



ALeRCE

Automatic Learning for the
Rapid Classification of Events

ALeRCE HackFest 2026!



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CMM
Center for
Mathematical
Modeling



DO
DATA OBSERVATORY





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Alert streams

- Cámara: 3200 megapixels (~260 celulares)
- ~20TB por noche
- En 10 años ~60 PB de imágenes
 - Cerebro humano ~2.5 PB de memoria
 - Rubin ~24 personas





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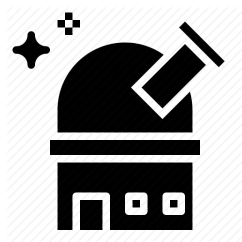
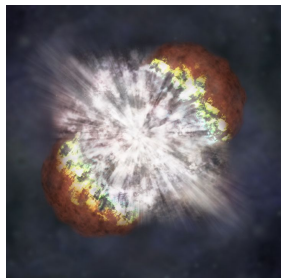
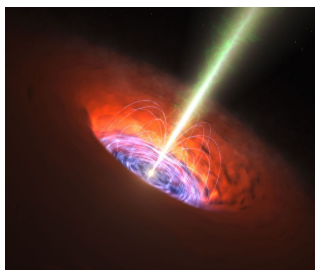
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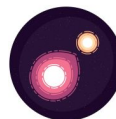
SN Ia



RR Lyrae

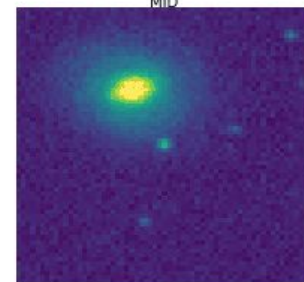
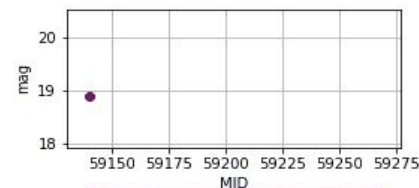


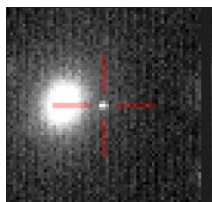
AGN



Eclipsing Binary

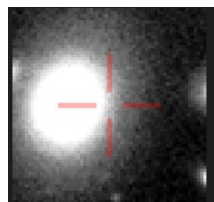
Datos Astronómicos





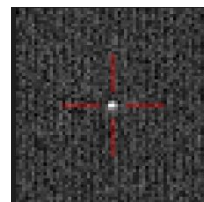
science

-



template

=



difference



Alerts data

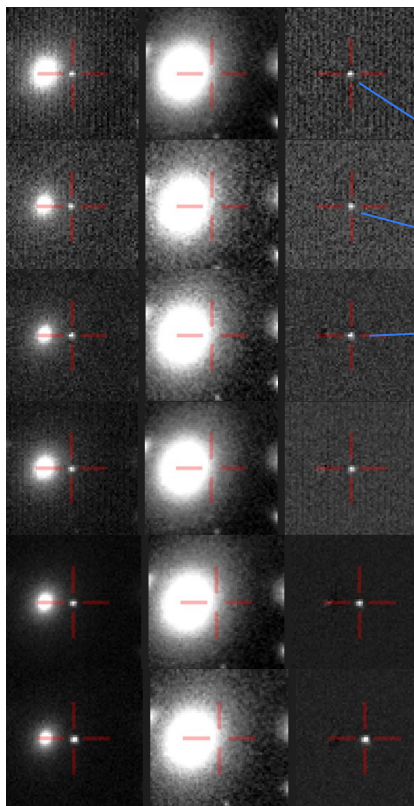
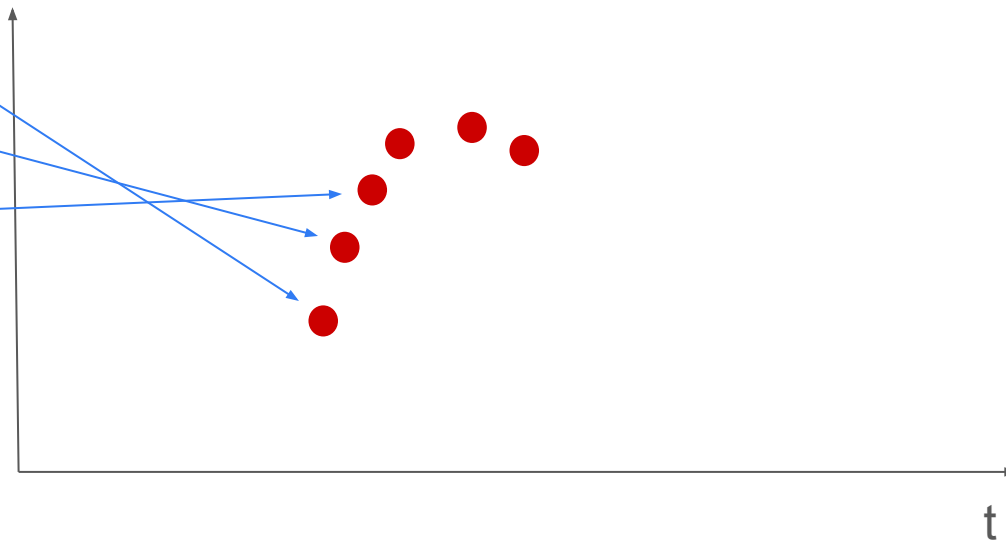


Image stamps

Brightness



Multi band time series / light curves



Alerts data

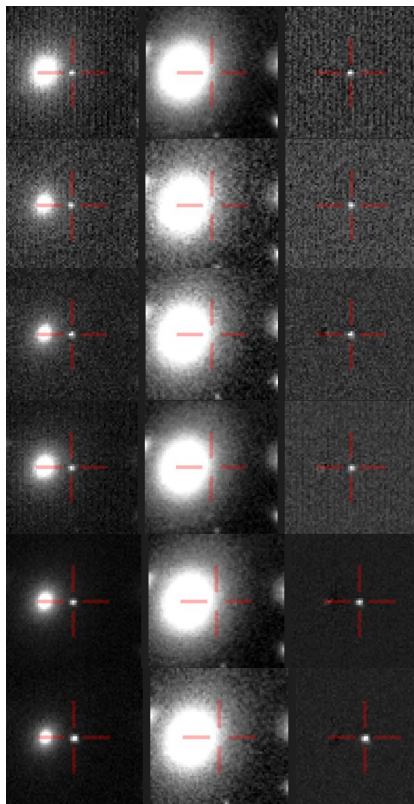
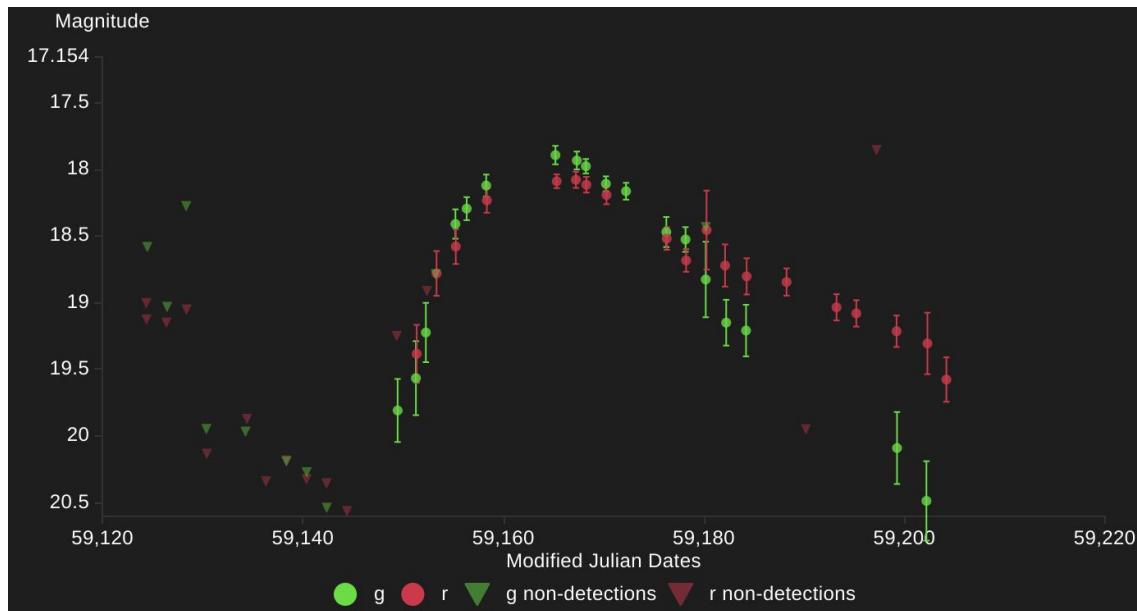


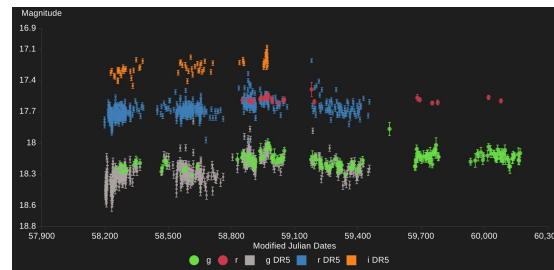
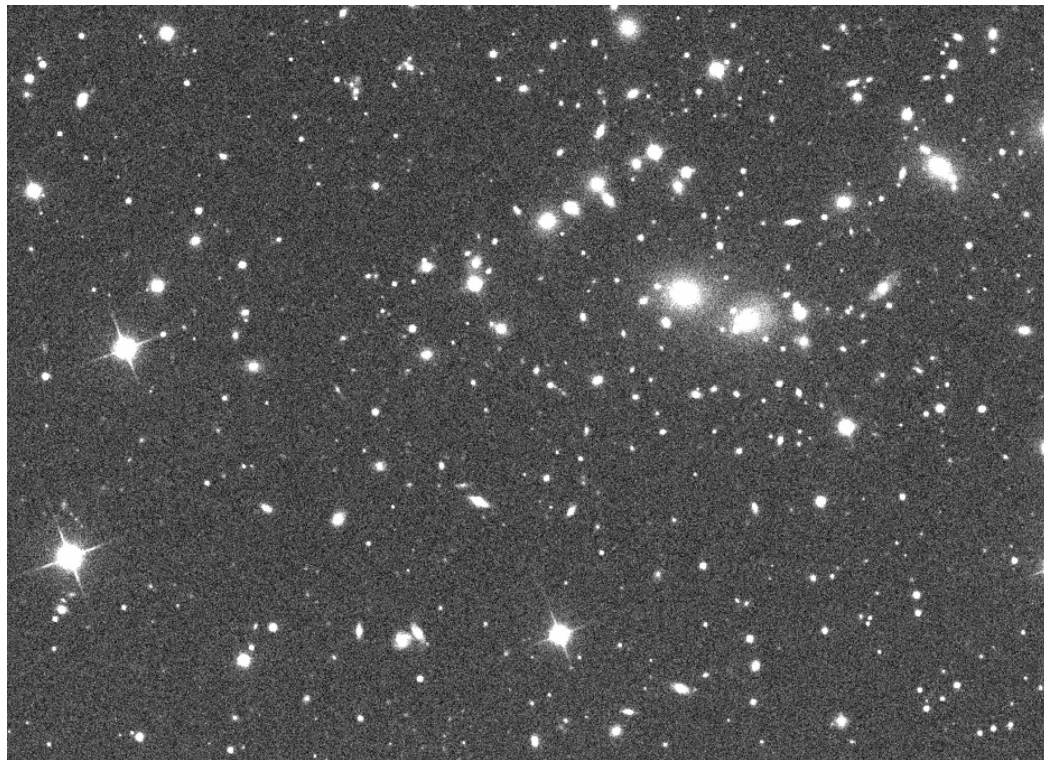
Image stamps



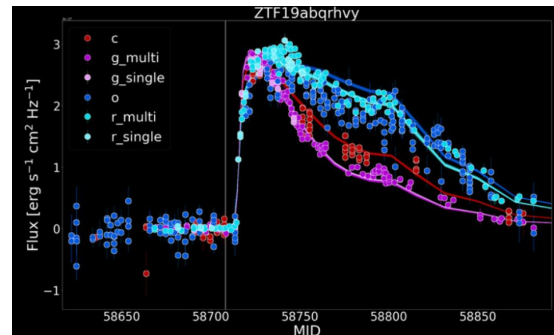
Multi band time series / light curves



Light curves



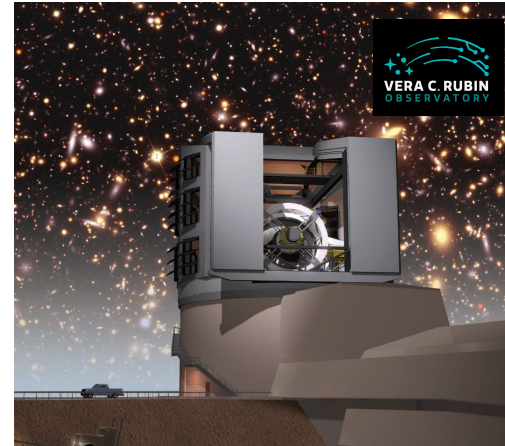
Science images (Data Releases)



Difference images (Forced Photometry)



From ZTF to the LSST



2018-2024

~1 TB per night

~1 billion objects

~0.1 to 1 million alerts per night

2025-2035

~20 TB of raw data per night

~47 billion objects

~10 million alerts per night



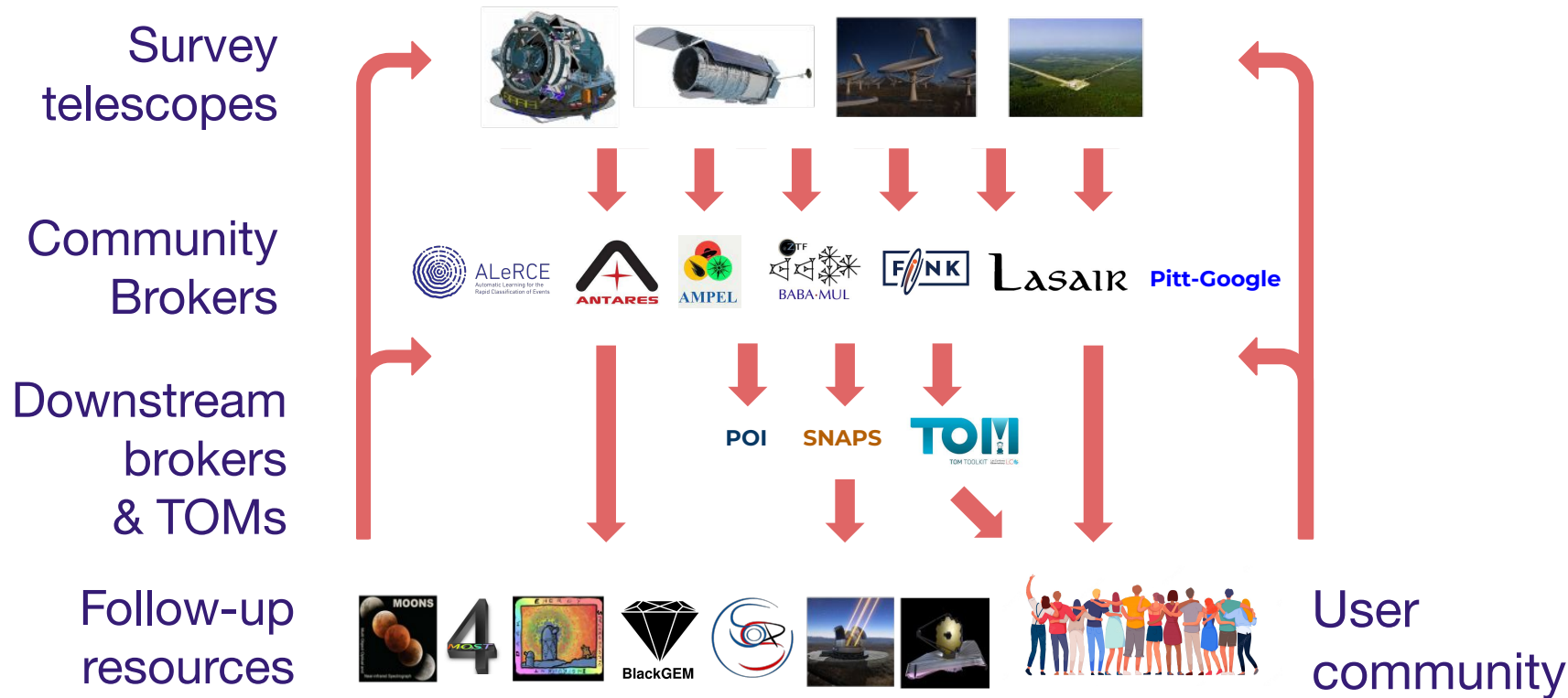
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Brokers

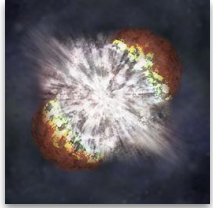


The Future Time Domain Ecosystem





Scientific questions



Transients

Progenitors of stellar explosions (outermost layers) & explosion physics (ejecta structure).

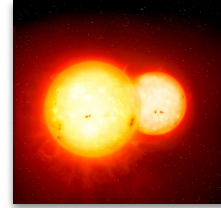
How does the Universe expand?



Active Galactic Nuclei

Changing state AGNs, reverberation mapping, detection of intermediate mass black holes, tidal disruption events.

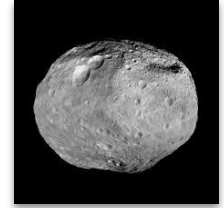
What is the nature of accretion in supermassive black holes?



Variable stars

Microlensing events, changing mode stellar pulsators, rapid reaction to eclipsing events, eruptive events.

How is matter distributed in our galaxy?



Solar System

Near earth objects, size distribution, collisional or rotational disintegration.

How was the solar system formed?



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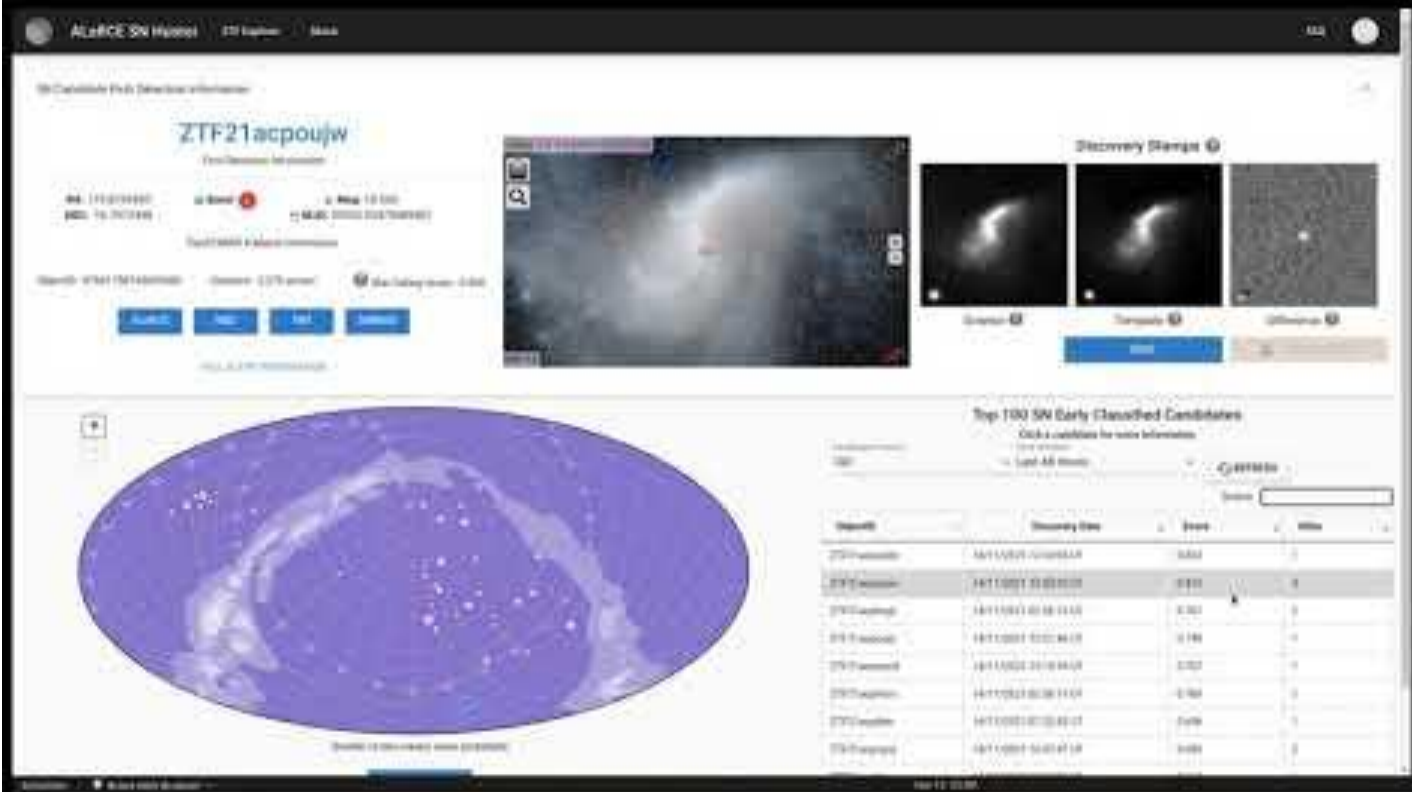
Tools



ALeRCE SN Hunter

Select young SN
candidates

<https://snhunter.alerce.online>





ALeRCE Explorer

Inspect classes
& classifiers

<https://alerce.online/>

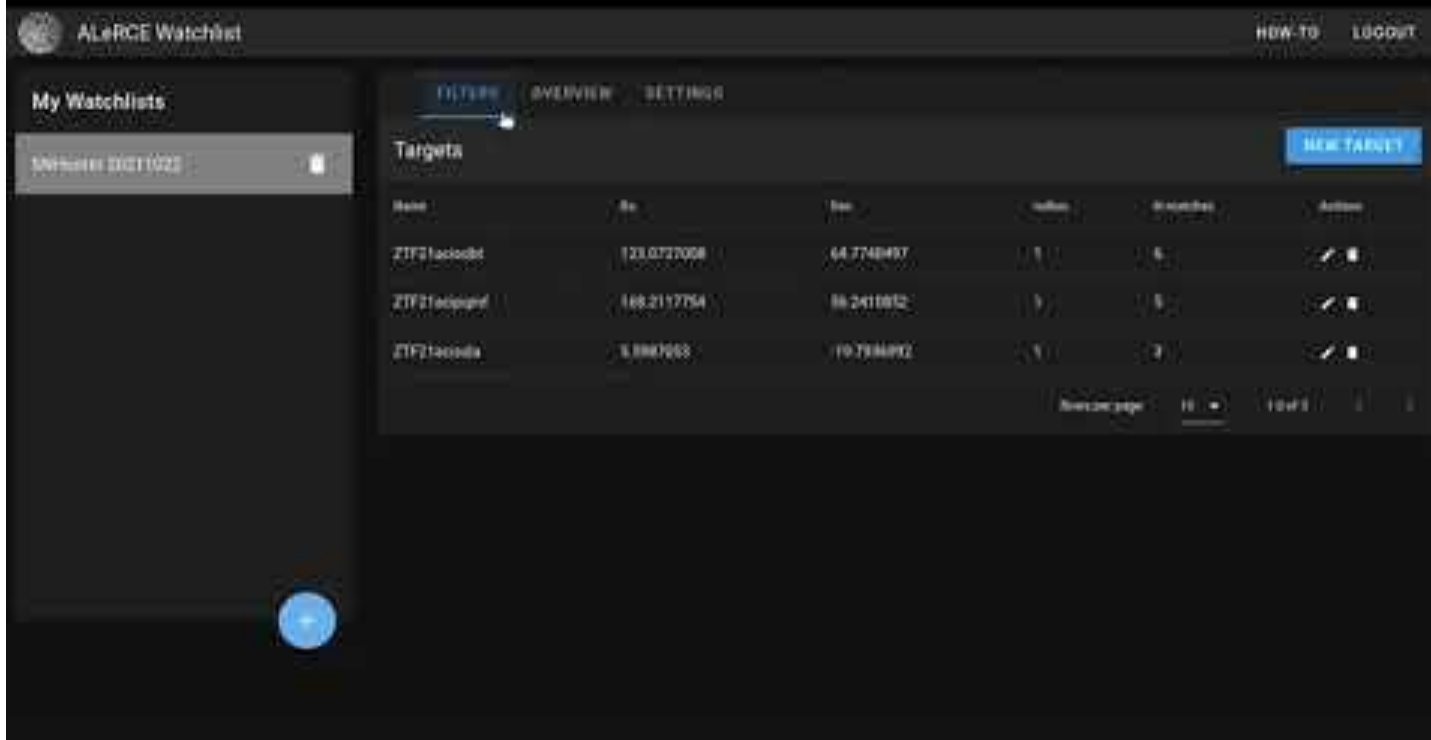




ALeRCE Watchlist

Get object
notifications

<https://watchlist.alerce.online>





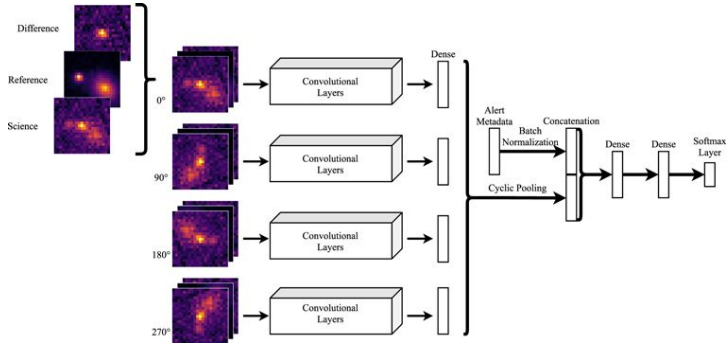
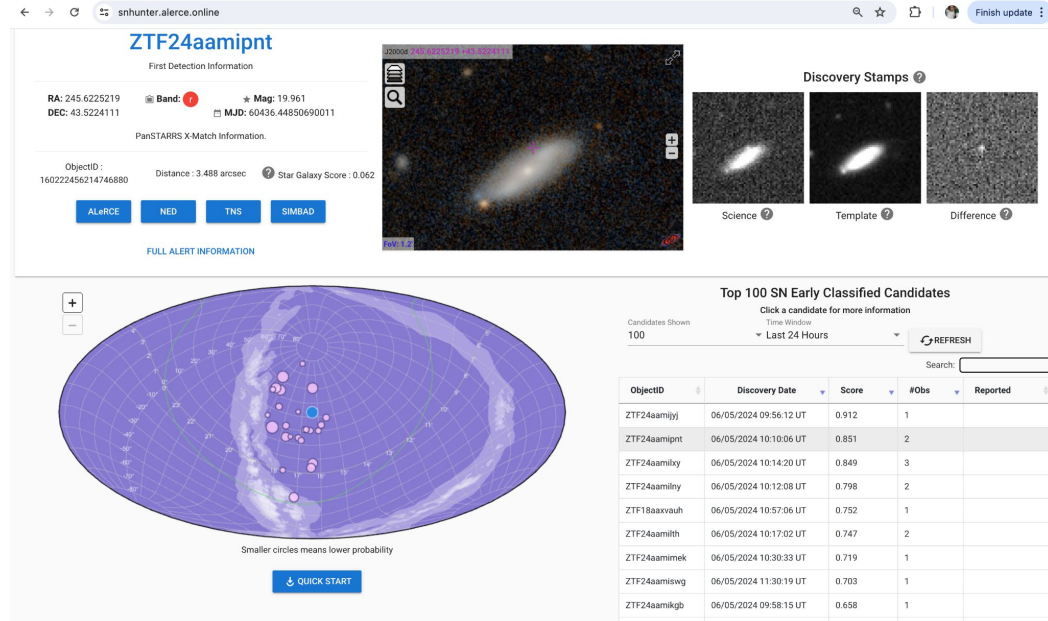
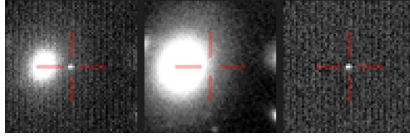
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Models



Stamp based classifier: SN Hunter

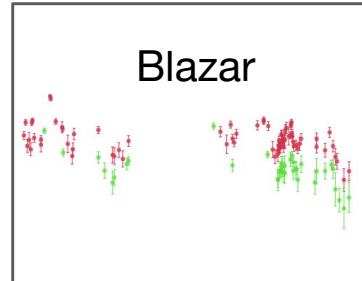
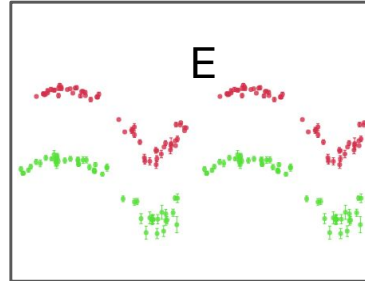
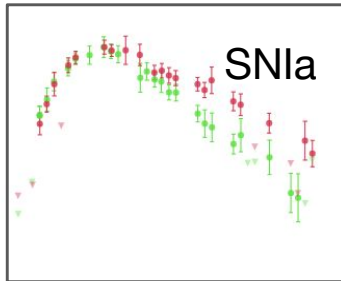


Carrasco-Davis, Reyes+2021
DOI 10.3847/1538-3881/ac0ef1



Light curve classifiers

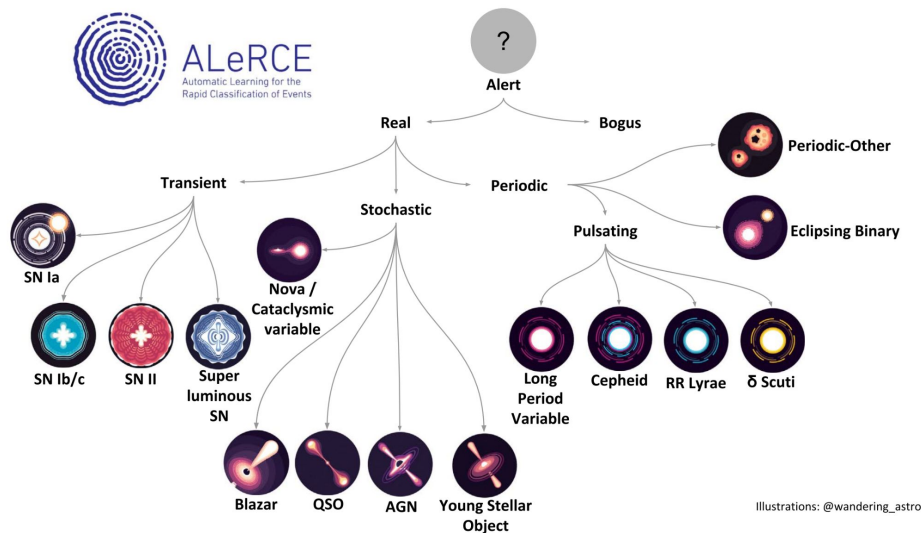
- Calculate ~185 features
- Balanced Hierarchical Random Forest



Sánchez-Sáez+2021 AJ

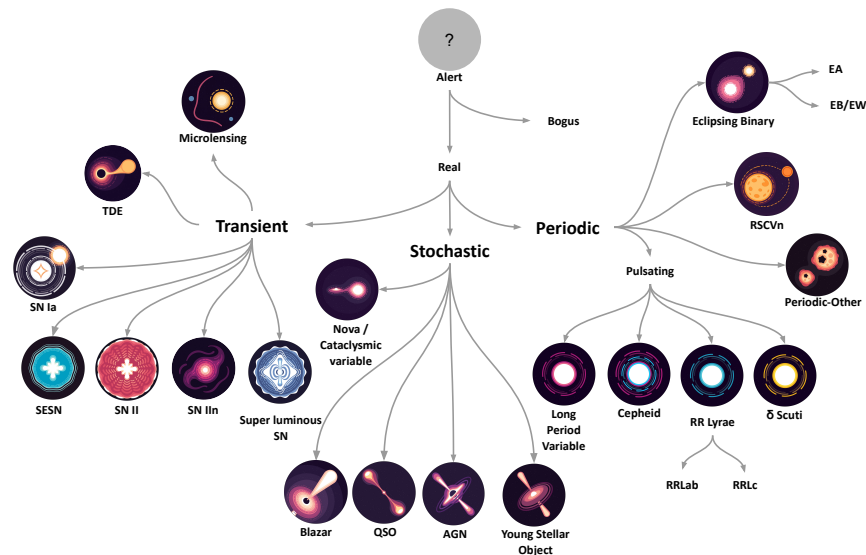
Light curve classifier 1

Sánchez-Sáez+2021 AJ



Light curve classifier 2

Started: 29/05/2025





ALeRCE ZTF Explorer

Search Filters

General Filters

Object ID

Classifier

Lc Classifier

Lc Classifier Top

Lc Classifier BHRF Forced Phot

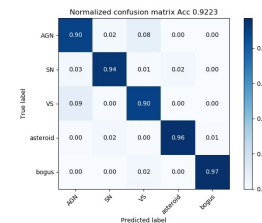
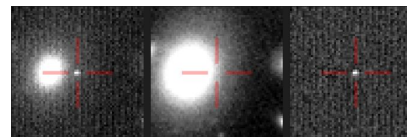
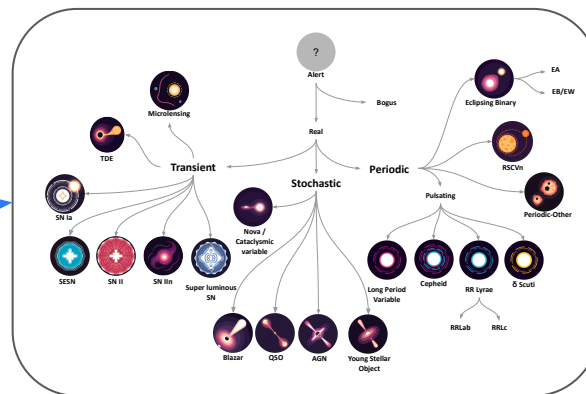
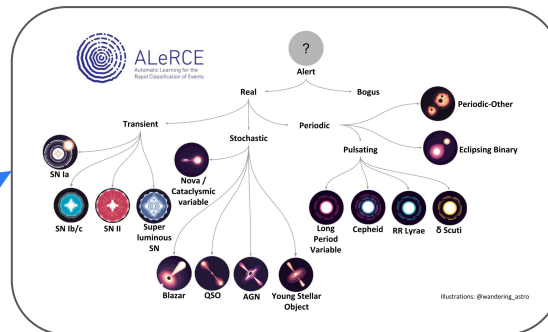
Stamp Classifier

LC Classifier ATAT Forced Phot Beta

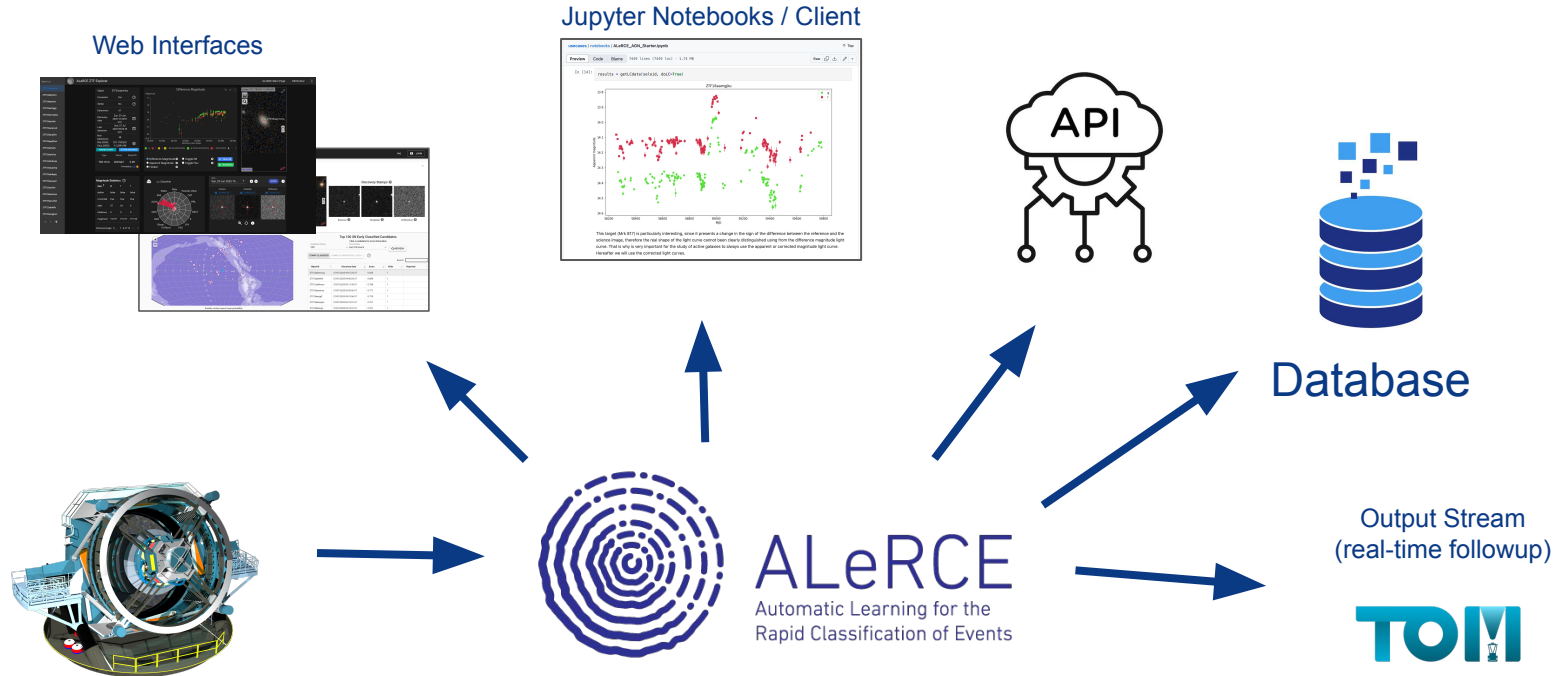
Stamp Classifier 2025 Beta

SEARCH

CLEAR



User Interfaces





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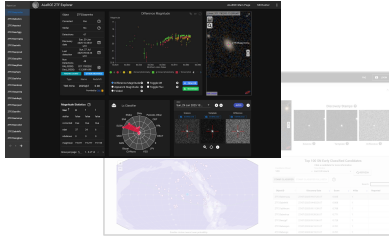
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RUBIN IS HERE!!!

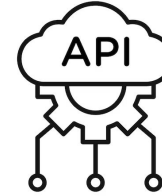
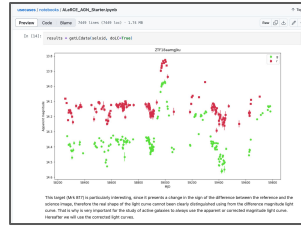
<https://science.alerce.online/alerce-lsst/>

User Interfaces

Web Interfaces

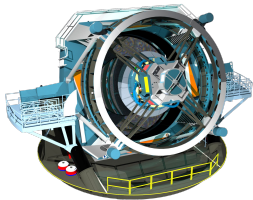


Jupyter Notebooks / Client



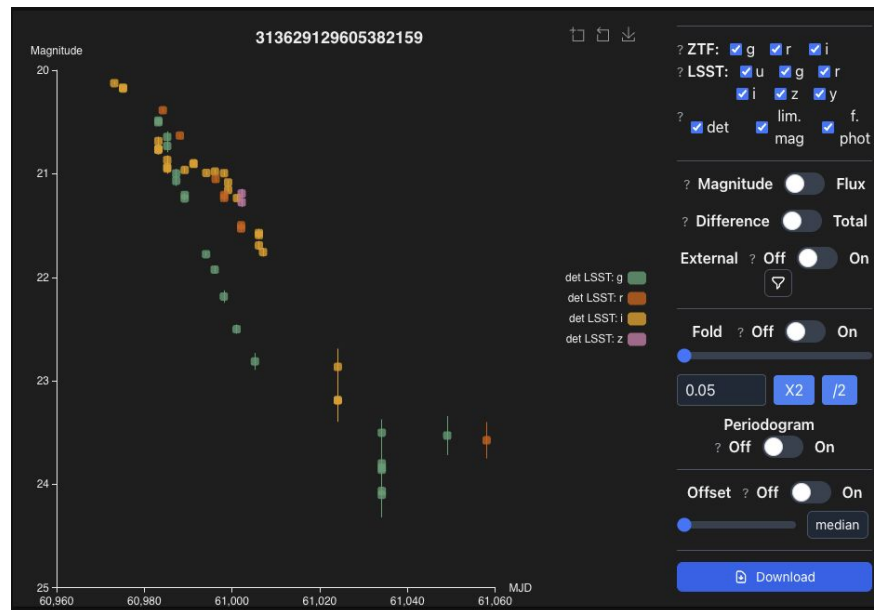
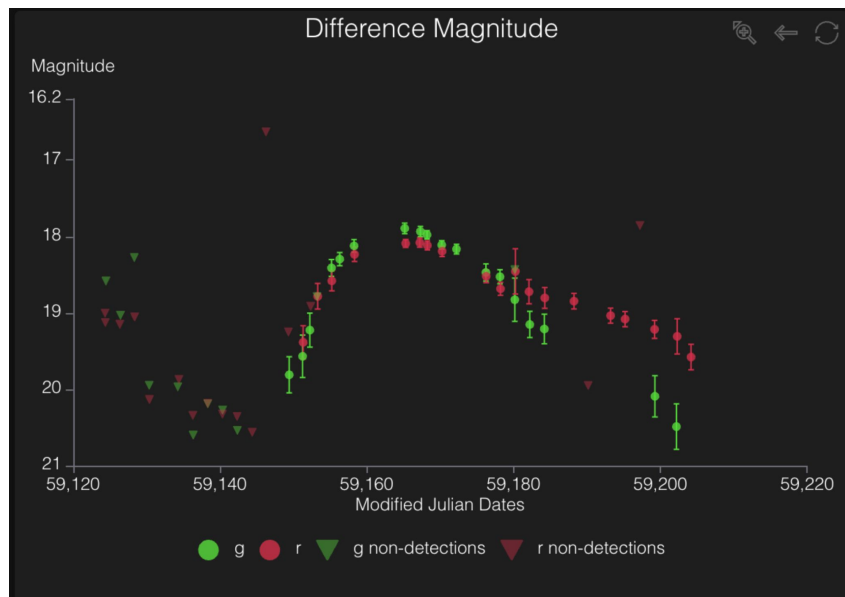
TAP

Output Stream
(real-time followup)



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Rubin vs ZTF





ALeRCE HACKATHON!!!!

	Tuesday	Wednesday	Thursday	Friday
9:00		Rubin Science Platform (Jeff Carlin)	Presentation of projects	
9:30			Work on projects	Final presentations
10:00				
10:30				
11:00		Coffee	Coffee	Coffee
11:30		ALeRCE LSST Data Access (Alejandra Muñoz Arancibia)	Work on projects	
12:00				Awards ceremony
12:30		Groups discussion		
13:00		Lunch	Lunch	
13:30				
14:00	Arrival and registration	Presentation of projects	Presentation of projects	
14:30	Introduction to ALeRCE (Guillermo Cabrera-Vives)	Work on projects	Work on projects	
15:00	Introduction to ALeRCE tools (Alejandra Muñoz Arancibia)			
15:30				
16:00	Coffee: Participants introductions	Coffee	Coffee	
16:30	ALeRCE Science Tutorials (Lorena Hernández-García)	Work on projects	Work on projects	
17:00				
17:30				



Contact us



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