Axel Donath

Curriculum Vitae

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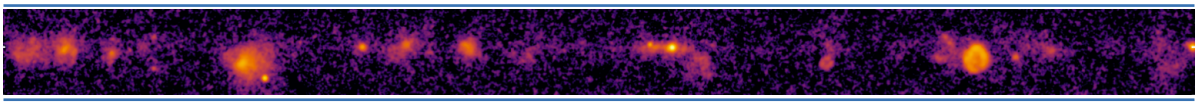

- I am a Postdoc researcher at the Center for Astrophysics Harvard & Smithsonian in Cambridge MA, where I research in the field of X-ray and gamma-ray astromomy.
- I am interested in the global structure of the Milky-Way in GeV-TeV gamma-rays and the Galactic gamma-ray source population. This includes association and classification of TeV gamma-ray sources in context of source catalog production as well as separation of sources from interstellar diffuse gamma-ray emission.
- My second interest is in advanced data analysis methods for counts based data with low statistics. This includes maximum likelihood based spectro morphological modelling of gamma-ray data, with handling of time and spatially dependent instrument response and combining data from multiple gamma-ray instruments.
- I am also interested in open source software development for astronomical data analysis and reproducible, open science.

Experience

Employment

CfA 2021–present — Postdoctoral researcher, CHASC astro-statistic group, Center for Astrophysics Harvard & Smithsonian, Cambridge MA. Supervised by Aneta Siemiginowska

MPIK 2018–2021 — Postdoctoral researcher, non-thermal astrophysics, Max-Planck-Institut for Nuclear Physics (MPIK), Heidelberg. Supervised by Jim Hinton

MPIK 2014–2018 — Doctoral student, high energy astrophysics, Max-Planck-Institut for Nuclear Physics (MPIK), Heidelberg. Supervised by Werner Hofmann

HCI 2012–2014 — Student researcher, computer vision, Heidelberg Collaboratory for Image Processing (HCI), Heidelberg. Supervised by Bernd Jähne.

Halle02 2006–2007 — Volunteer, Voluntary year in culture at *Atelier Kontrast*, Heidelberg

Education

Phd 2014 - 2018 — **Department of Physics and Astronomy**, *Thesis: The Galactic Gamma-ray source Population between 10 GeV and 50 TeV, advised by Werner Hofmann*, University of Heidelberg

M.Sc. 2011 - 2014 **Department of Physics and Astronomy**, *Thesis: Towards the H.E.S.S. Galactic Plane Survey Catalog, advised by Werner Hofmann*, University of Heidelberg

B.Sc. 2007 - 2011 **Department of Physics and Astronomy**, *Specialized in Astronomy and Image Processing*, University of Heidelberg

Formal Teaching

Python Spring 2016 Tutor for *Python programming for scientists*, lectured by Thomas Robitaille, University of Heidelberg

Python Fall 2015 Tutor for *Python programming for scientists*, lectured by Thomas Robitaille, University of Heidelberg

Soft skills Autumn 2009 Tutor for *Basiskurs Schlüsselkompetenzen*, University of Heidelberg

Service

Gammapy 2015-present Organisation of mutiple Gammapy coding sprints (approx. 3 per year) and weekly Gammapy developer calls

JOSS 2022-present I am editor for the astronomy and astrophysics track of the Journal of Open Source Software

Chandra Cycle 24 2022 Faciliation of Chandra guest investigator proposals

PyGamma19 2019 Member of the SoC and LoC for the 1st Python in Gamma-Ray Astronomy conference

PyGamma15 2015 Member of the SoC and LoC for the 2nd Python in Gamma-Ray Astronomy conference

Mentoring

GSoC Summer 2015 Mentoring of Google Summer of Code project by Patti Carroll *Astropy: Efficient and Precise Model Rasterization*.

Awards

Open Science Award Dec 2021 Recipient of the Jury Price at the Open Science Awards for Open-Source Research Software from the French ministry of higher education with the Gammapy project

ICRC July 2021 Recipient of the *Best Poster Award* at the International Cosmic Ray Conference *Gammapy: A Python Package for Gamma-Ray Astronomy*

ICVS June 2013 Recipient of the *Best Paper Award* at the International Conference on Computer Vision Systems for the contribution *Is Crowdsourcing feasible for optical flow ground truth estimation?*

Computing

I am developer, maintainer and contributor to several astronomical Python software packages. See my GitHub profile `https://github.com/adonath` for an overview of my activity.

Skills

Expert — Python, Numpy, Scipy, Matplotlib, Scikit-Learn, Scikit-Image, PyQt, Astropy, Pytorch

Intermediate — C++, LaTeX, Linux

General — Git, Pytest, Sphinx

Software

GSoC Summer 2013 — Google Summer of Code project: *AstroPy: Extending the functionality of the photutils package*, supervised by Thomas Robitaille

Gammapy 2012-present — I am co-creator and currently lead developer of Gammapy, a Python package for Gamma-Ray astronomy and prototype for the science tools of the Cherenkov Telescope Array

Astropy 2014-present — I have contributed multiple components to the convolution functionality of Astropy a community developed Python package for astronomy. I am currently one of the sub-package maintainers of the Astropy convolution sub package.

gamma-cat 2016-present — I am co-creator and maintainer of gamma-cat, an open data collection and source catalog for gamma-ray astronomy.

Others 2014-present — I have made mutiple minor contributions to Astropy affiliated packages photutils, regions and hipspy. I wrote the initial prototype for Scikit-image's blob detection functionality.

Talks

Astronomy

Gamma June 2016 — *The H.E.S.S. Galactic Plane Survey*, 6th International Symposium on High-Energy Gamma-Ray Astronomy, Heidelberg

TeVPa June 2016 — *The H.E.S.S. Galactic Plane Survey*, TeV Particle Astrophysics conference, Geneva

H.E.S.S. 2014-2018 — Various presentations on the H.E.S.S. Galactic Plane Survey at H.E.S.S. collaboration meetings, Warsaw, Heidelberg and Paris

Software

* Invited talks / tutorials

Scipy 2022 July 2022 — Pylira: deconvolution of images in the presence of Poisson noise

***TU Dortmund** January 2021 — *Gammapy analysis methods and package*, Astroparticle Group Dortmund, Virtual

***HAWC** June 2020 — Gammapy analysis of public HAWC Crab data, HAWC technical meeting, Virtual

***Sexten** June 2019 — *Gammapy* tutorial, Multimessenger Data Analysis in the CTA era Summer School, Sexten

***Asterics-Obelics** 2017–2019 — Astropy tutorial, 1st, 2nd and 3rd ASTERICS-OBELICS International School, Annecy

CTA/H.E.S.S. 2014 – 2019 — Various Gammapy talks and tutorials at H.E.S.S and CTA collaboration meetings, Annecy, Bologna and Lugano

PyGamma19 March 2019 — *Gammapy - A Python Package for Gamma-Ray Astronomy*, Python in Gamma Ray Astronomy Conference, Heidelberg

PyGamma15 Nov. 2015 — *An overview of Astropy, Sherpa and Gammapy*, Python in Gamma Ray Astronomy Conference, Heidelberg

DAG Autumn 2014 — *Astropy - A community developed core package for Astronomy in Python*, German Astronomical Society (DAG), Bamberg

Publications and Proceedings

[1] Axel Donath et al. "Jolideco: Joint Likelihood Deconvolution in the Presence of Poisson Noise". In: *ApJ, in preparation* (2024). In preparation.

[2] A. Donath et al. "Gammapy: A Python package for gamma-ray astronomy". In: *Astronomy & Astrophysics* (Aug. 2023). DOI: 10.1051/0004-6361/202346488. URL: https://doi.org/10.1051%2F0004-6361%2F202346488.

[3] Fabio Acero et al. *Gammapy: Python toolbox for gamma-ray astronomy*. 2022. DOI: 10.5281/ZENODO.7311399. URL: https://zenodo.org/record/7311399.

[4] A. Albert et al. "Validation of standardized data formats and tools for ground-level particle-based gamma-ray observatories". In: *Astronomy & Astrophysics* 667 (Nov. 2022), A36. DOI: 10.1051/0004-6361/202243527. URL: https://doi.org/10.1051%2F0004-6361%2F202243527.

[5] Larry Bradley et al. *astropy/photutils: 1.6.0*. 2022. DOI: 10.5281/ZENODO.596036. URL: https://zenodo.org/record/596036.

[6] Axel Donath et al. "Pylira: deconvolution of images in the presence of Poisson noise". In: *Proceedings of the Python in Science Conference*. SciPy, 2022. DOI: 10.25080/majora-212e5952-00f. URL: https://doi.org/10.25080%2Fmajora-212e5952-00f.

[7] Axel Donath et al. "The Astropy Project: Sustaining and Growing a Community-oriented Open-source Project and the Latest Major Release (v5.0) of the Core Package". In: *The Astrophysical Journal* (2022). DOI: 10.3847/1538-4357/ac7c74. URL: http://doi.org/10.3847/1538-4357/ac7c74.

[8] Axel Donath et al. *The Future of Gamma-Ray Experiments in the MeV-EeV Range*. 2022.

[9] J. Lefaucheur et al. "Gammapy - an Open-source Python Package for γ-Ray Astronomy". In: *Proceedings of the Astronomical Data Analysis Software and Systems XXVII conference*. 2020.

[10] Catherine Boisson et al. "Versioned Executable User Documentation for In-development Science Tools". In: *Proceedings of the Astronomical Data Analysis Software and Systems XXVII conference*. 2019.

[11] K. Bruegge et al. "Towards Open and Reproducible Multi-Instrument Analysis in Gamma-Ray Astronomy". In: *Proceedings of the 36th International Cosmic Ray Conference*. 2019.

[12] C. Nigro et al. "Towards open and reproducible multi-instrument analysis in gamma-ray astronomy". In: *Astronomy and Astrophysics* (2019).

[13] Astropy Collaboration et al. "The Astropy Project: Building an Open-science Project and Status of the v2.0 Core Package". In: *The Astronomical Journal* (2018).

[14] H. E. S. S. Collaboration et al. "A search for new supernova remnant shells in the Galactic plane with H.E.S.S." In: *Astronomy and Astrophysics* (2018).

[15] H. E. S. S. Collaboration et al. "The H.E.S.S. Galactic plane survey". In: *Astronomy and Astrophysics* (2018).

[16] C. Deil et al. "Gammapy - A prototype for the CTA science tools". In: *Proceedings of the 35th International Cosmic Ray Conference*. 2017.

[17] Axel Donath et al. "The H.E.S.S. galactic plane survey". In: *Proceedings of the 6th International Symposium on High Energy Gamma-Ray Astronomy*. 2017.

[18] L. Jouvin et al. "Towards a 3D analysis in Cherenkov γ -ray astronomy". In: *Proceedings of the 35th International Cosmic Ray Conference*. 2017.

[19] Arjun Voruganti et al. "Gamma-sky.net: Portal to the gamma-ray sky". In: *Proceedings of the 6th International Symposium on High Energy Gamma-Ray Astronomy*. 2017.

[20] C. Deil et al. "H.E.S.S. data analysis with open source science tools". In: *Proceedings of the 34th International Cosmic Ray Conference*. 2015.

[21] C. Deil et al. "The H.E.S.S. Galactic plane survey". In: *Proceedings of the 34th International Cosmic Ray Conference*. 2015.

[22] A. Donath et al. "Gammapy: An open-source Python package for gamma-ray astronomy". In: *Proceedings of the 34th International Cosmic Ray Conference*. 2015.

[23] A. Donath et al. "The H.E.S.S. Galactic plane survey poster". In: *Proceedings of the 34th International Cosmic Ray Conference*. 2015.

[24] S. Carrigan et al. "The H.E.S.S. Galactic Plane SurveyMaps, Source Catalog and Source Population". In: *Proceedings of the 33rd International Cosmic Ray Conference*. 2013.

[25] Axel Donath and Daniel Kondermann. "Is Crowdsourcing for Optical Flow Ground Truth Generation Feasible?" In: *Computer Vision Systems*. Ed. by Mei Chen, Bastian Leibe, and Bernd Neumann. Berlin, Heidelberg: Springer Berlin Heidelberg, 2013, pp. 193–202. ISBN: 978-3-642-39402-7.