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RICHARD M. FEDER

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RESEARCH INTERESTS

Observational cosmology; crowded field photometry and other astrostatistics; deep generative modeling for studying large scale structure; near-Infrared instrumentation

EDUCATION

California Institute of Technology MA/PhD in Physics Division of Physics, Mathematics and Astronomy <i>Advisor: Jamie Bock</i>	September 2018 - Present
Harvard University Bachelor of Arts, Physics and Astrophysics, with Honors <i>Advisor: Douglas Finkbeiner</i>	August 2014 - May 2018

RESEARCH EXPERIENCE

Harvard-Smithsonian Center for Astrophysics <i>Senior Thesis in Astrophysics</i>	September 2017 - July 2019
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- Worked with Prof. Douglas Finkbeiner to expand the tools of probabilistic cataloging (PCAT) for use with multiband data products
- Developed programs in Python and IDL to optimize positional calibration/cross-matching across multiple observations and convergence properties of sampling algorithm

Harvard-Smithsonian Center for Astrophysics <i>Member of DESI BGS Working Group</i>	June 2017 - October 2017
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- Designed target selection strategy for the Bright Galaxy Survey (BGS) of the Dark Energy Spectroscopic Instrument (DESI), which will take high resolution spectra of ~ 10 million galaxies.
- Research done under guidance of Prof. Daniel Eisenstein, sponsored by the Harvard College Research Program and Harvard Physics Department.

Harvard-Smithsonian Center for Astrophysics <i>Research Assistant</i>	June 2017 - October 2017
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- Worked with Prof. Douglas Finkbeiner and Tansu Daylan on application of probabilistic cataloging to the Chandra Deep Field - South Survey
- Used combination of statistical techniques and simulation tools to characterize AGN populations near and below the telescope detection limit

Columbia University <i>Research Assistant</i>	June 2015 - August 2015
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- Designed instrumentation parts for EBEX, a high altitude balloon-borne experiment deployed at the South Pole to measure CMB polarization.
- Research done under guidance of Prof. Amber Miller and Dr. Glenn Jones

New York University <i>Data Analyst</i>	June 2014 - August 2014
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- Wrote Python code to scrape missing person data from separate online databases, compiled into a more complete database to be cross-referenced with instances of human trafficking. Project presented at PyGotham conference (August 2014)
- Work done under guidance of mentor Eric Schles (Adjunct Professor, NYU)

Harvard-Smithsonian Center for Astrophysics

July 2013 - September 2013

Research Assistant

- Worked with Dr. Francesca Civano to identify sample of elliptical galaxies with non-active supermassive black holes from the COSMOS survey using Chandra X-ray data. This sample was used to constrain total galactic mass estimates through X-ray gas luminosities.

ACADEMIC ACHIEVEMENTS

ASA Astrostatistics Student Paper Finalist, 2020 Joint Statistical Meetings

Intel Science Talent Search semifinalist, 2014

TECHNICAL SKILLS

Programming Experience (8 years)

Python, C, HTML, Javascript, Matlab, Mathematica
IDL

Languages

Spanish (conversational), Italian

Laboratory

CIAO 4.9, TOPCAT, MARX 5.0, SolidWorks,
Arduino microcontrollers, EAGLE

OUTREACH AND SERVICE

Volunteer Judge for Caltech Science Olympiad, October 2018 - Present

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

Caltech Physics graduate student representative, October 2019 - Present

Referee for Neural Information Processing Systems Conference – Machine Learning and the Physical Sciences, October 2019

PUBLICATIONS

Feder, R., Berger, P., Stein, G. *Nonlinear 3D Cosmic Web Simulation with Heavy-Tailed Generative Adversarial Networks* (2020). *Physical Review D*, in preparation.

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.

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

POSTERS AND SELECTED TALKS

Joint Statistical Meetings (Astrostatistics Interest Group), 8/6/20. *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).

16th Meeting of the High Energy Astrophysics Division, August 2017. *Transdimensional cataloging of the Chandra Deep Field South*