Jeff Jennings

Research Software Engineer
Center for Computational Astrophysics

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[Google Scholar](), [GitHub]()

Education and research experience

04.2024 - Present	Research Software Engineer, Center for Computational Astrophysics
	Development and application of software for astronomy research
2022 - 2024 (1 yr 8 month)	Eberly Research Fellow, Astronomy, Pennsylvania State University
	Interferometric imaging using machine learning frameworks
2018 - 2022 (4 yr)	Ph.D., Astronomy, University of Cambridge
	Thesis: Characterizing sub-mm observations of protoplanetary disks at super-resolution scales – Advisor Cathie Clarke
2017 (8 month)	Visiting Student Researcher, Astronomy, University of Washington
	Statistical analysis of exoplanet transit timing variations – Advisor Eric Agol
2016 - 2017 (1 yr 5 month)	M.Sc., Astrophysics, Ludwig-Maximilians-Universität München (LMU Munich)
	Thesis: Energetic regimes of photoevaporative disc dispersal & their influence on gas giant migration – Advisor Barbara Ercolano
2015 - 2016; 2017 - 2018 (1 yr 9 month)	Research Assistant, Optics, National Institute of Standards and Technology
	Experimental development of frequency combs and interferometers for extreme precision radial velocity surveys – Advisor Scott Diddams
2013 - 2015 (2 yr 5 month)	Post-baccalaureate, Physics, University of Colorado at Boulder
	Observational luminosity class diagnostics – Advisor Emily Levesque
2008 - 2011 (3 yr 5 month)	B.A., University of Colorado at Boulder
	Ecology & Evolutionary Biology (Major 1), Environmental Studies (Major 2)

Published works

9 first/second author, 11 third/later author, h-index 14 (first/second author h-index 7)

Refereed: first and second author

Million Points of Light (MPoL): a PyTorch library for radio interferometric imaging and inference
   I. Czekala, **J. Jennings**, B. Zawadzki, et al. 2025 JOSS (submitted)

Super-resolution trends in the ALMA Taurus survey: structured inner discs and compact discs
   J. Jennings, M. Tazzari, C. J. Clarke, R. Booth, & G. P. Rosotti 2022 MNRAS

A super-resolution analysis of the DSHARP survey: substructure is common in the inner 30 au
   J. Jennings, R. Booth, M. Tazzari, C. J. Clarke, & G. P. Rosotti 2022 MNRAS

Frankenstein: protoplanetary disc brightness profile reconstruction at sub-beam resolution with a rapid Gaussian process
   J. Jennings, R. Booth, M. Tazzari, G. P. Rosotti, & C. J. Clarke 2020 MNRAS

Frequency stability of the mode spectrum of broad bandwidth Fabry-Pérot interferometers
   J. Jennings, R. Terrien, C. Fredrick, M. Grisham, M. Notcutt, S. Halverson, S. Mahadevan, & S. A. Diddams 2020 OSA Continuum

The comparative effect of FUV, EUV and X-ray disc photoevaporation on gas giant separations

J. Jennings, B. Ercolano & G. Rosotti 2018 MNRAS

X-ray photoevaporation's limited success in the formation of planetesimals by the streaming instability
    B. Ercolano, **J. Jennings**, G. Rosotti, & T. Birnstiel 2017 MNRAS

Frequency stability characterization of a broadband fiber Fabry-Pérot interferometer
    J. Jennings, S. Halverson, R. Terrien, S. Mahadevan, G. Ycas, & S. A. Diddams 2017 Optics Express

Hα as a luminosity class diagnostic for K- and M-type stars
    J. Jennings & E. M. Levesque 2016 ApJ

Refereed: third and later author

High resolution ALMA observations of compact discs in the wide binary system of Sz 65 and Sz 66
    J. Miley et al. 2024 A&A

Regularized maximum likelihood image synthesis and validation for ALMA continuum observations of protoplanetary disks
    B. Zawadzki et al. 2023 PASP

Deprojecting and constraining the vertical thickness of exoKuiper belts
    J. Terrill et al. 2023 MNRAS

Distribution of solids in the rings of the HD 163296 disk: a multi-wavelength study
    G. Guidi et al. 2022 A&A

Unveiling the outer dust disc of TW Hya with deep ALMA observations
    J. Ilee et al. 2022 MNRASL

Broadband stability of the Habitable Zone Planet Finder Fabry-Pérot etalon calibration system: evidence for chromatic variation
    R. Terrien et al. 2021 AJ

Dust ring morphology in protoplanetary disks from ALMA dual-wavelength observations
    F. Long et al. 2020 ApJ

Modelling thermochemical processes in protoplanetary disks I: numerical methods
    T. Grassi et al. 2020 MNRAS

Evidence for He I 10830 Å absorption during the transit of a warm Neptune around the M-dwarf GJ 3470 with the Habitable-zone Planet Finder
    J. P. Ninan et al. 2020 ApJ

A sub-Neptune sized planet transiting the M2.5-dwarf G 9-40: validation with the Habitable-zone Planet Finder
    G. Stefansson et al. 2020 AJ

Stellar spectroscopy in the near-infrared with a laser frequency comb
    A. J. Metcalf et al. 2019 Optica

Conference proceedings

Infrared astronomical spectroscopy for radial velocity measurements with 10 cm s^{-1} precision
    A. J. Metcalf et al. 2018 CLEO

Measuring the thermal sensitivity of a fiber Fabry-Pérot interferometer
    J. Jennings, S. Halverson, S. A. Diddams, R. Terrien, G. Ycas, & S. Mahadevan 2016 Proc. of SPIE

Software ───

Frankenstein (`frank`) – Python package for super-resolution, 1D imaging of sub-mm interferometric data.
Implements a non-parametric, empirical Bayes approach with a Gaussian process

Million Points of Light (`MPoL`) – Python package for super-resolution, 2D imaging of interferometric data.
Implements machine learning techniques for regularized maximum likelihood imaging

`arksia` – Python package for bulk imaging and characterization of the ALMA large program ARKS datasets.
Uses parallelization and custom routines to scale imaging and analysis for 20 sources

Peer review ───

Referee of 9 published papers:

4 in MNRAS, MNRASL on disc photoevaporation, disc substructure

2 in ApJL, ApJS on disc substructure, interferometric imaging

1 in A&A on disc substructure

1 in PASJ on interferometric imaging

1 in JOSS (Journal of Open Source Software) on interferometric imaging

NASA peer review:

2 panels in 2023, Chair of 1 panel

Recent talks ───

Regularized maximum likelihood imaging for sub-mm astronomy

09.2023 – Lunch talk – Columbia University

ALMA imaging beyond CLEAN: techniques and applications

08.2023 – Star and planet formation seminar – ESO Headquarters

The scientific utility of software development: a case study in radio interferometry

03.2023 – Astronomy & astrophysics colloquium – Pennsylvania State University

Teaching and outreach ───

ALMA Ambassador – ALMA Ambassador Fellows Program 2024

Cambridge Ph.D. student hack week – Organizer (11.2019), 15 attendees

Cambridge 'Ask an Astronomer' outreach program (Q&A at public open nights) – Organizer (2019/2020)

Cambridge University Astronomy YouTube channel (outreach platform) – Co-founder (03.2020)

Undergraduate supervision – Tutorial sessions for introductory physics (10.2018 – 06.2019)