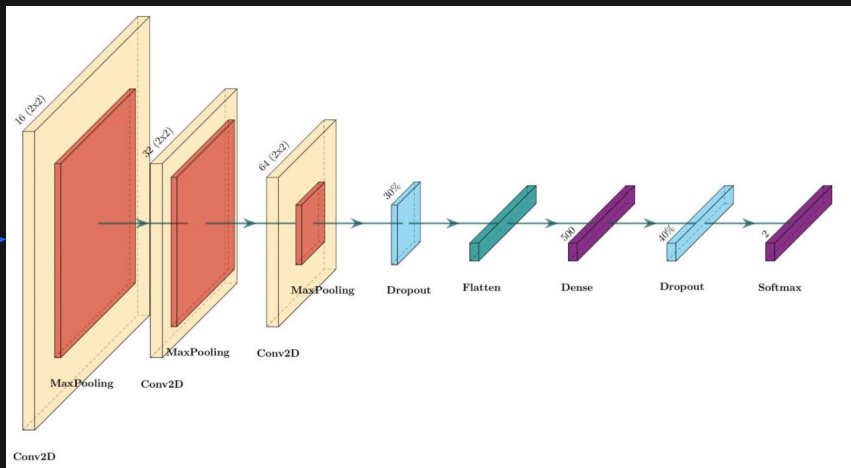
REAL/BOGUS

Reference: [Weston et al. 2024](#)

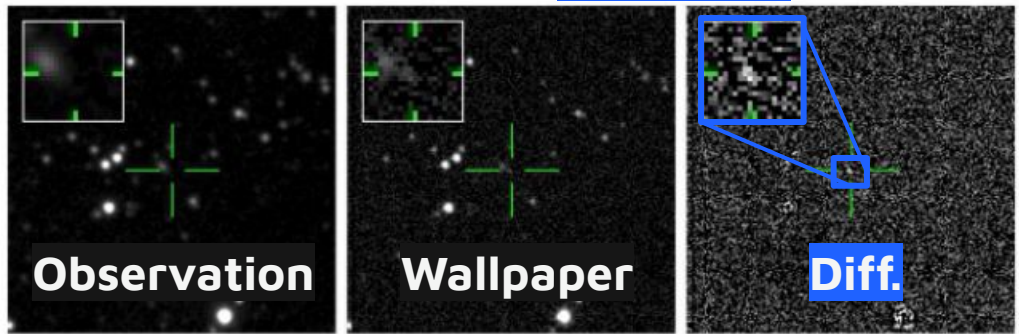


Josh Weston

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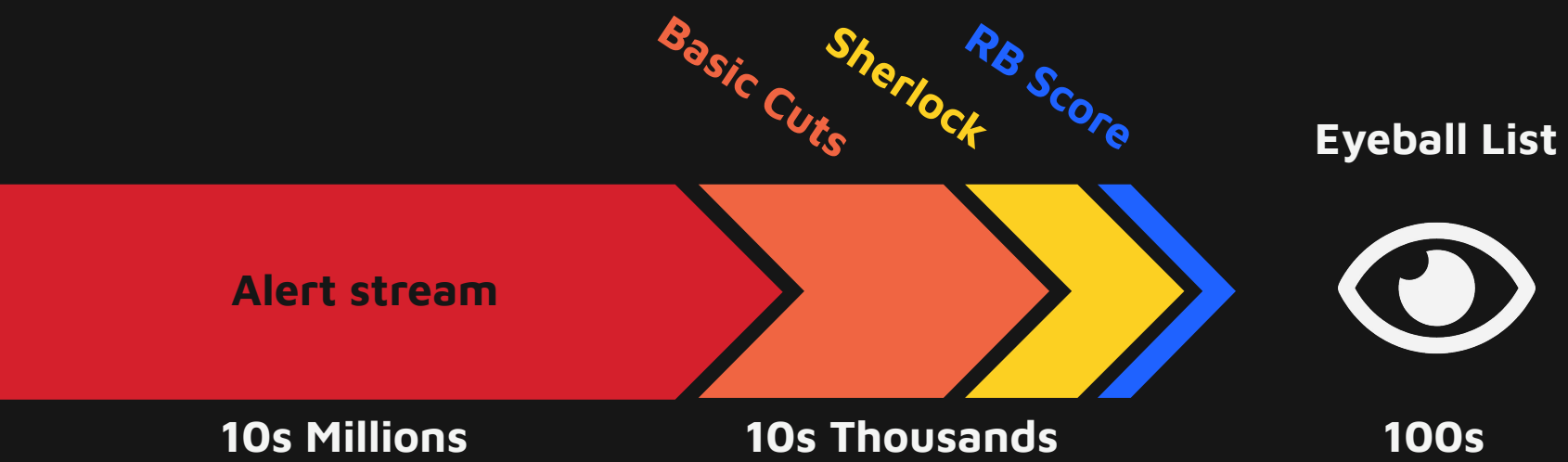
CNN input



Full size stamps

**Score between 0
(bogus) and 1 (real)**

<0.2 → Garbage



Alert stream

10s Millions

Basic Cuts

10s Thousands

Sherlock

RB Score

Eyeball List

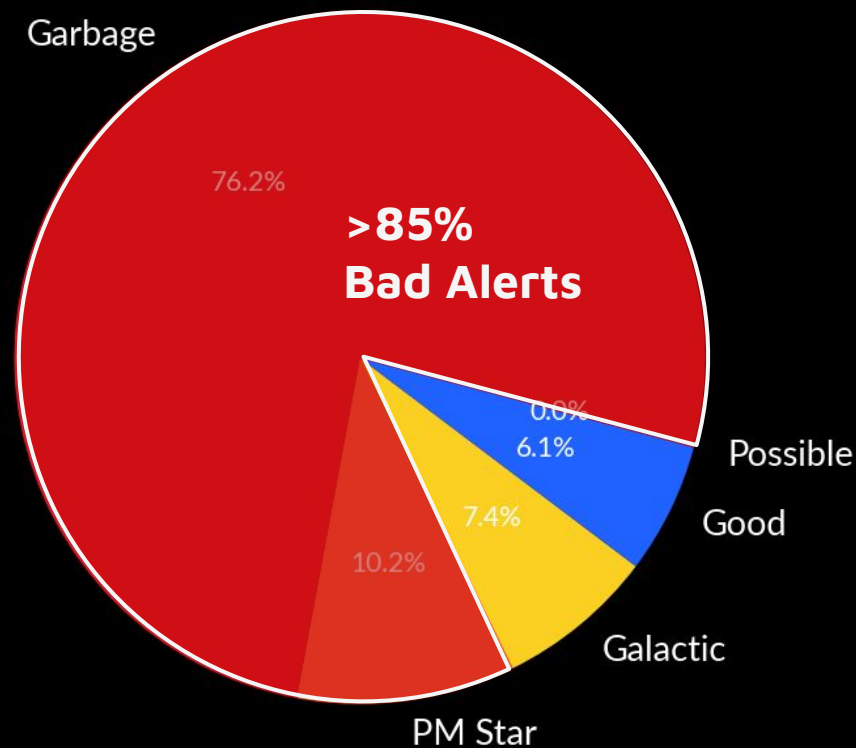


100s

*Eyeball
Everything
Everytime*

A lot of garbage left to eyeball

HUMAN LABELING SUMMARY (N=25335)



Data set gathered between 27 March and 18th July 2024

Technical Details

Features

- Sky location
- Light curve features
- Sherlock context
- Real Bogus Score

Histogram based Gradient
Boosted Decision Trees

VIRTUAL RESEARCH ASSISTANT

- > **Scores and Ranks alerts**
- > **Updates when new data**
- > **Auto-garbage bad alerts**



meee!



5-50

Workload Reduced by

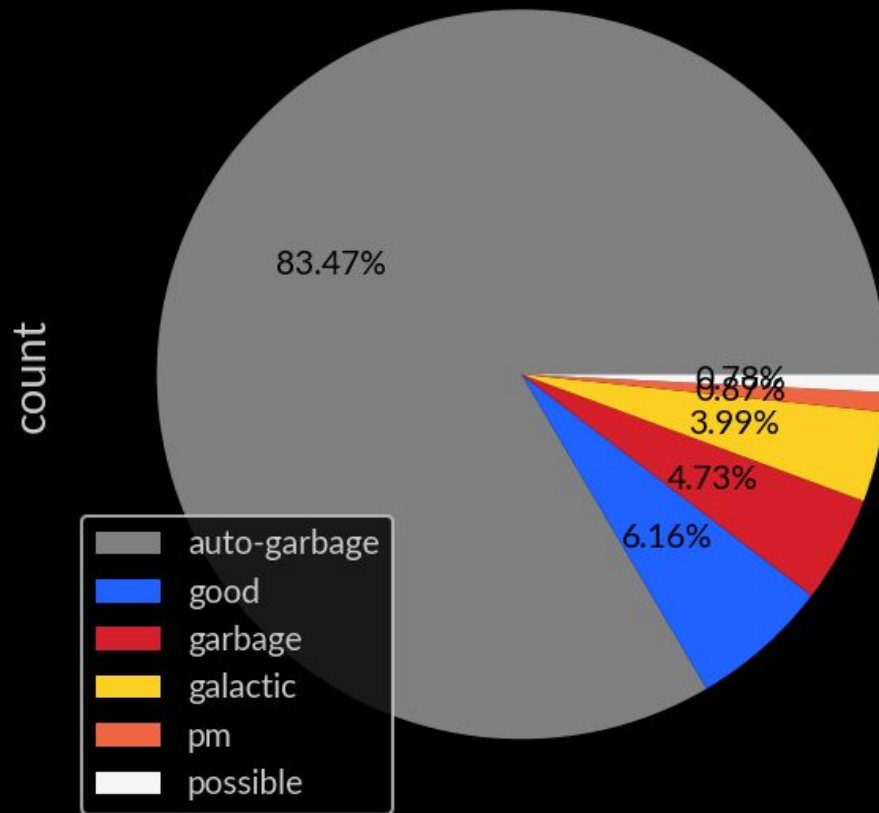
~80%

Last Week's Numbers

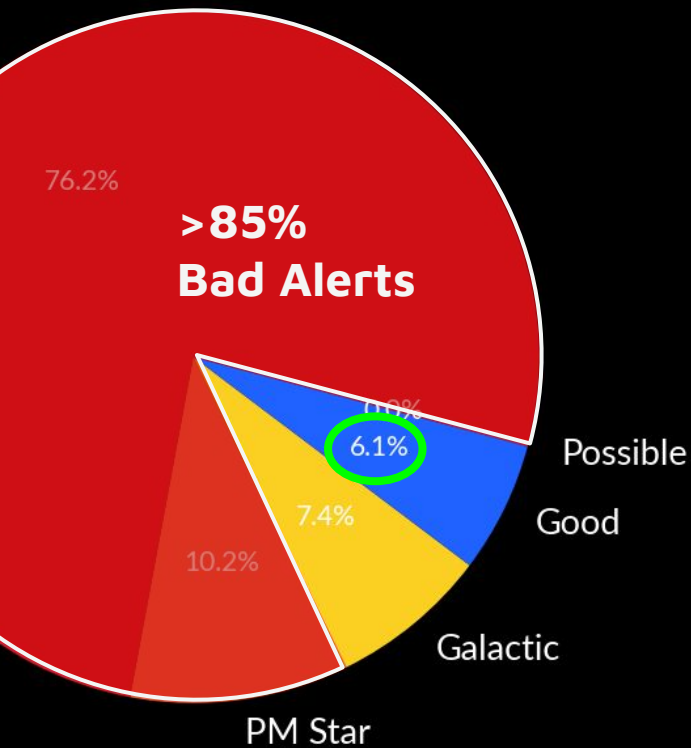
3036 alerts after CNN cuts
380 eyeballed by humans

>83% handled autonomously by VRA

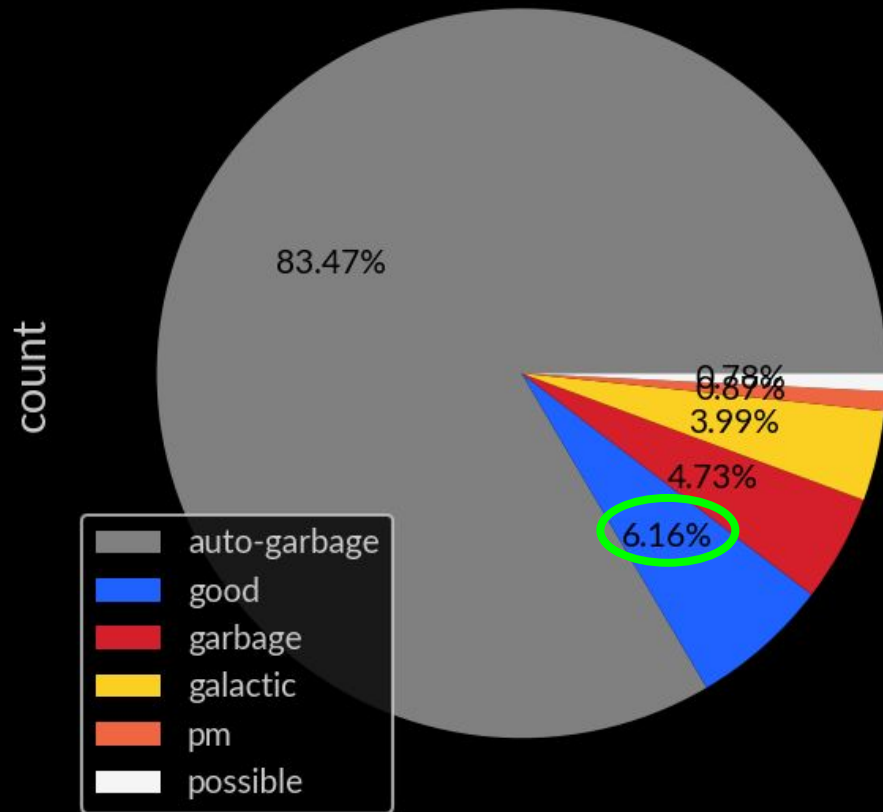
6th-13th September



LABELING
Y (N=25335)



6th-13th September



Accessing the data

GOOD

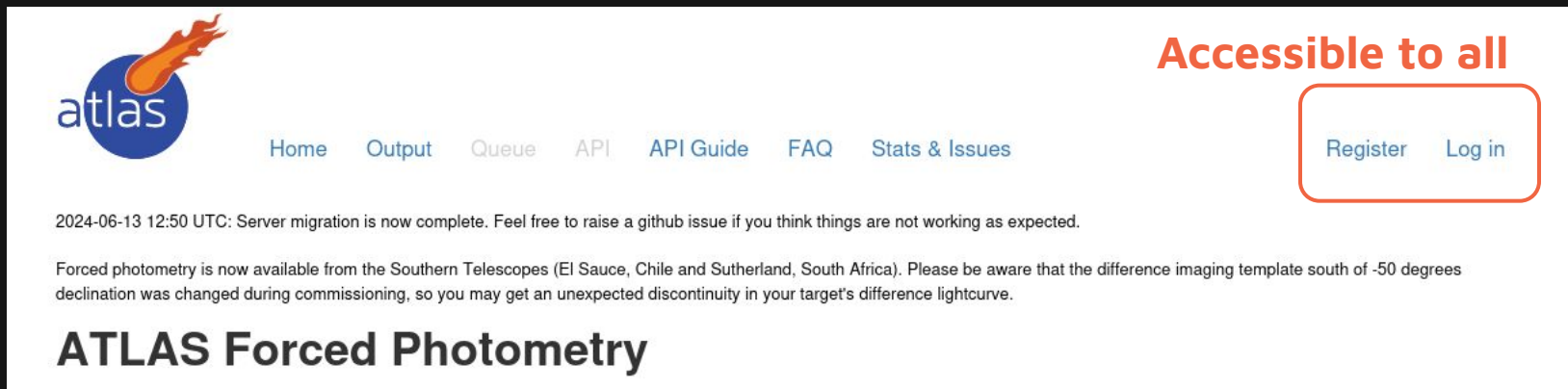
Extra Galactic Transients

Automatic TNS reporting

ATTIC

Real but not Extragalactic transients.

We currently do nothing with those but their data (like all data) is accessible through the Forced Photometry Server



The screenshot shows the ATLAS Forced Photometry website. At the top left is the ATLAS logo, which consists of a blue circle with the word "atlas" in white lowercase letters, and a stylized orange and red comet tail above it. To the right of the logo is a navigation menu with links: Home, Output, Queue, API, API Guide, FAQ, and Stats & Issues. In the top right corner, there is a red-bordered box containing the text "Accessible to all" in red, and below it, two buttons: "Register" and "Log in". Below the navigation menu, there is a message: "2024-06-13 12:50 UTC: Server migration is now complete. Feel free to raise a github issue if you think things are not working as expected." Below this message is another line of text: "Forced photometry is now available from the Southern Telescopes (El Sauce, Chile and Sutherland, South Africa). Please be aware that the difference imaging template south of -50 degrees declination was changed during commissioning, so you may get an unexpected discontinuity in your target's difference lightcurve." At the bottom of the screenshot, the text "ATLAS Forced Photometry" is displayed in a large, bold, black font.

<https://fallingstar-data.com/forcedphot/>

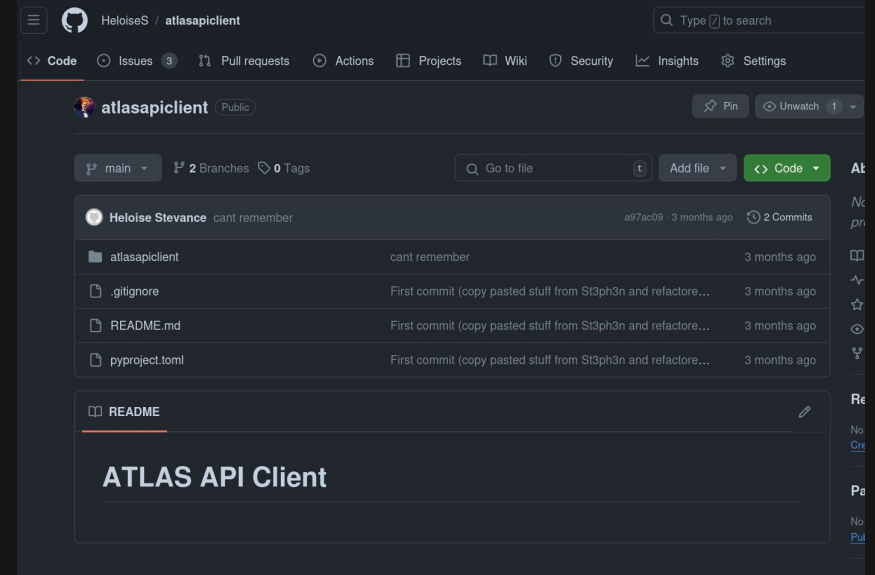
Luke Shingles

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Coming soon to your pypi



atlasapiclient



To be released by mid-November

Thanks!

Any questions?

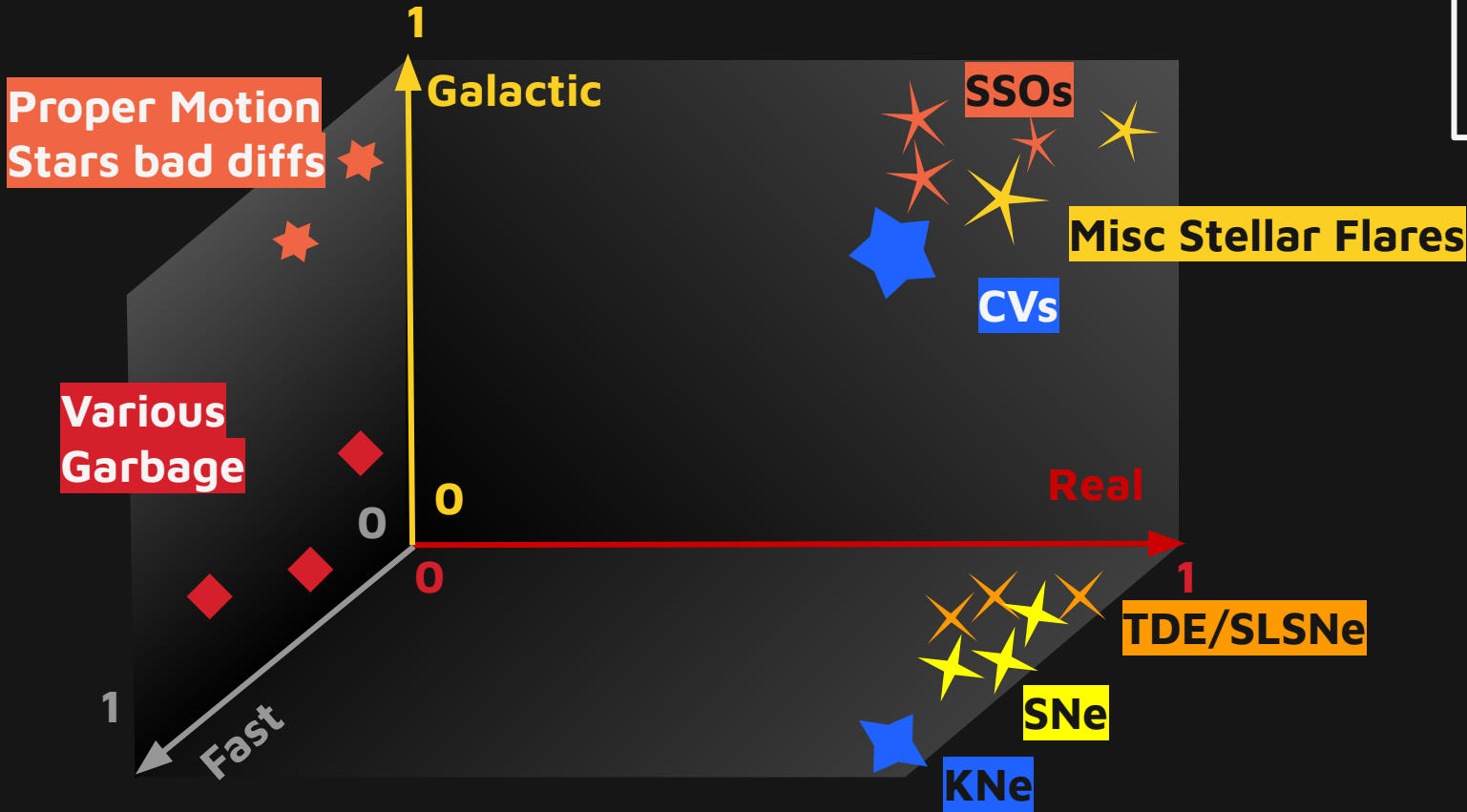
If you are reading this slides after the presentation please email hfstevance@gmail.com or relevant people flagged in earlier slides

How?

STEP 1

Forget the Supernova Classification

VRA

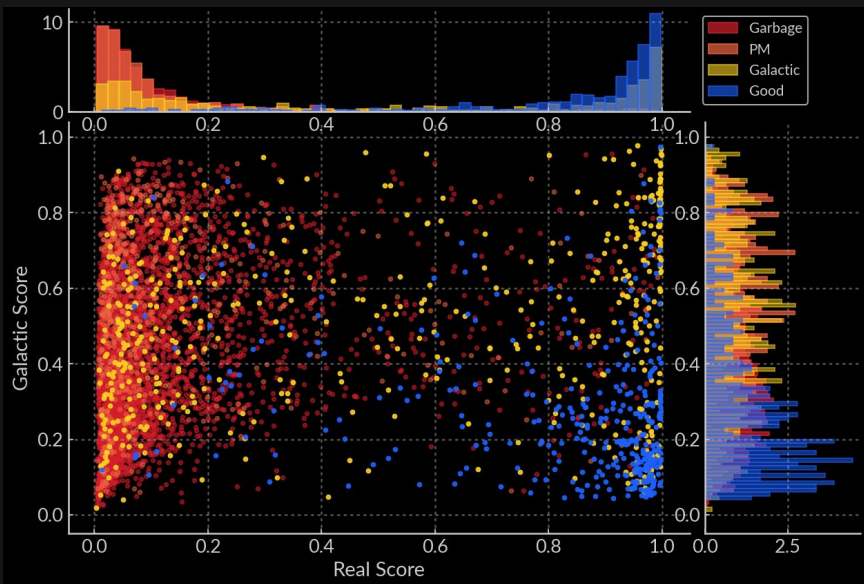


SCORE SPACE

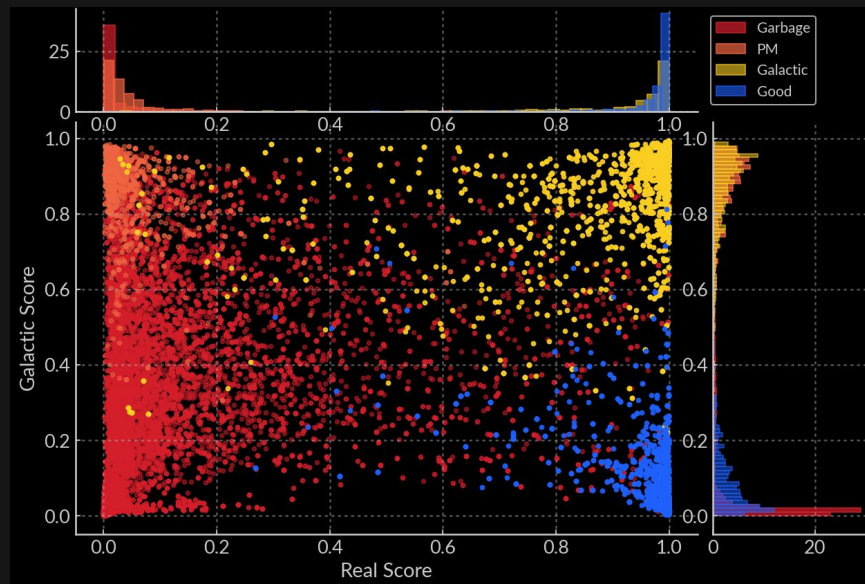
- > Independent “Real” and “Galactic” scorers
- > Still working on “Fast” axis

VRA

Plots of the predicted scores on unbalanced test set



Day 0 Model



Updater Model

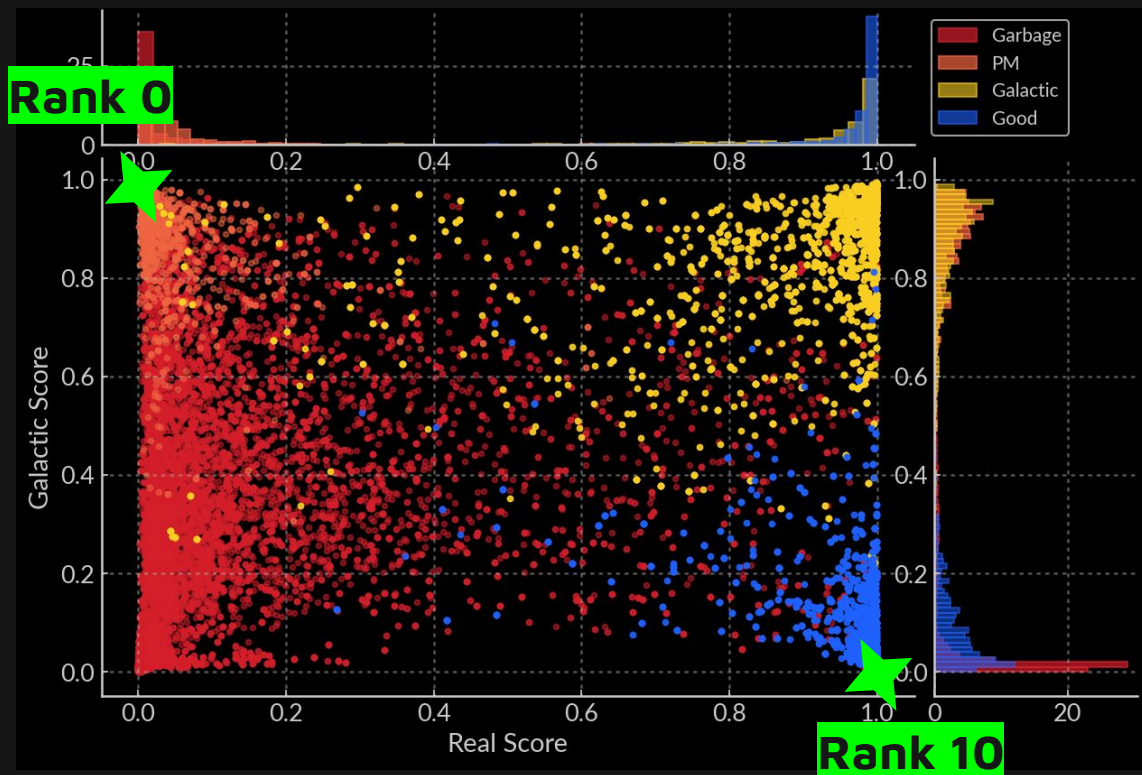
STEP 2

Use the power of basic geometry

VRA

Geometric distance to coordinate (1,0) with a fudge factor and then normalised between 0 and 10

RANKING








STEP 3

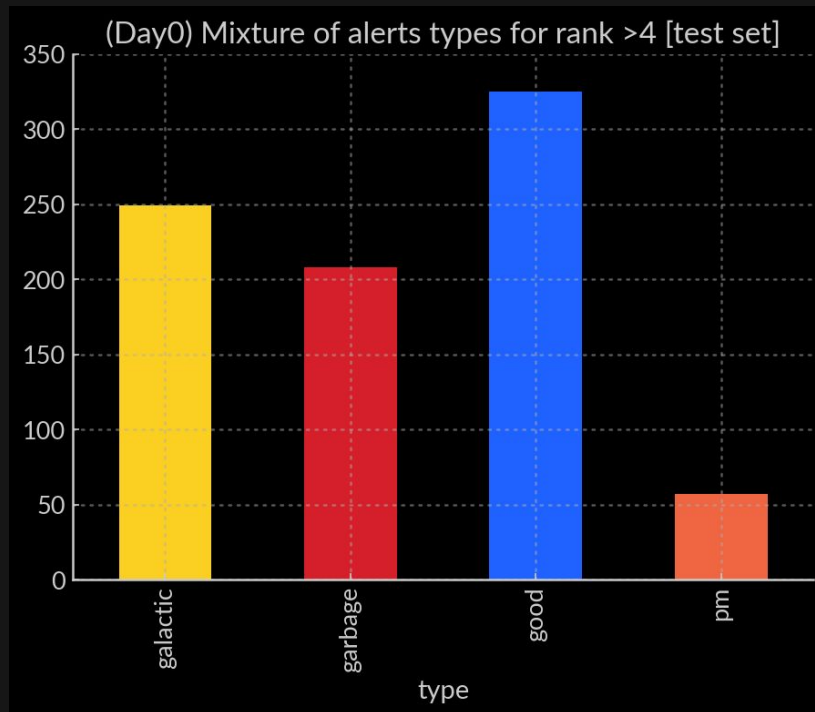
Define a new eyeballing strategy

New Eyeball Strategy



-  **st3ph3n** APP 12:58 AM
There are 337 objects in the [eyeball list](#). 23 of these have VRA rank >4:
-  **st3ph3n** APP 2:18 AM
There are 294 objects in the [eyeball list](#). 21 of these have VRA rank >4:
-  **st3ph3n** APP 4:27 AM
There are 305 objects in the [eyeball list](#). 25 of these have VRA rank >4:
-  **st3ph3n** APP 7:10 AM
There are 369 objects in the [eyeball list](#). 30 of these have VRA rank >4:
-  **st3ph3n** APP 11:35 AM
There are 340 objects in the [eyeball list](#). 5 of these have VRA rank >4:

Save for



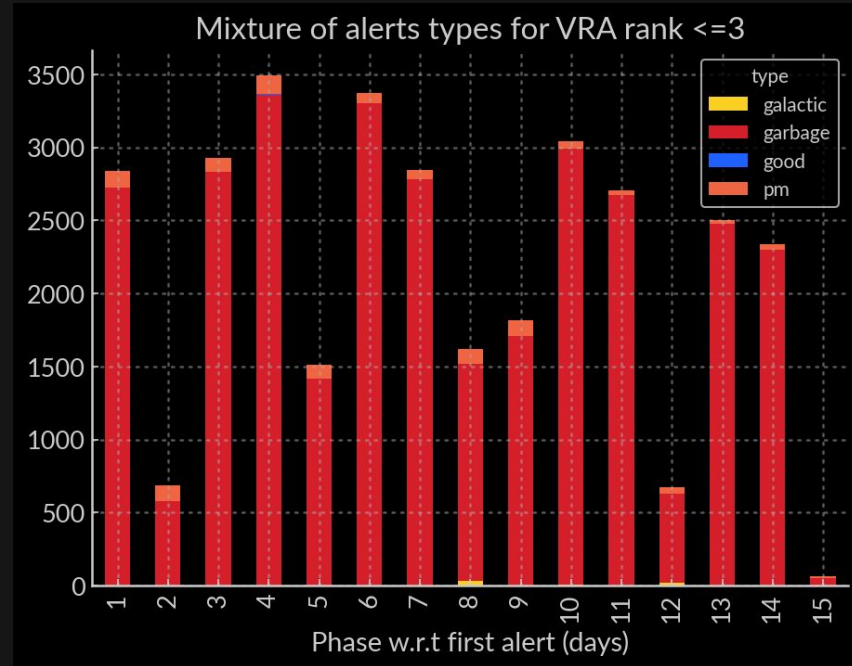
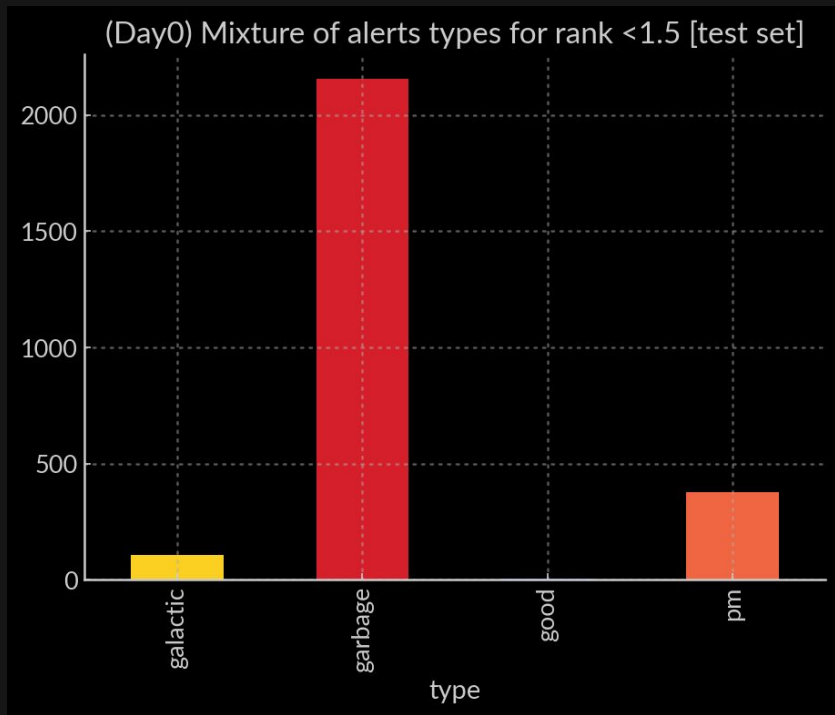
Day 0

rank < 1.5

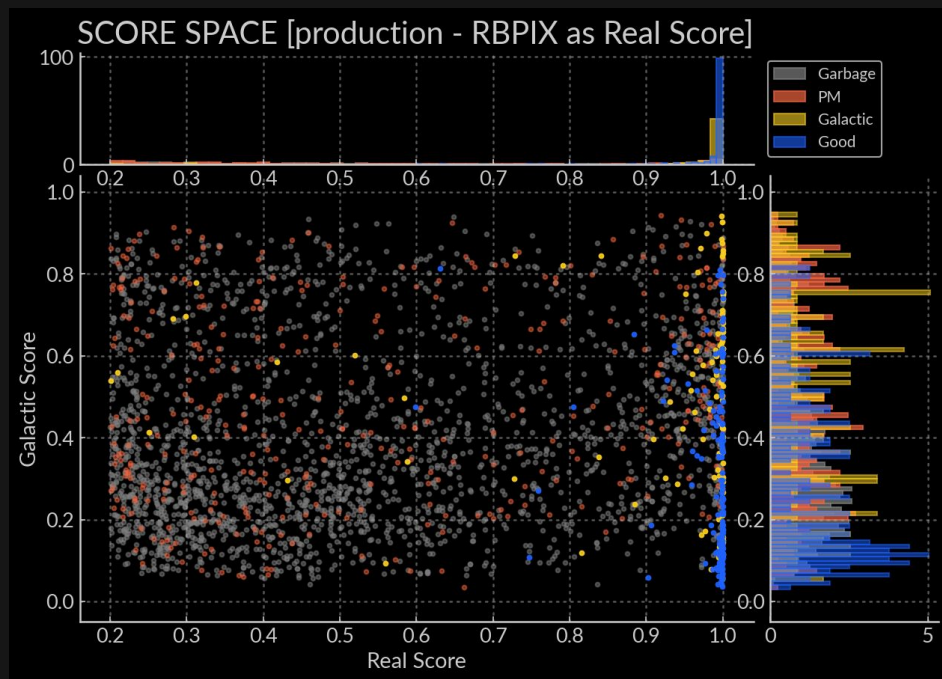
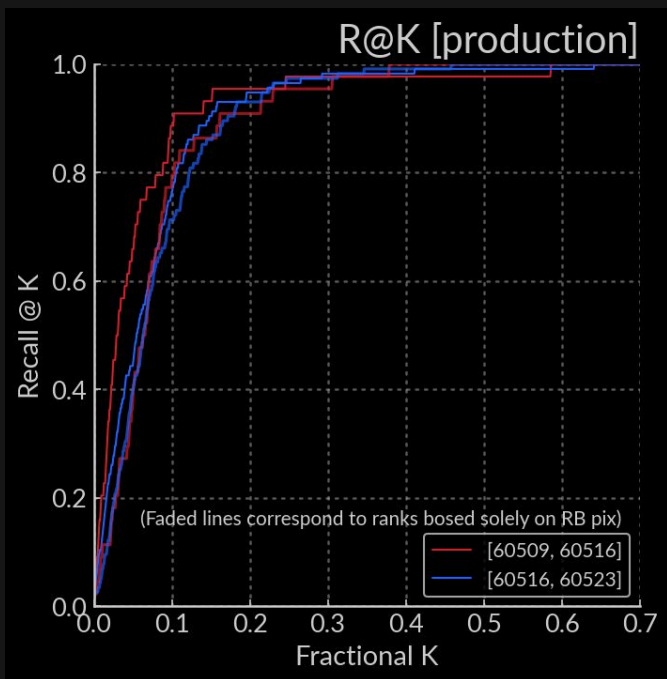


Update

max(rank) < 3

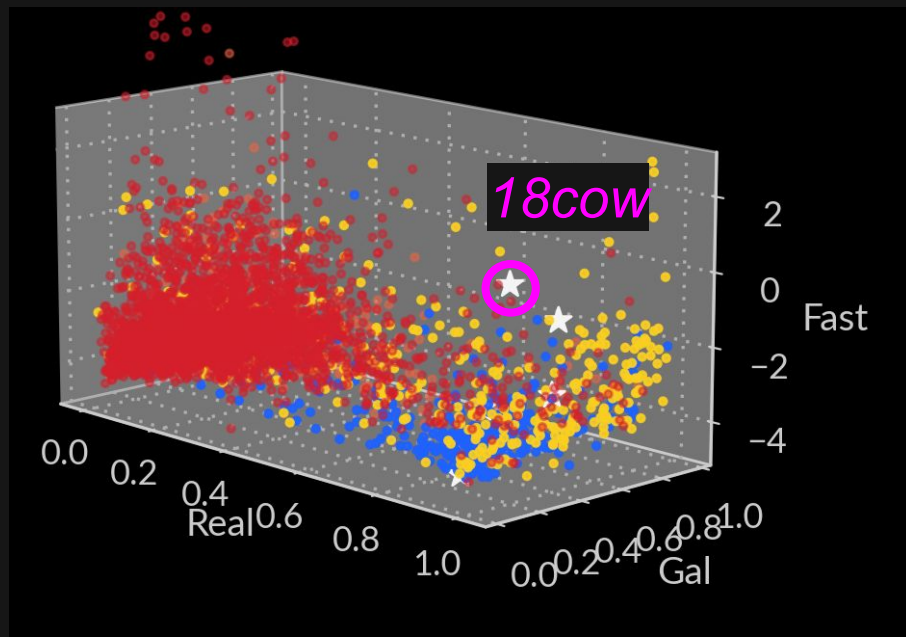


Extra Slide - Using RB score for the Real Axis



Although the real scores are higher for the transients, the garbage distribution is "Smeared" → ranking is less effective

Extra Slide - Fast Axis Motivation and Test



Extra Slide - Why Forget the SN Classification?

- 1) Most “transient” classifiers forget that galactic transients exists and the models are trained **without ever seeing a CV or a stellar flare** → **fail in production**
- 2) Human eyeballers can split the data into “Extra galactic” “Galactic” “Garbage” **very accurately with very little data** (1-2 Lightcurve points)

Classifying a LC as a type Ia with 75% confidence is useless at this stage.