

# John Franklin Crenshaw

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**Summary:** I am a KIPAC Rubin Fellow at the Kavli Institute for Particle Astrophysics and Cosmology. My research focuses on observational cosmology, large-scale structure, Lyman-break galaxies, photo-z estimation, weak lensing, active optics for wide-field telescopes, galaxy evolution, and AI for science.

## Professional Appointments

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**KIPAC Rubin Fellow**, Stanford Univ. & SLAC National Accelerator Laboratory      Sept 2025 – present  
*Faculty Mentor: Pat Burchat*

## Education

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**University of Washington**, MS, PhD in Physics      Sept 2019 – Jun 2025

*Advisor: Andrew Connolly*

*Thesis: Towards High-redshift Cosmology with Lyman-break Galaxies Detected by LSST*

**Duke University**, BS in Physics      Aug 2015 – May 2025

*summa cum laude* with highest distinction

*Advisor: Kate Scholberg*

*Thesis: Sensitivity of the Helium and Lead Observatory to Core-Collapse Supernova Neutrino Bursts*

## Fellowships, Grants, & Awards

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KIPAC Rubin Fellowship (\$368,000)	2025 – 2029
NASA Euclid General Investigator Program, Science PI (\$480,000)	2025
Vera C. Rubin Observatory Builder Status	2025
LSST Dark Energy Science Collaboration (DESC) Builder Status	2025
Dunlap Institute Workshop Grant (\$6,500)	2024
DOE Cosmic Frontier Grant, Contributor (\$360,000)	2023
DOE SCGSR Fellowship (\$10,400)	2023
Rubin Observatory ISSC Ambassador (\$4,500)	2021 – 2022
DOE Scholar (\$12,000)	2021
Duke Faculty Scholar (\$10,000)	2018 – 2019
Daphne Chang Memorial Award (\$1,000)	2019
DAAD RISE Research Exchange Fellowship (€ 5,000)	2018

## Publications

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As of October 2025, I have (co-)authored 13 papers, with a total of 86 citations and an h-index of 5.

### First and Second Author:

4. *Quantifying the Impact of LSST u-band Survey Strategy on Photometric Redshift Estimation and the Detection of Lyman-break Galaxies*  
**Crenshaw J. F.**, Leistedt B., Graham M. L., Payerne C., et al. (2025) arXiv:2503.06016
3. *Probabilistic Forward Modeling of Galaxy Catalogs with Normalizing Flows*  
**Crenshaw J. F.**, Kalmbach J. B., Gagliano A., Yan Z., et al. (2024) AJ 168 80
2. *Using AI for Wave-front Estimation with the Rubin Observatory Active Optics System*  
**Crenshaw J. F.**, Connolly A. J., Meyers J. E., Kalmbach J. B., et al. (2024) AJ 167 86

1. *Learning Spectral Templates for Photometric Redshift Estimation from Broadband Photometry*  
**Crenshaw J. F.**, Connolly A. J. (2020) AJ 160 191

#### Co-Author with Major Contributions:

9. *Photometric Redshift Estimation for Rubin Observatory Data Preview 1 with Redshift Assessment Infrastructure Layers (RAIL)*  
Zhang T., Charles E., **Crenshaw J. F.**, Schmidt S. J., et al. (2025) arXiv:2510.07370
8. *Redshift Assessment Infrastructure Layers (RAIL): Rubin-era photometric redshift stress-testing and at-scale production*  
The RAIL Team, including **Crenshaw J. F.** (2025) arXiv:2505.02928
7. *RTN-095: The Vera C. Rubin Observatory Data Preview 1*  
NSF-DOE Vera C. Rubin Observatory Team, including **Crenshaw J. F.** (2025)
6. *Impact of survey spatial variability on galaxy redshift distributions and the cosmological  $3 \times 2$ -point statistics for the Rubin Legacy Survey of Space and Time (LSST)*  
Hang Q., Joachimi B., Charles E., **Crenshaw J. F.**, et al. (2024) MNRAS 535 2970
5. *The Active Optics System on the Vera C. Rubin Observatory: Optimal Control of Degeneracy among the Large Number of Degrees of Freedom*  
Megias Homar G., Kahn S. M., Meyers J. M., **Crenshaw J. F.**, et al. (2024) ApJ 974 108
4. *Improving Photometric Redshift Estimates with Training Sample Augmentation*  
Moskowitz I., Gawiser E., **Crenshaw J. F.**, Andrews B. H., et al. (2024) ApJ 967 L6
3. *The simulated catalogue of optical transients and correlated hosts (SCOTCH)*  
Lokken M., Gagliano A., Narayan G., et al., including **Crenshaw J. F.** (2023) MNRAS 520 2887
2. *The Sensitivity of GPz Estimates of Photo-z Posterior PDFs to Realistically Complex Training Set Imperfections*  
Stylianou N., Malz A. I., Hatfield P., **Crenshaw J. F.**, et al. (2022) PASP 134 044501
1. *An information-based metric for observing strategy optimization, demonstrated in the context of photometric redshifts with applications to cosmology*  
Malz A. I., Lanusse F., **Crenshaw J. F.**, Graham M. L. (2021) arXiv:2104.08229

#### Students Supervised



##### Graduate Students:



<i>Ben Sherwin</i> , Stanford University	2025 – present
<i>Maya Redden</i> , Stanford University	2025 – present
<i>Hurum Tohfa</i> , University of Washington	2024 – present


##### Undergraduate Students:



<i>Dominik Riemann</i> , University of Washington	2022 – 2024
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#### Software

PZFlow: Creator and lead developer of a Python package for efficient, high-dimensional probabilistic modeling of tabular data using normalizing flows.  

PhotErr: Creator and lead developer of a Python package for estimating photometric errors for astronomical imaging surveys, including the Rubin, Euclid, and Roman observatories.  

ts-wep: Contributing developer of a Python package for wave-front inference for the active optics system of the Rubin Observatory. 

RAIL: Contributing developer of the RAIL photometric redshift (photo-z) estimation pipeline, including forward modeling galaxy catalogs and sources of systematic error.  

## Selected Presentations

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### Invited Talks:

Pontificia Universidad Católica de Chile de Valparaíso	<i>Valparaíso, Chile; Oct 2025</i>
Berkeley Center for Cosmological Physics Seminar	<i>Berkeley, CA; Sept 2025</i>
DESI-II Working Group	<i>Virtual; Feb 2025</i>
DES-DESC Special Session, AAS Winter 2025	<i>National Harbor, MD; Jan 2025</i>
Cosmopalooza 2023 Plenary	<i>Virtual; Oct 2023</i>
University of Chile Colloquium	<i>Santiago, Chile; Mar 2023</i>
AAS Astronomers Turned Data Scientists Meeting Plenary	<i>Virtual; Mar 2022</i>
DESC Winter Meeting Plenary	<i>Virtual; Feb 2022</i>
KIPAC Seminar	<i>Virtual; Sept 2020</i>

### Contributed Talks:

DESC Summer Meeting	<i>Chicago, IL; Aug 2022</i>
DESC Winter Meeting	<i>Virtual; Feb 2022</i>
Rubin Observatory Project & Community Workshop	<i>Virtual; Aug 2020</i>
DESC Winter Meeting	<i>Tucson, AZ; Jan 2020</i>

### Posters:

Adaptive Optics for Extremely Large Telescopes 8	<i>Viña del Mar, Chile; Oct 2025</i>
Rubin Observatory Community Workshop	<i>Palo Alto, CA; Jul 2024</i>
American Astronomical Society 241st Meeting	<i>Seattle, WA; Jan 2023</i>
American Astronomical Society 238th Meeting	<i>Virtual; Jun 2021</i>
Statistical Challenges in Modern Astronomy VII	<i>Virtual; Jun 2021</i>
Duke Physics Research Symposium	<i>Durham, NC; Apr 2019</i>
5th Joint Meeting of the APS and JPS	<i>Waikoloa, HI; Oct 2018</i>
28th International Conference on Neutrino Physics and Astrophysics	<i>Heidelberg, Germany; Jun 2018</i>

## Teaching

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Guest Lecturer, Extragalactic Astronomy	<i>University of Washington; 2025</i>
Reading Course Instructor	<i>University of Washington; 2020 – 2022</i>
Teaching Assistant	<i>Duke University; 2016 – 2019</i>
Undergraduate Tutor	<i>Duke University; 2016 – 2019</i>

## Outreach

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Astro on Tap: <i>Warning! Objects in Mirror Are Farther Than They Appear</i>	<i>San Francisco, CA; Oct 2025</i>
Astro on Tap: <i>Dark Matter Murder Mystery</i>	<i>Seattle, WA; Mar 2025</i>
Emerald City Comic Con	<i>Seattle, WA; Mar 2025</i>
Astro on Tap: <i>Dark Energy in the era of DESI</i>	<i>Seattle, WA; May 2024</i>
Astro on Tap: <i>Before the Big Bang</i>	<i>Seattle, WA; Apr 2023</i>
Class at ScioŠkola Praha 11	<i>Prague, CR; May 2022</i>
UC Berkeley Graduate Student Q&A Panel	<i>Virtual; Jul 2021</i>

STEM Pals Organizer & Pedagogical Simulation Lead	Virtual; 2021
Duke University Teaching Observatory	Durham, NC; 2018 – 2019
Queer in Research Discussion Panel	Durham, NC; Oct 2018
Public Lecture: <i>Where Did We Come From and Are We Alone</i>	Durham, NC; Jan 2018

## Service and Leadership

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DESC Lyman-break Galaxy Topical Team Creator & Leader	2024 – present
Co-chair of the DESC Equity, Diversity, and Inclusion Committee	2023 – present
Rubin Observatory Science Collaborations EDI Committee	2023 – present
Reviewer for the ML4Astro Workshop at ICML 2025	2025
Organized workshop on cosmology with LBGs at the Dunlap Institute	2025
DUSC Cosmology and Astroparticle Group Leader	2022 – 2024
University of Washington Astronomy Journal Club	2023 – 2024
Rubin Community Workshop Science Organizing Committee	2023 – 2024
DiRAC Machine Learning Group Leader	2022 – 2023
DESC Collaboration Meeting Science Organizing Committee	2022 – 2023
AAS Software Carpentry Workshop Volunteer	Jan 2023
University of Washington Academic Grievance Committee	2022
Physics Undergraduate Reading Course Leadership Committee	2022
Photo-z Commissioning Session Organizer	Aug 2022
Snowmass 2021 Summer Study A/V Co-coordinator	Jul 2022
Physicists for Inclusion and Equity Officer	2020 – 2021

updated: October 28, 2025