gamma-sky.net: Portal to the Gamma-Ray Sky

Arjun Voruganti[1,a)], Christoph Deil[1], Axel Donath[1] and Johannes King[1]

[a)]Corresponding author: Arjun.Voruganti@gmail.com
[1]*MPIK, Heidelberg, Germany*

Abstract. gamma-sky.net is a novel interactive website designed for exploring the gamma-ray sky, targeting both practitioners of astronomy and the general public alike. Our poster displays the content of our online portal, featuring high-energy survey images and catalog information using data from the Fermi Large Area Telescope (Fermi-LAT). Users can interact with the archive through a pan-and-zoom feature and powerful search tools. As the field of gamma-ray astronomy develops, we plan on expanding the website with more publicly available gamma-ray data, including High Energy Spectroscopic System (H.E.S.S.) Galactic Plane Survey maps (upon their public release) and survey images from the Planck satellite. Along with enriching our database, we also aim to make available to the user additional engaging and resourceful tools, such as a display of spectral information. The website is being developed as an open-source, open-data project at `https://github.com/gammapy/gamma-sky`. Feedback and contributions are very welcome!

TODO update abstract?

Introduction

- Evolution of VHE gamma-ray astronomy - increasing number of detections, novel Cherenkov telescope arrays (especially CTA)
- Upcoming surveys like HGPS (by MPIK) - clearer resolution than our current surveys
- Because of an increasing interest in the field, there is a need for a hub of VHE data (GeV, TeV) across many different catalogs. This is what gamma-sky.net was created for.

Idea

- Interactive website designed for exploring the gamma-ray sky
- Survey images of different frequency bands (mainly all-sky) overlaid onto a three-dimensional map. Gamma-ray sources from catalog data are pinpointed onto the map.
- The website facilitates both quick browsing and deep investigation of sources
- Understand the context of sources by viewing them on the map
- Easily compare sources from different catalogs
- Open source, open data - allows for 1. users to download any data from our website, and 2. for other developers to contribute to the code. (TODO maybe make this a separate section, or a subsection?)
- Website status (TODO maybe make this a separate section, or a subsection?)

Features

(Should we present this information in a bullet list or in paragraphs?)

1. Map View - easy navigation and quick browsing
   - Pan and zoom the sky map by dragging and scrolling
   - Toggle and view specific catalog layers and multi-wavelength survey images
   - Pop-ups over each source for basic information

- Powerful search tools - locate objects by name, association, or coordinate position
- Export and share a specific view of the sky map via PNG

(Figure of Map View)

2. Catalog View - deeply investigate a specific source
   - Search tool to find a source in its respective catalog by source name
   - Basic info, extension info, spectral info, distance info
   - Light curves, emission spectra (currently only for 3FGL catalog)
   - References to which telescope detected the source and links to where our data came from

   (Figure of Catalog View, 3FGL source with Light Curve and Emission Spectrum)
   (Plans for future features?)
3. Further analysis of our data with tools like Gammapy (generate specific plots, etc.)
4. Mention again that all data is openly available for download

Data

1. Survey images
   - Default: Fermi color image. Mention other survey options
   - HiPS file format and HEALPix projection for the map
   - Our images came from CDS' HiPS database of 300+ images

   (Image of different surveys on the Aladin Map) (Table of multi-wavelength surveys on our site)
2. Catalog images
   - Fermi-LAT - 3FGL and 2FHL
   - SNRcat
   - GeTeV Catalogue

   (Table of number of sources per catalog (and maybe also number of sources in each class?))

Implementation

- Gammapy, Astropy used to generate catalog data (and map data)
- Data consumed with JS and HTML
- Website architecture built with Angular 2 as a single-page app
- Sphere interface and maps overlay by Aladin Lite tool

Summary

TODO

Acknowledgements

TODO

REFERENCES

[1] A. Donath, C. Deil, M. P. Arribas, J. King, E. Owen, R. Terrier, I. Reichardt, J. Harris, R. Bühler, and S. Klepser, ArXiv e-prints September (2015), arXiv:1509.07408 [astro-ph.IM] .

[2] J. Knödlseder, M. Mayer, C. Deil, J.-B. Cayrou, E. Owen, N. Kelley-Hoskins, C.-C. Lu, R. Buehler, F. Forest, T. Louge, H. Siejkowski, K. Kosack, L. Gerard, A. Schulz, P. Martin, D. Sanchez, S. Ohm, T. Hassan, and S. Brau-Nogué, ArXiv e-prints June (2016), arXiv:1606.00393 [astro-ph.IM] .

[3] P. Fernique, M. G. Allen, T. Boch, A. Oberto, F.-X. Pineau, D. Durand, C. Bot, L. Cambrésy, S. Derriere, F. Genova, and F. Bonnarel, AAP **578**, p. A114June (2015), arXiv:1505.02291 [astro-ph.IM] .

[4] S. P. Wakely and D. Horan, International Cosmic Ray Conference **3**, 1341–1344 (2008).