OSSR final workshop Partner report : MGP-MPIK

Q. Remy, A. Donath

December 1st, 2022

Tasks performed

Task 3.2 : "open science tools and software packages for astroparticle physics that work on high-level CTA data formats."

- development of gammapy, a python package for gamma-ray astronomy (selected as CTA science tools) - involved in the development of the data format for gamma-ray astronomy GADF, doi.org/10.3390/universe7100374

Task 3.1 : "Organize training activities to provide a consistent level of knowledge amongst the partners."

- gammapy meetings :
 - coding sprint (in person) or co-working week (remote) twice per year
 - user calls and user testing events
- tutorial sessions at ESCAPE summer school and CTA consortium meetings
- PYGAMMA workshops every 4 years, next in 2023

Task 3.3 : "providing interfaces between the python-based frameworks of CTA and KM3NeT" - possible with gammapy if KM3NeT data and IRFs are exported following GADF conventions Joint analysis of CTA and KM3NET simulated data, by Lars Mohrmann and Tim Unbehaun from ECAP (slides)



Gammapy onboarded on OSSR and tutorials on ESAP

ember 21, 2022 (00.10.03) 🛛 Software 📕 Open Access

gLike

D Rico, Javier; D Nigro, Cosimo; D Kerszberg, Daniel; D Miener, Tjark;

gLike is a general-purpose ROOT-based code framework for the numerical maximization of joint likelihood functions. The joint likelihood function has one free parameter (named g) and as many nuisance parameters as wanted, which will be profiled in the maximization process.

Uploaded on November 21, 2022

7 more version(s) exist for this record

November 17, 2022 (0.3.0) Software Open Access

agnpy

💿 Nigro, Cosimo; 💿 Sitarek, Julian; 💿 Gliwny, Pawel; Sanchez, David; 💿 Craig, Matthew; 💿 Vuillaume, Thomas; Viale, Ilaria; Maniadakis, Dimitrios;

agnpy is a python package focusing on the computation of the radiative processes of relativistic particles accelerated in the jets of Active Galactic Nuclei (AGN). It includes classes describing the galaxy components responsible for line and thermal emission and calculates the absorption due to gamm

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November 10, 2022 (1.0) Software Open Access

Gammapy: Python toolbox for gamma-ray astronomy

🝺 Acero, Fabio; Aguasca-Cabot, Arnau; 🗅 Buchner, Johannes; 🝺 Carreto Fidalgo, David; 🝺 Chen, Andrew; Chromey, Alisha; 🝺 Contreras Gonzalez, José Luis; de Bony de Lavergne, Mathieu; de Miranda Cardoso, José Vinícius; Deil, Christoph; 🝺 Donath, Axel; 💿 Giunti, Luca; 💿 Hinton, James; Jouvin, Léa; 💿 Khélifi, Bruno; King, Johannes; Lefaucheur, Julien; 💿 Lenain, Jean-Philippe; 💿 Linhoff, Maximilian; 💿 López-Coto, Rubén; 💿 Mohrmann, Lars; 💿 Morcuende, Daniel; Nakashima, Kaori; Nigro, Cosimo; 😰 Olivera-Nieto, Laura; 💿 Owen, Ellis; 💿 Panny, Sebastian; 💿 Papadopoulos Orfanos, Dimitri; 💿 Paz Arribas, Manuel; 💿 Pintore, Fabio; 💿 Poon, Helen; 💿 Remy, Quentin; 💿 Ruiz, José Enrique; 💿 Siejkowski, Hubert; 💿 Sinha, Atreyee; 💿 Sipőcz, Brigitta M; Spir-Jacob, Marion; 💿 Terrier, Régis; 💿 Tibaldo, Luigi; 💿 Unbehaun, Tim; 💿 van Eldik, Christopher; D Vuillaume, Thomas; D Weinstein, Amanda; Wood, Matthew;

Gammapy analyzes gamma-ray data and creates sky images, spectra and lightcurves, from event lists and instrument response information; it can also determine the position, morphology and spectra of gamma-ray sources. It is used to analyze data from H.E.S.S., Fermi-LAT, HAWC, and the Cherenkov Telesco



ESCAPE 2	2020
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ESCAPE aims to address the Open Science challenges shared by ESFRI facilities (CTA, ELT, EST, FAIR, HL-LHC, KM3NeT, SKA) as well as other pan-European research infrastructures (CERN, ESO, JIV-ERIC, EGO-Virgo) in astronomy and particle physics research domains.

ESCAPE has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 824064.

Read more

Curated by:

thomas_vuillaume

Curation policy:

All participations must be open-source.

For Software and Dataset, records must meet our requirements and follow an onboarding procedure as defined by our policies.

The ESCAPE Zenodo community welcomes entries that support the software and service projects in the OSSR, it also encourages the archival of documents and material that disseminate and support the goals of ESCAPE.

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Gammapy overview





matpletlib jupyter visualization

tutorials

A **Python** package for **gamma-ray** astronomy





Data reduction

Analysis workflow



DataStore Observations Observation GTI



MapDatasetMaker SafeMaskMaker FoVBackgroundMaker RingBackgroundMaker etc.



Datasets MapDataset MapDatasetOnOff etc.



DL5 Science products

Likelihood fitting



Fit, Models, SkyModel FoVBackgroundModel etc.

Source Catalogs

Name	Flux	Size
SNR	1e-12	1 deg
PWN	1e-11	0.2 deg
GRB	1e-10	0 deg







FluxPointsEstimator FluxMapEstimator etc.

SEDs & Lightcurves



Typical analysis use cases



<u>1D spectral analysis</u>

support for two analysis workflows:

- config-driven high-level interface
- user library API

docs.gammapy.org/1.0/





observation simulation







Gammapy v1.0 (LTS) release



- After 19000 commits from more than 90 contributors
- After 10 coding-sprints and 6 co-working weeks \bullet
- After 20 minor releases
- Gammapy v1.0 has been released on Nov 10 \bullet



Toward v2.0

- Roadmap for v2.0 in preparation
- Next coding sprint :
 - December 5th 9th (Paris hybrid)

- If you would like to contribute, contact us:
 - gammapy.slack #dev channel
 - GitHub discussions & issues
 - present feature prototype during dev call.



Toward v2.0

- On going developments and plans
 - Extend likelihood to support nuisance parameters & priors
 - Un-binned analysis
 - Develop time domain, e.g. improved pulsar analysis
 - Implement support for new data formats and format versions (e.g. support for event types/classes)
 - Metadata handling (minimal provenance)
 - Improved & more configurable high level analysis
 - Performance and distributed computing

