

Improve time domain astrophysics

Summary of all publicly available alert channels

Complement existing platforms

Modern platforms: API + web + smartphones

professional + amateur astronomers



# LLMs @ Astro-COLIBRI

- Prototype NLP pipeline for information extraction from observation reports
- Short summary text of each event (target audience: general public)
- Automatic translation of posts in our discussion forum
- Podcast discussing recent papers (NotebookLM => [Astro-COLIBRI @ Spotify](#), etc.)
- Coding support (e.g. unit + integration tests)





# Circulars of the General Coordinates Network (GCN)

## Astronotes of the Transient Name Server (TNS)

### Astronomer's Telegrams

## Recurrent Nova M31N 2008-12a: Discovery of the 2024 eruption

ATel #16942; *Jingyuan Zhao (Xingming Observatory), A. W. Shafter, J. C. Horst, R. M. Quimby (SDSU), M. J. Darnley, M. W. Healy-Kalesh (LJMU), K. L. Page (U. Leicester), on behalf of the 12a Collaboration*

*on 13 Dec 2024; 04:31 UT*

*Distributed as an Instant Email Notice Novae*

*Credential Certification: Allen W. Shafter (ashafter@sdsu.edu)*

Subjects: Optical, Nova, Transient

Referred to by ATel #: [16944](#), [16945](#), [16946](#)

✕ Post

We report the discovery of the predicted 2024 eruption of the recurrent nova M31N 2008-12a (see also <http://www.cbat.eps.harvard.edu/unconf/followups/J00452894+4154098.html>).

The nova is clearly detected in a single 900 s exposure obtained on 2024 Dec. 13.0074 UTC at magnitude  $CV = 18.6 \pm 0.2$  by J. Zhao. The observations were obtained remotely from the 0.61-m f/6.5 Corrected Dall-Kirkham robotic telescope (Lane, 2018, RTSRE, 1, 119) at the Burke-Gaffney Observatory (BGO) of Saint Mary's University (Halifax, Nova Scotia, Canada). Follow-up photometric and spectroscopic observations of this most recent eruption of M31N 2008-12a are strongly encouraged.

## GCN Circular 42797

**Subject** LIGO/Virgo/KAGRA S251105aj: SVOM/ECLAIRs detection of a high-energy transient SVOM J2320.0-2901 through targeted search  
**Event** [LIGO/Virgo/KAGRA S251105aj](#)  
**Date** 2025-11-22T10:00:14Z (5 days ago)  
**Edited On** 2025-11-22T21:08:52Z (4 days ago)  
**From** SVOM\_group <svomgroup@bao.ac.cn>  
**Edited By** Vidushi Sharma at NASA GSFC/UMBC <vidushi.sharma@nasa.gov> on behalf of SVOM\_group <svomgroup@bao.ac.cn>  
**Via** Web form

H. Yang, O. Godet, J.-L. Atteia, M. Brunet, S. Guillot (IRAP), M. Pillas (IAP), L. P. Xin, Y. N. Ma (NAOC)

Using the event-by-event data downloaded through the X-band ground stations, we report on the identification of a faint SVOM/ECLAIRs transient SVOM J2320.0-2901 detected at 2025-11-05T13:00:48.34 UTC (T<sub>0</sub>), 88.4 s after the compact binary merger candidate S251105aj (The LIGO-Virgo-Kagra Collaboration, GCN [42587](#)). This transient was detected through an offline targeted search for possible counterparts of the GW event S251105aj.

SVOM J2320.0-2901 was detected with a timescale of 82 s and below 60 keV, with a best signal-to-noise ratio of 6.1 starting at T<sub>0</sub>.

The localization of SVOM J2320.0-2901 is RA, Dec = 349.998, -29.022 degrees:

RA (J2000) = 23h20m00s  
Dec (J2000) = -29d01m19s

with a 90% C.L. radius of 13.9 arcmin (including a systematic error of 6 arcmin added in quadrature). This position is about 2 degrees outside the 99% area contour of the Bilby.multiorder.fits skymap of S251105aj. At the time of the GW trigger, ECLAIRs was covering 88% of the skymap 99% area.

The time-averaged spectrum from T<sub>0</sub> to T<sub>0</sub>+82 s in the energy range of 5-60 keV is well fitted by a blackbody (BB) model, with a measured temperature of 7.8 (+1.5/-1.2) keV. With this model, the total 4-120 keV flux is (3.6+/-0.8)e-9 erg/cm<sup>2</sup>/s. Assuming a distance of 2071 Mpc (z=0.374) for the source, this corresponds to a luminosity of 1.8e48 erg/s and a BB emission radius of 1.9e6 cm. A broken power-law model is also tested, providing a comparable fit, though with less well-constrained parameters of photon index 1 around -0.5, break energy of 22 (+21/-10) keV, and photon index 2 around 2.9.

At this stage, the nature of SVOM J2320.0-2901 is unknown.

We conducted SVOM/VT and EP/FXT follow-up observations on this field. The results will be published in dedicated circulars.

All the quoted errors are at the 68% confidence level.

The Space-based multi-band astronomical Variable Objects Monitor (SVOM) is a China-France joint mission led by the Chinese National Space Administration (CNSA), French Space Agency (CNES), and the Chinese Academy of Sciences (CAS), which is dedicated to observing gamma-ray bursts and other transient phenomena in the energetic universe. ECLAIRs was developed jointly by CNES, CEA-IRFU, CNRS-IRAP, CNRS-APC.

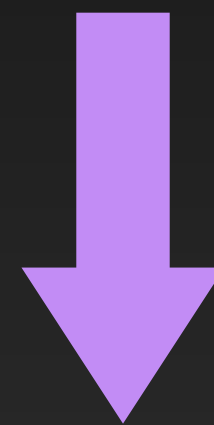
The SVOM/ECLAIRs point of contact for this source is: Hui Yang (IRAP) (hui.yang@irap.omp.eu).





# NLP pipeline for Astro-COLIBRI

The [Chandra X-ray Observatory](#) imaged the field of [GRB 991216](#) for 10ks starting on [Dec 18.208 \(UT\)](#), i.e. about 37 hrs after the GRB ([Kippen et al. GCN n. 463](#)). From a preliminary analysis of the data we found a single unknown point source, that we name [CXO J050931.4+111706](#), in the center of the field. The position is [RA = 05h09m31.35s](#), [DEC = 11d17'](#).



Celestial Object	Observatory	Date	Coordinates	Citation
CXO J050931.4+111706	Chandra X-ray Observatory	Dec 18.208 (UT)	RA = 05h09m31.35s, DEC = 11d17'	Kippen et al. GCN n. 463
GRB 991216	...	...	...	...

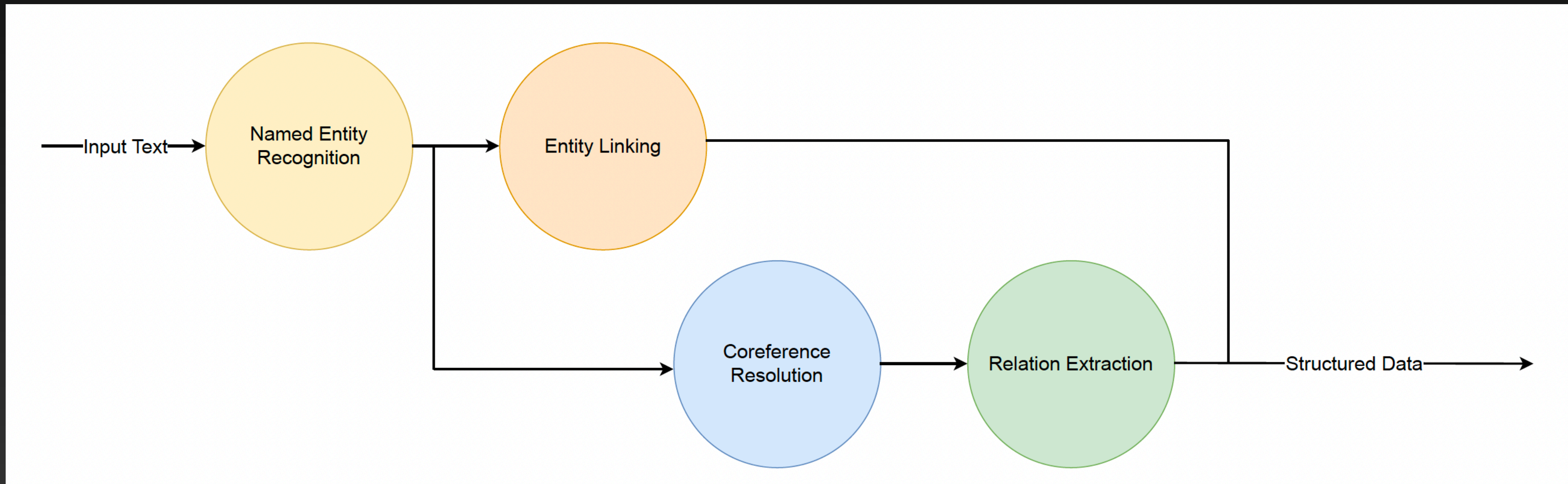




# NLP pipeline for Astro-COLIBRI

PhD thesis of Atilla Kaan Alkan (2021-2024; joint supervision FS + P. Zweigenbaum LISN)

Dedicated, annotated corpus « astroECR » => Fine tuning of the SciBert + astroBERT models => prototype for a complete information extraction pipeline



Alkan, Atilla Kaan, F. Grezes, C. Grouin, F. Schussler, and P. Zweigenbaum. “*Enriching a Time-Domain Astrophysics Corpus with Named Entity, Coreference and Astrophysical Relationship Annotations*”. LREC-COLING 2024

<https://aclanthology.org/2024.lrec-main.545/>





# LLMs @ Astro-COLIBRI

- Prototype NLP pipeline for information extraction from observation reports
  - Aim: replace current tools based on regular expressions
  - Rapid evolution of the field over the last years
    - Upgrade to recent LLMs + extensive real-life testing + deployment pending
- Short summary text of each event (target audience: general public)
- Automatic translation of posts in our discussion forum
- Podcast discussing recent papers (NotebookLM => [Astro-COLIBRI @ Spotify, etc.](#))
- Coding support (e.g. unit + integration tests)





# Astro-COLIBRI

<https://astro-colibri.com>



The screenshot shows the Astro-COLIBRI web interface. At the top, there are navigation buttons for 'Select action', 'Latest transients', 'Cone search', 'Personalize', and 'Status: logged out'. Below this is a filter bar for 'Observatories' (Swift, Fermi, HAWC, IceCube, AMON, Integral, GECAM, FlaapLUC, LVC, Catalogs, Other) and 'Event type' (FRB, Unclassified OT, Classified OT, SN, GRB, burst, neutrino, nuem, GW, 4FGL, TeVCAT, SGR/AXP, IceCat). A timeline shows events from 2023-11-08 to 2023-11-23. The main content area is divided into three sections: a list of recent events (S231123cg Gravitational wave, GRB 231123A Gamma-ray burst, Gamma-ray burst, GRB 231122A Gamma-ray burst, RXJ131058.8+323335 GeV flare), a central sky map with a cone search overlay, and a detailed view of the selected source S231123cg, including its coordinates, detection time, and classification.

The image shows three smartphone screens displaying the Astro-COLIBRI mobile application. The first screen shows a 'Cone search' interface with a sky map and a list of nearby sources. The second screen shows 'Source info' for GRB 220107A, including its coordinates, detection time, and classification. The third screen shows 'Visibility at H.E.S.S.' with a graph of altitude vs. azimuth and a monthly visibility chart.



<https://astro-colibri.science>

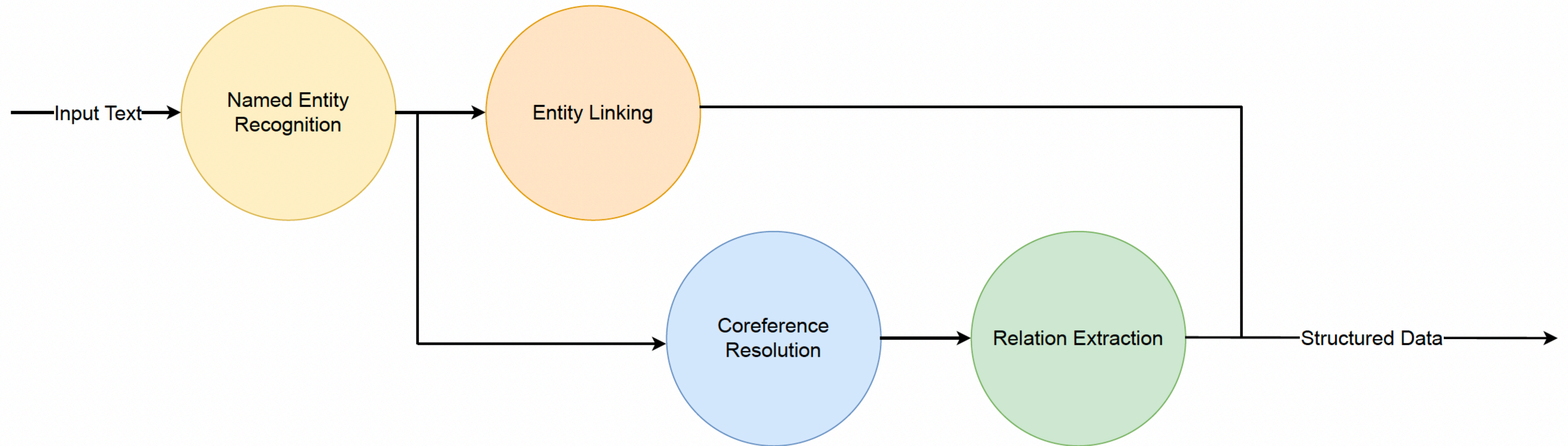








# NLP pipeline for Astro-COLIBRI

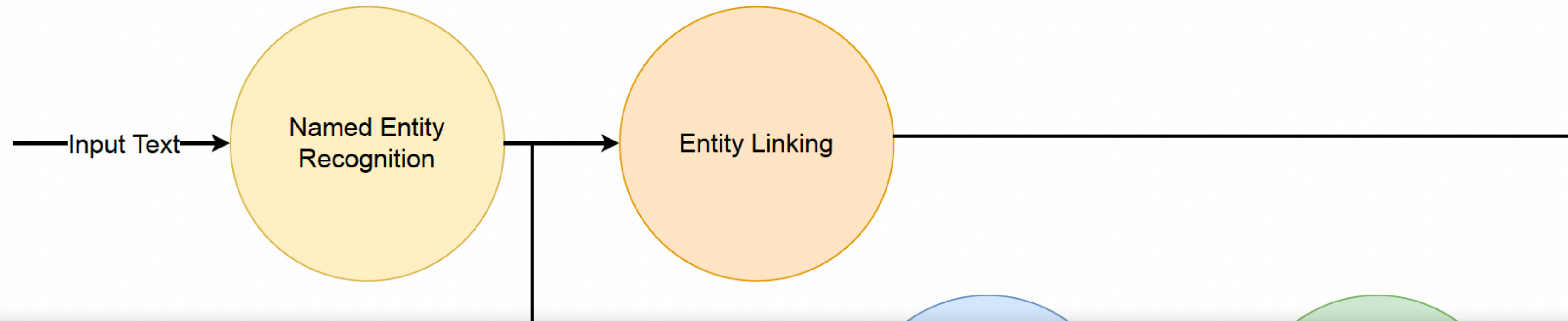


- Alkan, Atilla Kaan, F. Grezes, C. Grouin, F. Schussler, and P. Zweigenbaum. “*Enriching a Time-Domain Astrophysics Corpus with Named Entity, Coreference and Astrophysical Relationship Annotations*”. LREC-COLING 2024, <https://aclanthology.org/2024.lrec-main.545/>
- Alkan, Atilla Kaan, C. Grouin, F. Schussler, and P. Zweigenbaum. “*A Majority Voting Strategy of a SciBERT-based Ensemble Models for Detecting Entities in the Astrophysics Literature*”. First Workshop on Information Extraction from Scientific Publications, Association for Computational Linguistics, <https://aclanthology.org/2022.wiesp-1.17>





# Named Entity Recognition



A Cycle 6 obs ALMA proposal for 4 epochs of stand-alone Telescope Atacama Compact Array wlght Band 7 observations of variables in obj Serpens identified by the Survey JCMT Transient Survey has been accepted (PI: Person Logan Francis, project code Grant 2018.1.00917.S ). These observations will complement results from the contemporaneous Transient Survey by observing at Wavelength 850  $\mu\text{m}$  with a resolution of 38 (compared to the 146 resolution of the tel JCMT), sufficient to reach the scale of the inner envelopes ( $\approx 1500$  au) of protostars in obj Serpens.

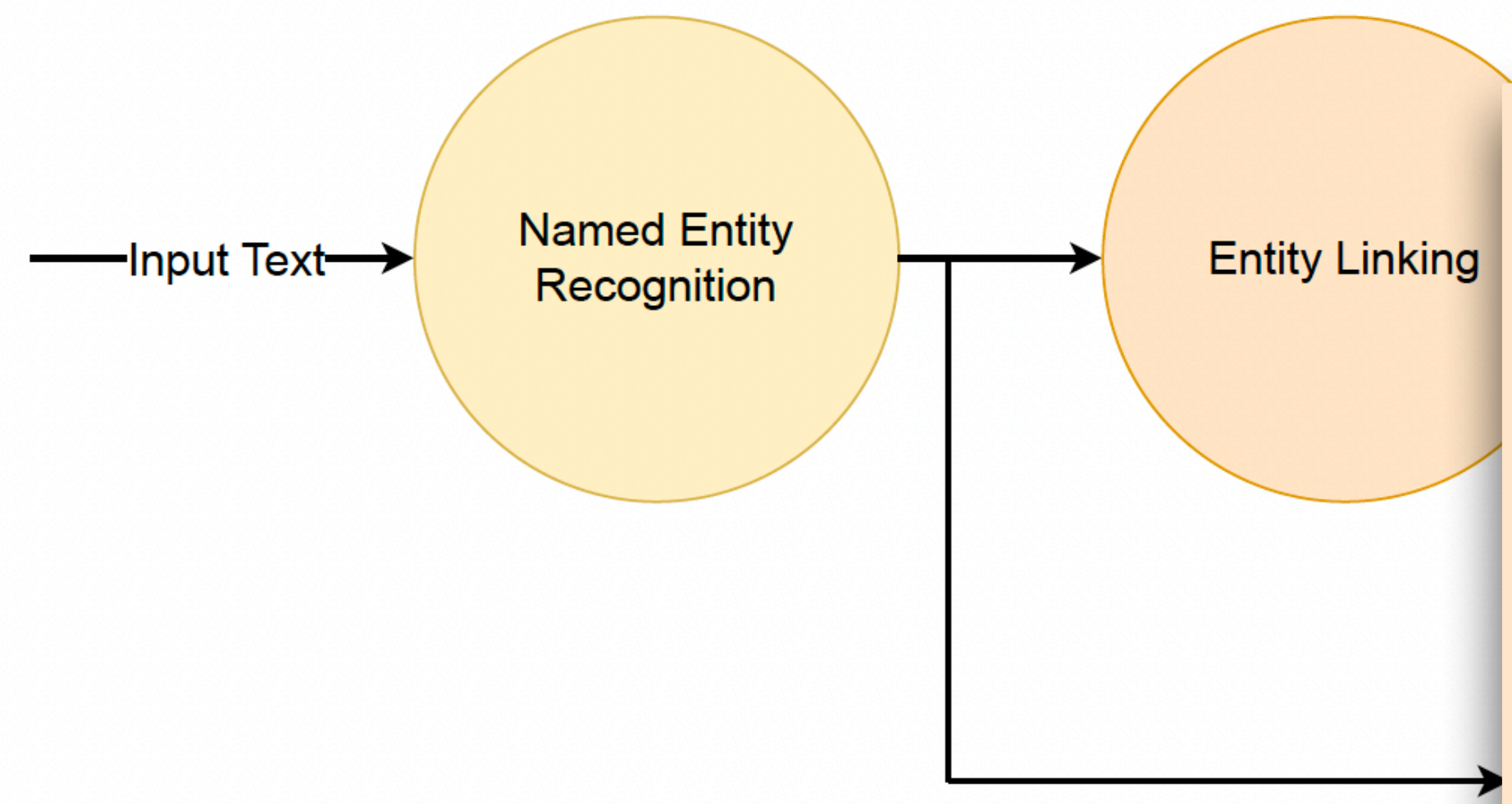
Linked Data →

- recognize a list of predefined concepts (celestial objects, astronomical facilities, physical properties, people, organization etc.)





# Entity Linking



ATel #3345:  
The [Large Area Telescope \(LAT\)](#) on board the [Fermi Gamma-ray Space Telescope](#) has observed an increasing gamma-ray flux from sources positionally consistent with [MG1 J123931+0443](#) (also known as [GB6 J1239+0443](#), [CRATES J1239+0443](#), [SDSS J123932.75+044305.3](#)) and [GB6 J0742+5444](#) (also known as [87GB 073840.5+545138](#), [BZU J0742+5444](#)).

ATel #7198:  
We report the ongoing NIR flare of [BZU J0742+5444](#) ([GB6 J0742+5444](#)) an intermediate redshift quasar ( $z=0.72$ ).

**GB6 J0742+5444**

other query modes: Identifier query, Coordinate query, Criteria query, Reference query, Basic query, Script submission, TAP, Output options, Help

Query: GB6 J0742+5444

**Basic data:**  
**6C 073840+545153 -- BL Lac**

Other object types: Red (2020464, GC, ...), gm (250,386, ...), QSO (201040), IV20001, ..., B1e (2009544, IMU20091, ...), X (2009464, RX, ...), BL (20194215), AGN (2011A23), B27 (2015Ap055), \* (G01a), NIR (204655), MIR (W15CA)

FK4 coord. (ep=B1950 eq=1950): 07 38 40.34293289 +54 51 30.77223417 | 0.0070257 0.1045 0 |

Gal coord. (ep=J2000): 182.03726723284 +29.90109745424 | 0.6070257 0.1045 0 |

Proper motions mas/yr: 0.118 0.238 [0.136 0.147 90] A 2020yCat.3356...06

Radial velocity / Redshift / cz: 200362...325...3720

Parallax (mas): 0.3907 [0.2378] A 2020yCat.1354...06

Fluxes (5): U 14.59 [-] E -  
G 18.520513 [0.029703] C 2010yCat.3356...06  
J 15.697 [0.048] C 2005yCat.2246...0C  
H 14.793 [0.077] C 2002yCat.2246...0C  
K 12.098 [0.044] C 2002yCat.2246...0C

**[VV2006] J123932.7+044305 -- Quasar**

other query modes: Identifier query, Coordinate query, Criteria query, Reference query

Query: GB6 J1239+0443

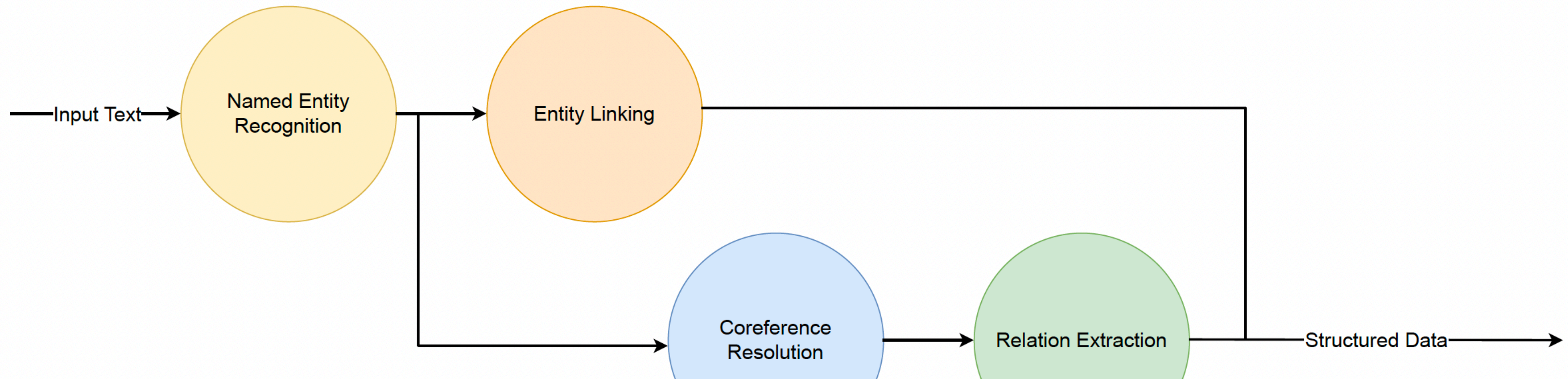
**Basic data:**  
**[VV2006] J123932.7+044305 -- Quasar**

- Disambiguating named entity mentions by linking them to the corresponding entries in a knowledge base.





# Coreference Resolution



We discovered **PS19did** (*AT2019khq*) on MJD 58666.31 = 2019-07-02.31, at  $w = 19.9 \pm 0.1$  [...] *The new transient source* is in the galaxy **UGC 11003** [...] Followup observations of *this intrinsically faint transient* are encouraged.

...

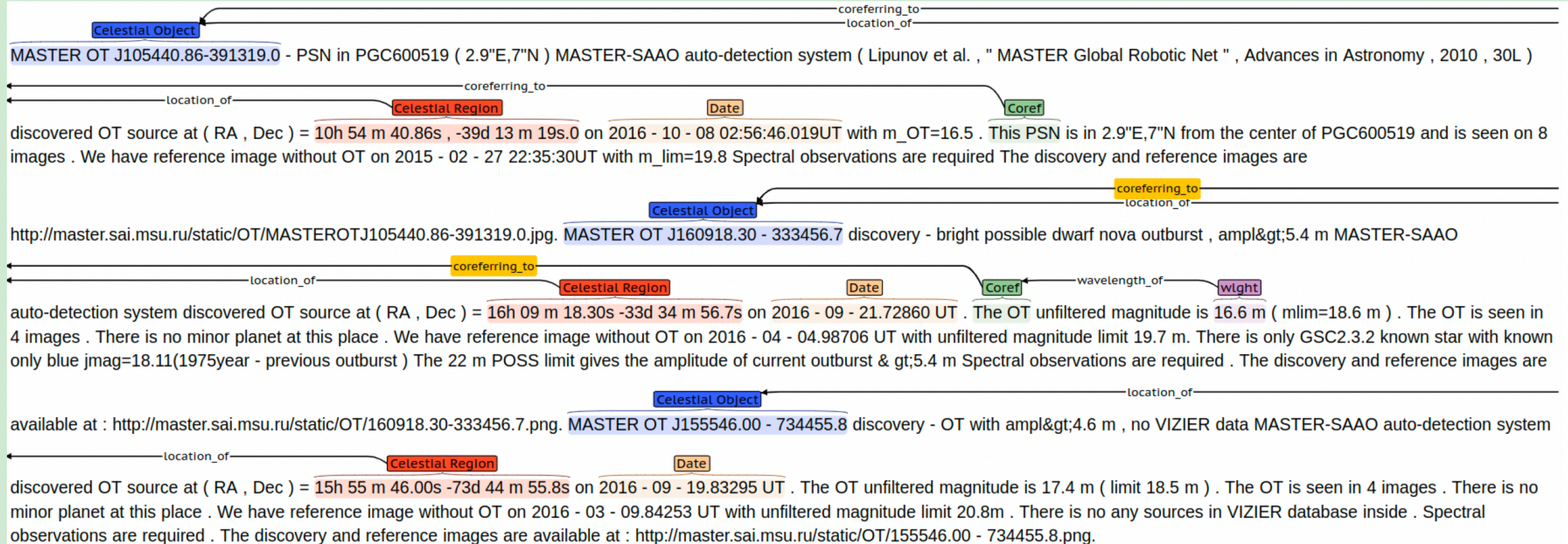
A spectrum was obtained of the possible supernova in **2MASX J11200680+3407396** with the 1.82-m Plaskett telescope [...] Adopting *the host galaxy* redshift  $z=0.03566$  (NED) yields an expansion velocity...

- Identify and group all mentions referring to the same entity





# Relation Extraction



- Extracting semantic relationships between two or more entities





# LLM based event summaries

Astro-COLIBRI

Personalize: Science mode:  Status: logged in as fabian.sch Infos: ✓ v2.24.0

2025-11-15 × 11-15 11-16 11-17 11-18 11-19 11-20 11-21 11-22 11-23 11-24 11-25 11-26 2025-11-26

**GRB 251127A**  
Gamma-ray burst

**GRB 251126A**  
Gamma-ray burst

Gamma-ray burst

**GB6J0742+5444**  
GeV flare

**PKS0235-618**  
GeV flare

**TCP J07175565-0926546**  
Unclassified optical transient

**AT 2025aevo**  
Unclassified optical transient

**GRB 251125B**

**GRB 251126A**  
Gamma-ray burst

**Zoom**

Date [UTC]: 2025-11-26 19:12  
Right ascension [deg] : 99.94  
Declination [deg] : 54.99  
observatory: Swift  
instrument: XRT

Summary of the selected source:

On November 26, 2025, the Swift Observatory detected a gamma-ray burst designated as GRB 251126A, located in the constellation Lynx. This event, captured by the X-ray Telescope (XRT) instrument, was precisely pinpointed at coordinates (RA: 99.94°, Dec: 54.99°) with an error margin of 0.0007°. The burst's photometric redshift is estimated at  $z = 3.5$ , indicating that it occurred at a significant distance from Earth in the early universe. Such high redshift events are crucial for understanding the conditions and evolution of the early cosmos.

Gamma-ray bursts like GRB 251126A are among the most energetic events in the universe, often associated with the collapse of massive stars or the merger of compact objects. This detection adds to the growing field of multi-messenger astronomy, where astronomers use various signals, such as electromagnetic radiation and potentially gravitational waves, to study cosmic phenomena. The event is positioned 135.95° away from the sun, which facilitates observational follow-ups by other telescopes aiming to explore its afterglow and gather more data to enhance our understanding of these powerful cosmic explosions.

Learn more about GRBs: [link](#)

Learn more about the events in Astro-COLIBRI here: [link](#)

Discuss this event in our forum:

External information:

- GCN #42855**  
Follow link for further information.
- ALADIN**  
Displays event in an interactive sky atlas
- ESASky**  
Displays event in an interactive sky atlas
- TNS**  
Transient Name Server
- AAVSO**  
Data collected by amateur astronomers
- Find about**