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RICHARD M. FEDER

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RESEARCH INTERESTS

I work on a number of topics in **observational cosmology**, with a broad interest in developing and applying **computational techniques rooted in astrostatistics** that enable robust inference for image datasets. Some of my research utilizes techniques in **deep generative modeling** to enhance studies of **large-scale structure formation**.

I am a member of the CIBER collaboration, working on both **data analysis of CIBER-1 data** and **hardware/laboratory work for the CIBER-2 experiment**. As an experimentalist, I built hardware for CIBER-2, ran laboratory measurements to characterize instrument performance, and helped integrate the experiment with the full sounding rocket payload. This work was done in collaboration with NASA's sounding rocket program and involved working at both NASA Wallops Flight Facility in Virginia and White Sands Missile Range in Las Cruces, New Mexico, where I participated in a **successful first flight and experiment recovery** (Press release for CIBER-2 first flight, June 2021).

EDUCATION

California Institute of Technology September 2018 - Present
MA/PhD in Physics
Division of Physics, Mathematics and Astronomy
Advisor: Jamie Bock

Harvard University August 2014 - May 2018
Bachelor of Arts, Physics and Astrophysics, with Honors
Advisor: Douglas Finkbeiner

RESEARCH POSITIONS/AFFILIATIONS

California Institute of Technology September 2021 - Present
Member of L4 Science Team for SPHEREx

California Institute of Technology January 2019 - Present
Member of Cosmic Infrared Background ExpeRiment (CIBER) collaboration

Harvard-Smithsonian Center for Astrophysics June 2017 - October 2017
Member of DESI BGS Working Group, supervised by Prof. Daniel Eisenstein (supported by the Harvard College Research Program and Harvard Physics Department)

Harvard-Smithsonian Center for Astrophysics June 2017 - October 2017
Research Assistant, including completion of Senior Thesis in Astrophysics, supervised by Prof. Douglas Finkbeiner, Tansu Daylan and Stephen Portillo

Columbia University June 2015 - August 2015
Research Assistant, supervised by Dr. Glenn Jones and Prof. Amber Miller

Harvard-Smithsonian Center for Astrophysics July 2013 - September 2013
Research Assistant, supervised by Dr. Francesca Civano

ACADEMIC ACHIEVEMENTS

ASA Astrostatistics Student Paper Finalist, 2020 Joint Statistical Meetings

PROFESSIONAL ACTIVITIES, OUTREACH AND SERVICE

California Institute of Technology

Volunteer teacher for STARS science enrichment program, February 2021 - Present

Volunteer judge for Caltech Science Olympiad, October 2018 - Present

Member of Scholarship and Financial Aid Committee at Caltech, October 2018 - 2019

Caltech Physics graduate student representative, October 2019 - September 2020

Manuscript Referee

Conference on Neural Information Processing Systems (NeurIPS) – Machine Learning and the Physical Sciences workshop. October 2019 - present

ApJ, September 2020 - present.

Astronomy and Computing, September 2021 - present.

PUBLICATIONS AND PROCEEDINGS

I am an author on **8** papers, of which I am (co-)lead author on **3**. My current h-index is **3** and my ORCID ID is 0000-0002-9330-8738.

In preparation

Feder R.; ... ; et *al. Joint reconstruction of astronomical images through simultaneous modeling of pointlike and diffuse emission.*

(Co-)Lead Author

Butler V.; **Feder R.**; ... ; et al. *Measurement of the Relativistic Sunyaev-Zel'dovich Correction in RX J1347.5-1145* (2021). *Astrophysical Journal (in review)*
arXiv:2110.13932

Feder R., Berger, P., Stein, G. *Nonlinear 3D Cosmic Web Simulation with Heavy-Tailed Generative Adversarial Networks* (2020). *Physical Review D*: 102, Art. No. 103504.
arXiv:2005.03050

Feder R., Portillo, S., Daylan, T., Finkbeiner, D. P. *Multiband Probabilistic Cataloging: A Joint Fitting Approach to Point Source Detection and Deblending* (2020). *The Astronomical Journal*, 159:4.
arXiv:1907.04929, press release here.

Contributing Author

Takimoto, K.; Bang, S.-C.; ...; **Feder R.**; et al. *Polarization Spectrum of Near-Infrared Zodiacal Light Observed with CIBER* (2021). *The Astrophysical Journal (in review).*
arXiv:2112.05350

Cheng, Y-T.; ...; **Feder R.**; et *al. Probing Intra-Halo Light with Galaxy Stacking in CIBER Images*
arXiv:2103.03882

Korngut, P.; ...; **Feder R.**; et *al. Measurements of the Zodiacal Light Absolute Intensity through Fraunhofer Absorption Line Spectroscopy with CIBER*
arXiv:2104.07104

Takimoto, K.; Bang, S.-C.; ...; **Feder R.**; et al. *Pre-flight optical test and calibration for the Cosmic Infrared Background ExpeRiment 2 (CIBER-2)* (2020). Proceedings Volume 11443, Space Telescopes and Instrumentation (2020).
SPIE link here

Civano, F., Fabbiano, G., Pellegrini, S., Kim, D., **Feder R.**, Elvis, M. *Early-Type Galaxies in the Chandra COSMOS Survey* (2014). *The Astrophysical Journal*, 790:16
arXiv:1405.7039

SELECTED TALKS AND POSTERS

Greater IPAC Technology Seminar, October 2021. *Dissecting the Near Infrared Universe with the Cosmic Infrared Background Experiment* (**invited talk**).

Observing the millimeter universe with the NIKA-2 camera, July 2021. *Bridging the gap between large and small scales in astronomical images with simultaneous modeling of pointlike and diffuse emission* (**selected talk**).

Zemcov Group Meeting, Rochester Institute of Technology, February 2021. *Photometric methods in astronomy and probabilistic cataloging* (**invited talk**).

Joint Statistical Meetings (Astrostatistics Interest Group), August 2020. *Multiband probabilistic cataloging: a joint fitting approach to improved source detection and deblending* (**invited talk**).

Great Lakes Cosmology Workshop, 8/5/19 - 8/8/19. *Multiband probabilistic cataloging: a joint fitting approach to improved source detection and deblending* (**selected talk**).

Great Lakes Cosmology Workshop, 8/5/19 - 8/8/19. *Data driven cosmological emulation through deep generative modeling* (poster).

Astroinformatics Conference, 6/24/19-6/28/19. *Multiband probabilistic cataloging: a joint fitting approach to improved source detection and deblending* (poster).

231st American Astronomical Society Meeting, 1/21/18-1/25/18. *A transdimensional approach to modeling the cosmic X-ray background* (poster).