Dr. rer. nat. Jennifer E. Pollack

Research Scientist | Statistical Software Developer

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PROFESSIONAL EXPERIENCE

Research Engineer, Astroparticle and Cosmology Laboratory, **The French National Centre for Scientific Research (CNRS)**

11/2020 – Present Paris, France

Software and Data Analysis for the European Space Agency's *Euclid* experiment

- Develop software and analysis chains for joint-processing and analysis of CCD images of galaxies and stars acquired from wide-field ground-based and space-based telescopes
- Build and run image simulations of the instruments to robustly test and assess scientific accuracy and performance of the data analysis software
- Carry out the intercalibration of all ground-based photometric and astrometric data and verify compliance with the defined quality criteria

Senior Research Scientist, Institute for Computational Science, **University of Zürich**

10/2017 – 9/2019 Zürich, Switzerland

Software and Science Project Lead for the European Space Agency's *Euclid* experiment

- Led a team of software developers and engineers in the production and maintenance of state-of-the-art science-ready data-products using terabytes of data and 1k CPU cores
- Provided better visualization of cosmological features in the spatial clustering patterns of galaxies using alternative mathematical representations for descriptive statistics
- Devised two novel methods to accurately estimate sample covariances from large volume datasets reducing computational expense by a factor of 1000
- Introduced new ways to tighten constraints on key model parameters, efficiently train and test machine learning algorithms, generate better forecasts, and explore physics of the early universe

Senior Research Associate, Institute for Cosmology & Gravitation, **University of Portsmouth**

9/2014 – 8/2017 Portsmouth, United Kingdom

Software Developer for the European Space Agency's *Euclid* and Dark Energy Spectroscopic Instrument Experiments

- Designed algorithm for high-level data analytical tools for the upcoming European Space Agency's *Euclid* galaxy survey (∼600 million euros)
- Achieved 600% speed up of existing numerical code and made 55% more memory-efficient with results agreeing at machine-level precision
- Analyzed the time-evolution of non-linear features in the clustering properties of galaxies using TB-size dataset from 200 numerical simulations to formulate accurate predictive models
- Developed robust methodology for testing nonlinear regression models for galaxy clustering using various summary statistics within the Bayesian framework

ABOUT ME

Innovative and resourceful research scientist and developer with a successful record in delivering computational and mathematical solutions in complex data analytics. I value teamwork, open-mindedness, and continuous learning in order to achieve operational excellence and high-end results.

EDUCATION

Ph.D. in Astronomy, magna cum laude

University of Bonn

1/2011 – 10/2015 Bonn, Germany

M.Sc. in Astrophysics

University of Bonn

10/2008 – 11/2010 Bonn, Germany

B.A. in Physics

New College of Florida

8/2002 – 5/2006 Sarasota, FL, USA

TECHNICAL SKILLS

Programming/Query Languages

Python, Fortran, Unix shell scripting, high-performance computing, SQL

Software Packages & DevOps Tools

Jupyter Notebook, Numpy, Scipy, Pandas, Seaborn, Matplotlib, Scikit-learn, Keras, TensorFlow, LaTeX, Matlab, Mathematica, Doxygen, Git, Redmine, Oracle VirtualBox

Data Analysis

Data mining, Data compression methods, Probability, Statistics, Time- and Spatial-series analysis, Hyper-parameter tuning, Cross-Validation, Machine Learning (Regression, KNN, SVM, Random Forests, Deep Neural Nets, Convolutional Neural Nets, PCA)

LANGUAGES

English (Native)
Spanish (C1)
German (B1)
French (A2)

PROFESSIONAL EXPERIENCE

Teaching Assistant, Argelander Institut für Astronomie, **University of Bonn**

Spring 2012, Spring 2013 Bonn, Germany

- Supervised problem sessions for Advanced data analysis and Bayesian statistics at the Master level

RESEARCH EXPERIENCE

Graduate Research Assistant, **University of Bonn**

1/2011 – 10/2015 Bonn, Germany

Dissertation: Cosmological Investigations with the Bispectrum

- Developed a new approach for modelling galaxy clustering using higher-order moments of the total matter density field
- Tested new model by computing and analyzing auto- and cross-polyspectra using galaxy catalogs extracted from 200 cosmological N-body simulations
- Applied statistical methods for Poisson processes, estimation of covariances, Bayesian inference, and likelihood sampling to accurately constrain model parameters

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Graduate Research Assistant, **University of Bonn**

10/2009 – 11/2010 Bonn, Germany

Master Thesis: Matter & Halo Bispectrum: Probing Large-Scale Halo Bias

- Conducted a study of non-linear regression models of the clustering properties of dark matter haloes using measurements of third-order connected correlation functions from 40 cosmological numerical N-body simulations
- Examined and compared various data modelling methods: bootstrapping, jack-knife sampling, PCA, Frequentist and Bayesian model selection

FURTHER EDUCATION

Deep Learning Specialization by deeplearning.ai
Coursera, Certificate earned on 13/2/2020

Data Wrangling, Analysis and AB Testing with SQL by UC Davis
Coursera, Completed on 20/11/2019

Machine Learning with Python by IBM
Coursera, Certificate earned on 14/10/2019

Machine Learning by Stanford University
Coursera, Certificate earned on 12/9/2019

Databases and SQL for Data Science by IBM
Coursera, Certificate earned on 10/9/2019

Machine Learning for High Energy Physics - a mini course
University of Zürich, Completed on 5/2/2019

VOLUNTEER EXPERIENCE

Host: Google AI Cloud Study Jam, **AI Camp & Google AI Workshop**

12/2019 Zürich, CH

Staff Representative in the Mathematics and Natural Sciences Department, **University of Zürich**

5/2018-9/2019 Zürich, CH

Science Demo: "Cosmic Expansion of Space", **Stargazing Live Event**

1/2017 Portsmouth, UK

Public Talk: "The Universe on the Grandest Scales", **Pint of Science Event**

5/2016 Portsmouth, UK

Q&A: "Ask the Expert-Dark Matter", **Stargazing Live Event**

1/2016 Portsmouth, UK

SELECTED TALKS

BK Function Galaxy Clustering Software, **Euclid Consortium Annual Meeting**

6/2019 Helsinki, FI

Computation of the Bispectrum Redshift-Space Multipoles, **Euclid Joint LE3-SWG-GC Science Meeting**

2/2018 Nice, FR

Probing Cosmology with the Galaxy Bispectrum, **California Institute of Technology**

11/2017 Pasadena, CA, USA

Cosmological Investigations with the Bispectrum, **UK-Euclid Meeting**

12/2015 Edinburgh, GB

A new method to measure galaxy bias, **Workshop on Galaxy Bias, ICTP**

10/2013 Trieste, IT

EXTRACURRICULAR ACTIVITIES

Athletics
Aerobics, Basketball, Boxing, Dancing, HIIT workouts, and Hiking
Travel
Architecture, Arts, Culture, International cuisine, and Nature
Hobbies
Baking, Cooking, Gardening, Meditation, Music, and Reading