

Daniel Lenz

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DanielLenz
LenzDaniel

Physicist, data scientist, and software developer using machine learning and data analysis to solve hard problems in physics & astronomy.

Looking to apply my skills to new technical challenges in other domains.

Work

Since 10/2016 **Computational Physicist**, *NASA Jet Propulsion Laboratory/California Institute of Technology.*

- Scientist in astrophysics/cosmology
- Using HPC and machine learning techniques analyze TB-scale astronomical data sets from the ESA *Planck* spacecraft
- Advance state-of-the-art through automatization, generalized linear models, cross validation, A/B testing, random forests, regularization, Bayesian inference
- Application to image component separation increased size of final data product by a factor of $\gtrsim 5$, compared to previous studies

05/2013 – **Graduate student**, *University of Bonn.*

- 07/2016
- PhD in astrophysics; data processing and analysis of TB-scale radio astronomy data
 - Based on 6,000 hours of observations with a 100-m telescope, resulted in a new legacy data set with order of magnitude improvements in sensitivity and resolution
 - Develop data processing and deployment pipeline, going from raw telescope data to final published data products, software development in Python

01/2010 – **Student research assistant**, *University of Bonn/Max Planck Institute for Radio Astronomy.*

- 04/2013
- Data reduction and analysis for a large-scale radio astronomy project

Education

10/2008 – **PhD Astrophysics, MSc Astrophysics, BSc Physics**, *University of Bonn.*

- 09/2016
- PhD *magna cum laude*
 - Award for academic excellence in MSc, accepted to the *Honors Branch* of the graduate school during PhD

Skills

Python 8+ years of daily usage

Software-development, signal processing, machine learning, deep learning
SciPy, Numpy, scikit-learn, pandas, Tensorflow/Keras, Matplotlib, dask, Jupyter

Other languages Git; Slurm; Some C++, Java, Julia

Techniques Data analysis, signal processing, Fourier analysis, version control, HPC computing, continuous integration, basics in AWS/Google Cloud

Projects

- Deep learning for image analysis
- Combining various TB-scale astronomy data sets
 - Using generative adversarial networks (GAN) to model the complex physics
 - Used to separate different image components
 - Recently started work, using tensorflow/keras and work on GPU clusters
- healpy
- Open source data format for full-sky spherical data, <https://github.com/healpy/healpy>
 - Implementation of the most-used data format in large-area astronomy
 - I improve the Python layer, extend it towards new language features, added Docker support to ease development, update documentation and tutorials
 - Interacting with other core developers, strategic planning, interacting with and advising the user base
- cygrid
- Open source data processing framework, <https://github.com/bwinkel/cygrid>
 - Fast, parallel, and unbiased gridding of data on the sphere in Python/Cython
 - 1-2 orders of magnitude faster than other implementations in e.g. SciPy, while providing many more options (kernels, real-world coordinates)
 - Used in large-scale production data processing by international telescope facilities
- Research in physics & astronomy
- Data science, machine learning, and HPC computing to address various research questions
 - Usage of and contributions to a wide range of Python libraries
 - Various publications in peer review journals, (invited) talks at international conferences, writing grant proposals

Grants

- 2019 **JPL Data Science Pilot**, *Teaching Machines the Way of the cosmic microwave background: Toward efficient de-lensing and component separation*, \$50k.

Awards

- 2018 **JPL Outstanding Postdoctoral Research Award**, *NASA Jet Propulsion Laboratory*.
- 2013 **Member of the Honors branch**, *Bonn-Cologne Graduate School of Physics and Astronomy*.
- 2012 **Scholarship for academic excellence**, *University of Bonn*.

Publications

15 total, 4 first author. Full list at <http://bit.ly/DanielsPublications>