Stanford



John Franklin Crenshaw

Postdoctoral Scholar, Physics

Bio

BIO

I am a Rubin Postdoctoral Fellow at the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) at Stanford University and SLAC National Accelerator Laboratory.

I study the large scale structure of the universe to extract information about fundamental physics and our cosmic origins. I am particularly interested in the high-redshift universe and using Lyman-break Galaxies (LBGs) and CMB lensing to constrain cosmology in the matter-dominated era. I created and lead the LBG Topical Team of the Dark Energy Science Collaboration (DESC) of the Vera C. Rubin Observatory's Legacy Survey of Space and Time (LSST). I also work on DESC's weak lensing analysis, particularly on pipelines, simulations, and validation for photo-z estimation and on photometric error modeling for simulated multi-survey catalogs.

I am also a member of the Rubin Observatory's active optics team. The active optics system applies real-time corrections to the telescope's optical alignment and mirror figure to optimize image quality for precision science, and is particularly vital for weak lensing and large-scale structure cosmology. I am primarily focused on wavefront estimation (i.e., inferring the presence of optical aberrations from Rubin images) and commissioning the active optics control system. I have spent many nights on the summit observing with and commissioning the Rubin Observatory.

I received my PhD at the University of Washington, advised by Prof. Andy Connolly. Before that, I completed my undergraduate studies at Duke University, where I was a Duke Faculty Scholar working with Prof. Kate Scholberg in the Duke Neutrino and Cosmology Group.

In my free time I enjoy alpine climbing, backcountry skiing, and watching way too many movies.

Note that I have a double name and go by "John Franklin" or "JF", not just "John".

PROFESSIONAL EDUCATION

- B.S., Duke University , Physics (2019)
- M.S., University of Washington , Physics (2020)
- Ph.D., University of Washington , Physics (2025)

STANFORD ADVISORS

- Patricia Burchat, Postdoctoral Faculty Sponsor

LINKS

- Website: jfcrenshaw.github.io

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

I study the large scale structure of the universe to extract information about fundamental physics and our cosmic origins. I am particularly interested in the high-redshift universe and using Lyman-break Galaxies (LBGs) and CMB lensing to constrain cosmology in the matter-dominated era. I created and lead the LBG Topical Team of the Dark Energy Science Collaboration (DESC) of the Vera C. Rubin Observatory's Legacy Survey of Space and Time (LSST).

I also work on the Rubin Observatory's active optics system, which applies real-time corrections to the telescope's optical alignment and mirror figure to optimize image quality for precision science. I am particularly focused on wavefront estimation (i.e., inferring the presence of optical aberrations from Rubin images) and commissioning the active optics control system. I have spent many nights on the summit observing with and commissioning the Rubin Observatory.

Publications

PUBLICATIONS

- **Impact of survey spatial variability on galaxy redshift distributions and the cosmological 3 x 2-point statistics for the Rubin Legacy Survey of Space and Time (LSST)** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Hang, Q., Joachimi, B., Charles, E., Crenshaw, J., Larsen, P., Malz, A., Schmidt, S., Yan, Z., Zhang, T., LSST Dark Energy Sci Collaboration
  2024; 535 (4): 2970-2997

- **The Active Optics System on the Vera C. Rubin Observatory: Optimal Control of Degeneracy among the Large Number of Degrees of Freedom** *ASTROPHYSICAL JOURNAL*
  Homar, G., Kahn, S. M., Meyers, J. M., Crenshaw, J., Thomas, S. J.
  2024; 974 (1)

- **Probabilistic Forward Modeling of Galaxy Catalogs with Normalizing Flows** *ASTRONOMICAL JOURNAL*
  Crenshaw, J., Kalmbach, J., Gagliano, A., Yan, Z., Connolly, A. J., Malz, A. I., Schmidt, S. J., LSST Dark Energy Science Collaboration
  2024; 168 (2)

- **Improving Photometric Redshift Estimates with Training Sample Augmentation** *ASTROPHYSICAL JOURNAL LETTERS*
  Moskowitz, I., Gawiser, E., Crenshaw, J., Andrews, B. H., Malz, A. I., Schmidt, S., LSST Dark Energy Sci Collaboration
  2024; 967 (1)

- **Using AI for Wave-front Estimation with the Rubin Observatory Active Optics System** *ASTRONOMICAL JOURNAL*
  Crenshaw, J., Connolly, A. J., Meyers, J. E., Kalmbach, J., Homar, G., Ribeiro, T., Suberlak, K., Thomas, S., Tsai, T.
  2024; 167 (2)

- **Advancing the Vera C. Rubin Observatory Active Optics Control System**
  Homar, G., Meyers, J. M., Thomas, S. J., Kahn, S. M., Connolly, A. J., Crenshaw, J., Kalmbach, J., Suberlak, K., Polen, R., Tsai, T., Ribeiro, T., Tighe, R., Rodeghiero, et al
  edited by Marshall, H. K., Spyromilio, J., Usuda, T.
  SPIE-INT SOC OPTICAL ENGINEERING.2024

- **The simulated catalogue of optical transients and correlated hosts (SCOTCH)** *MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY*
  Lokken, M., Gagliano, A., Narayan, G., Hlozek, R., Kessler, R., Crenshaw, J., Salo, L., Alves, C. S., Chatterjee, D., Vincenzi, M., Malz, A., Lsst Dark Energy Sci Collaboration
  2023; 520 (2): 2887-2912

- **The Sensitivity of GPz Estimates of Photo-z Posterior PDFs to Realistically Complex Training Set Imperfections** *PUBLICATIONS OF THE ASTRONOMICAL SOCIETY OF THE PACIFIC*
  Stylianou, N., Malz, A. I., Hatfield, P., Crenshaw, J., Gschwend, J.
  2022; 134 (1034)
- **Learning Spectral Templates for Photometric Redshift Estimation from Broadband Photometry** *ASTRONOMICAL JOURNAL*
  Crenshaw, J., Connolly, A. J.
  2020; 160 (4)