Sunil Simha

Updated February 12, 2026

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Research position
UChicago-Northwestern Sept. 2024 onwards
Brinson Postdoctoral Fellow

Research interests
Fast Radio Bursts (FRBs) as probes of the circumgalactic and intergalactic media (CGM and IGM).

Education
University of California, Santa Cruz Santa Cruz, California, USA
Ph.D. in Astronomy and Astrophysics 2018 – June 2024

Indian Institute of Technology Madras Chennai, Tamil Nadu, India
BS-MS in Physics 2013 – 2018

Awards and scholarships
JSPS pre-doctoral fellowship 2024
Awarded ¥200,000, in addition to other covered expenses, to work for four months in Japan with Prof. K-G Lee on the analysis of cosmic baryons along FRB sightlines.

UC Chancellor Dissertation Year Fellowship 2023
Awarded $9750 funding for my research in my dissertation-year.

Newcomb-Cleveland Prize (AAAS) 2021
Part of the research team which was awarded $25000 for an outstanding research publication in the *Science* journal.

UC Regents Grad Fellowship 2018
1-year research fellowship for graduate students in the University of California

S N Bose Scholarship (IUSSTF) 2017
$2000 grant for Indian students to work on a Summer research project in the USA.

Kishore Vigyan Protsahan Yojana (DST, India) 2013-2018
INR 80,000/year for undergraduates who cleared the KVPY competitive examination and majored in pure-science fields.

Research experience
The FLIMFLAM Survey
Advisors: J. Xavier Prochaska (UCSC), Khee-Gan Lee (IPMU) 2021 – Present
FLIMFLAM is a redshift survey of foreground galaxies along Fast Radio Burst (FRB) sightlines to constrain key parameters describing the distribution of ionized matter in the CGM and IGM to ∼ 20% precision.

Leading spectroscopic observational efforts with the Keck and Gemini telescopes for redshift estimation. Involved in imaging and spectroscopic observation, data reduction, redshift and mass estimation. Also involved in the subsequent matter density map reconstruction and bayesian inference of the parameters describing matter distribution in the universe.

Optical follow-up of localized FRBs

Advisor: J. Xavier Prochaska 2018 – Present

Current member of the F^4 team. Involved in planning, execution and data reduction of observations of localized FRBs (obtained through the CRAFT, Meer-TRAP, REALFAST, and DSA collaborations) with optical telescopes such as Keck, Gemini, SOAR. Utilized the observations, which included imaging and spectroscopy, to identify FRB host galaxies and characterize them as well as study foreground matter along FRB sightlines.

Keck Visiting Scholar

Advisors: Percy Gomez (Keck), Sherry Yeh (Keck) May-July 2022

Characterized the gratings and detector subsystems of the Low-Resolution Imaging Spectrograph (LRIS) on the Keck telescope. Produced spectroscopic throughput measurements for three gratings and automated the monthly checkout procedure for LRIS.

LRIS red-side detector upgrade

Advisor: Constance Rockosi (UCSC) 2020-2021

Involved in the testing and commissioning of the optical charged-coupled device (CCD) upgrade to LRIS on the Keck telescope. Characterized the CCD response through measurements of readout noise, gain and linearity.

Mg II absorber clustering

Advisors: Raghunathan Srianand (IUCAA), L. Sriram Kumar (IITM) 2017-2018

Studied the clustering and distribution of metal absorption lines, specifically of the Mg II doublet (2796-2802 $\mathring{A}$) in quasar spectra and investigated the masses of foreground halos likely contributing to the absorption features.

Publications

ADS Link to the full list

First author

Searching for the sources of excess extragalactic dispersion of FRBs

S. Simha, K.-G. Lee, J. X. Prochaska, et al., *ApJ, 2023, 954, 1, 71*, doi:10.3847/1538-4357/ace324

Estimating the Contribution of Foreground Halos to the FRB 180924 Dispersion Measure

Sunil Simha, Nicolas Tejos, J. Xavier Prochaska, et al., *ApJ, 2021, 921, 124*, doi:10.3847/1538-4357/ac2000

Disentangling the Cosmic Web toward FRB 190608

Sunil Simha, Joseph Burchett, J. Xavier Prochaska, et al., *ApJ, 2020, 901, 134*, doi:10.3847/1538-4357/abafc3

Significant contribution	**Stellar Mass–Dispersion Measure Correlations Constrain Baryonic Feedback in Fast Radio Burst Host Galaxies** C. Leung, S. Simha, I. Medlock, et al., *ApJL, 991, 1, 25* doi:10.3847/2041-8213/ae044d
	Constraining Baryon Fractions in Galaxy Groups and Clusters with the First CHIME/FRB Outrigger A. E. Lanman, S. Simha, K. W. Masui, et al., *submitted to ApJ* doi:10.48550/arXiv.2509.07097
	Investigating the sightline of a highly scattered FRB through a filamentary structure in the local Universe K. Shin, C. Leung, S. Simha, et al., *ApJ, 2025, 993, 2, 208* doi:10.3847/1538-4357/ae093b
	FRB 20250316A: A Brilliant and Nearby One-Off Fast Radio Burst Localized to 13 parsec Precision CHIME/FRB Collaboration, *including, S. Simha ApJL, 989, 2, 48* doi:10.3847/2041-8213/adf62f
	Discovery and Localization of the Swift-Observed FRB 20241228A in a Star-forming Host Galaxy A. Curtin, S. Andrew, S. Simha, et al., *Submitted to ApJ* doi:10.48550/arXiv.2506.10961
	FRB Line-of-sight Ionization Measurement from Lightcone AAOmega Mapping Survey: The First Data Release Y. Huang, S. Simha, I. Khrykin, et al., *ApJ, 2025, 277, 2, 64* doi:10.3847/1538-4365/adbc7f
	A Fast Radio Burst in a Compact Galaxy Group at $z \sim 1$ A. C. Gordon, W-F Fong, S. Simha, et al., *ApJ, 2024, 963, 2, L34* doi:10.3847/2041-8213/ad2773
	The FRB 20190520B Sight Line Intersects Foreground Galaxy Clusters K.G. Lee, I. Khrykin, S. Simha et al., *ApJL, 2023, 54, 1, L7* doi:10.3847/2041-8213/acefb5
	Dissecting the Local Environment of FRB 190608 in the Spiral Arm of its Host Galaxy Jay Chittidi, Sunil Simha, Alexandra Mannings, et al., *ApJ, 2021, 922, 173*, doi:10.3847/1538-4357/ac2818
	A High-resolution View of Fast Radio Burst Host Environments Alexandra Mannings, Wen-Fai Fong, Sunil Simha, et al., *ApJ, 2021, 917, 75*, doi:10.3847/1538-4357/abff56
	Host Galaxy Properties and Offset Distributions of Fast Radio Bursts: Implications for Their Progenitors Kasper Heintz, J Xavier Prochaska, Sunil Simha, et al., *ApJ, 2020, 903, 152*, doi:10.3847/1538-4357/abb6fb
Minor contribution	**Localisation and host galaxy identification of new Fast Radio Bursts with MeerKAT**

I. Pastor-Marazuela et al, *including S. Simha*, *MNRAS*, 2025, 538, 3, doi:10.1093/mnras/staf2144

James Webb Space Telescope Observations of the Nearby and Precisely-Localized FRB 20250316A: A Potential Near-IR Counterpart and Implications for the Progenitors of Fast Radio Bursts

P. Blanchard et al, *including S. Simha*, *ApJL, 2025, 989, 2, 49*, doi:10.3847/2041-8213/adf29f

Mapping the Spatial Distribution of Fast Radio Bursts within their Host Galaxies

A. Gordon et al, *including S. Simha*, *ApJ, 2025, 993, 1, 119*, doi:10.3847/1538-4357/ae0298

JWST and Ground-based Observations of the Type Iax Supernovae SN 2024pxl and SN 2024vjm: Evidence for Weak Deflagration Explosions

L. Kwok et al, *including S. Simha*, *ApJL, 2025, 989, 2, 33* doi:10.3847/2041-8213/adf062

Photometry and Spectroscopy of SN 2024pxl: A Luminosity Link Among Type Iax Supernovae

M. Singh et al, *including S. Simha*, *submitted to ApJ*, 2025, doi:10.1088/1538-3873/adc48a

Tilsotua: Reproducing Slitmask Sky Positions for use with the LRIS Multislit Archive

J. Sullivan et al, *including S. Simha*, *PASP, 137, 5, 054505*, 2025, doi:10.1088/1538-3873/adc48a

A Catalog of Local Universe Fast Radio Bursts from CHIME/FRB and the KKO Outrigger

CHIME Collaboration, *including S. Simha*, *ApJS, 2025, 280, 1, 6*, doi:10.3847/1538-4365/addbda

The CRAFT coherent (CRACO) upgrade I: System description and results of the 110-ms radio transient pilot survey

Z. Wang, K. W. Bannister, V. Gupta et al., *including S. Simha*, *PASA, 2025, 42*, doi:10.1017/pasa.2024.107

The Massive and Quiescent Elliptical Host Galaxy of the Repeating Fast Radio Burst FRB20240209A

T. Eftekhari, Y. Dong, W. Fong, et al. *including S. Simha*, *ApJ, 2025, 979, 2*, doi:10.3847/2041-8213/ad9de2

Modeling the Cosmic Dispersion Measure in the $D < 120$ Mpc Local Universe

Y. Huang, K.-G. Lee, N. I. Libekind, et al. *including S. Simha*, *MNRAS, 2025, 538, 4* doi:10.1093/mnras/staf417

FLIMFLAM DR1: The First Constraints on the Cosmic Baryon Distribution from 8 FRB sightlines

I. Khrykin, M. Ata, K.-G. Lee, et al. *including S. Simha*, *ApJ, 2024 973, 2, 151*, doi:10.3847/1538-4357/ad6567

A subarcsec localized fast radio burst with a significant host galaxy dispersion measure contribution
M. Caleb , L. N. Driessen, A. C. Gordon, et al. *including S. Simha*, *MNRAS, 2023., 524, 2*, doi:10.1093/mnras/stad1839

The Demographics, Stellar Populations, and Star Formation Histories of Fast Radio Burst Host Galaxies: Implications for the Progenitors
A. C. Gordon, W. F. Fong, C. D. Kilpatrick, et al. *including S. Simha*, *ApJ, 2023, 954, 1, 80*, doi:10.3847/1538-4357/ace5aa

Fast Radio Bursts as Probes of Magnetic Fields in Galaxies at $z < 0.5$
A. G. Mannings, R. Pakmor, J. X. Prochaska, et al. *including S. Simha*, *ApJ, 2023, 954, 2, 179*, doi:10.3847/1538-4357/ace7bb

A non-repeating fast radio burst in a dwarf host galaxy
S. Bhandari, A. C. Gordon, D. R. Scott, et al. *including S. Simha*, *ApJ, 2023, 948, 1, 67*, doi:10.3847/1538-4357/acc178

A luminous fast radio burst that probes the Universe at redshift 1
S. D. Ryder, K. W. Bannister, S. Bhandari, et al. *including S. Simha*, *Science, 2023. 382, 6668*, doi:10.1126/science.adf2678

A Deep and Wide Twilight Survey for Asteroids Interior to Earth and Venus
S. S. Sheppard, D. J. Tholen, P. Pokorny, et al. *including S. Simha*, *AJ, 2022, 164, 168*, doi:10.3847/1538-3881/ac8cff

Innovations and advances in instrumentation at the W. M. Keck Observatory, vol. II
M. F. Kassis, S. Allen, C. Alvarez, et al. *including S. Simha*, *SPIE, 2022, 12184, 05*, doi:10.1117/12.2628630

A Distant Fast Radio Burst Associated with Its Host Galaxy by the Very Large Array
C. J. Law, B. J. Butler, J. X. Prochaska, et al. *including S. Simha*, *ApJ, 2020, 899, 161*, doi:10.3847/1538-4357/aba4ac

The low density and magnetization of a massive galaxy halo exposed by a fast radio burst
J.X. Prochaska, J.P. Macquart, M. Mcquinn, et al. *including Sunil Simha*, *Science, 2019, 366, 231*, doi:10.1126/science.aay0073

A single fast radio burst localized to a massive galaxy at cosmological distance
Keith Bannister, Adam T. Deller, J., et al. *including Sunil Simha*, *Science, 2019, 365, 565*, doi:10.1126/science.aaw5903

Teaching experience

FTSky Pedagogical session Oct 2025

Co-taught aspects of optical analysis of FRB host galaxies to the conference participants of the FTSky workshop conducted at ICTS, India

Responsibilities: designed code tutorials via Jupyter/Python on optical spectroscopic data reduction, modeling the light of galaxies in imaging and accessing photometric data from public catalog.

Cal-Bridge student tutor Summer 2022

Phys 440: Computational Physics (SFSU)

Tutored a Cal-Bridge student in numerical methods. Helped tackle assignments on solving 2D partial differential equations via grid-based algorithms.

Teaching assistant, Department of Astronomy (UCSC) Winter 2022

ASTR 112: Physics of Stars

Instructor: Ryan Foley

Covered the physical processes that stars undergo from their formation to death. Included the hydrostatic equilibrium of stars, nuclear fusion, stellar evolution on the HR diagram, stellar remnants and using the Gaia public archive of observational data.

Responsibilities: helped design and grade assignments and examinations, conduct office-hours (twice per week) to aid student learning and taught a session on accessing the analyzing data from the Gaia data archive.

Cal-Bridge student tutor Summer 2022

Phys 440: Computational Physics (SFSU)

Tutored a Cal-Bridge student in numerical methods. Helped tackle assignments on solving 2D partial differential equations via grid-based algorithms.

Teaching assistant, Department of Astronomy (UCSC) Fall 2019

ASTR 119: Introduction to Scientific Computing

Instructor: Asher Wasserman

The course covered scientific computation methods via Python. Included basic data structures in Python, array-manipulation, numerical root-finding, curve-fitting and integration schemes.

Responsibilities: helped design and grade assignments and examinations, conduct office-hours (twice per week) to aid student learning. Office-hours included a weekly "Python basics" tutorial for first-time coders.

Conference presentations

FTSky (conference), ICTS *(invited talk)* Oct 2025

FTSky (pedagogy session), ICTS *(invited talk)* Oct 2025

FRB 2025, McGill University (*invited talk*) Jul 2025

Falcon Workshop, University of Chicago (*talk*) Mar 2025

Baryons Beyond Galactic Boundaries, Pune, India (*poster*) Dec 2024

FRB 2024, Khao Lak, Thailand (*talk*) Nov 2024

Baryons in the Universe 2024, Kavli IPMU (*talk*) Apr 2024

Oases in the Cosmic Desert, Arizona State University (*poster*) Feb 2023

Cosmic Web 2023, UC Santa Barbara, (*poster*) Feb 2023

Santa Cruz Galaxy Formation Workshop, UC Santa Cruz (*talk*) Aug 2022

IAU General Assembly S369, Busan, Korea (*talk*) Aug 2022

Keck Science Meeting, CalTech. (*talk*) Aug 2022

Keck Science Meeting, UC San Diego (*talk*) Sep 2021

Keck Science Meeting, Virtual meeting (*poster*) Sep 2020

Other Talks

Monday Astronomy Tea Seminar, MIT May 2025

Astronomy Lunch Talk, UC Los Angeles Oct 2023

	Astronomy Seminar, UC Irvine	Oct 2023
	Cosmology Seminar, UC Berkeley	Mar 2023
	Colloquium, Pontifica Universidad de Chile, Valparaíso	Aug 2022
	Public talk, San Fransisco Amateur Astronomers	Jan 2021
	Astronomy on Tap, Santa Cruz	Nov 2020
	Science on Tap, Santa Cruz	Jul 2020

Skills

Observational astronomy tools

PypeIt (developer), SExtractor (advanced), Galfit (advanced), CIGALE (advanced), ds9 (advanced), Slitmask designing software (advanced): AutoSlit, DSimulator, GMMPS, MAGMA.

Programming languages and tools

Python (advanced), Git (advanced), Bash (familiar), Pyraf/IRAF (familiar), C (familiar)

Languages

English (advanced), Hindi (advanced), Kannada (fluent), Spanish (beginner), Japanese (beginner)

Mentorship & service roles

CIERA Summer Internship Summer 2025

Mentoring Shelah Boyd (Spelman College, Atlanta) on investigating star-galaxy separation methods in public imaging surveys. Ms. Boyd is working towards comparing star-galaxy classification methods across imaging surveys such as Pan-STARRS and the Legacy Survey, and quantifying the false positive rate against deeper imaging surveys such as the HSC survey. Her findings will improve FRB host identification for the CHIME/FRB collaboration.

SIP Summer 2023

Mentored three high school students (12th grade) in India on a research project about using an FRB to probe the galaxy group environment of the M83-CenA cluster. The students were able to successfully reduce GMOS multi-object spectroscopic data and estimate redshifts using MARZ.

Grad admissions committee Fall 2021- Winter 2022

Served on the graduate student admissions committee in the department of Astronomy at UCSC. Reviewed roughly 400 applications in the committee and was involved in interviewing the candidates selected in the first round.

LAMAT Summer 2023

Co-mentored Ayanah Cason (post-bacclaureate) on her investigation of metal absorption systems at high redshifts. Advised Ms. Cason on structuring her publication (in-progress) and contextualizing it in the broader framework of galaxy feedback and high redshift quasar absorption observations.

LAMAT Summer 2021

Co-mentored Jason Barrios (UC Santa Barbara) on his investigation of probing galaxy feedback with FRBs. His findings are currently being drafted for publication in the Astrophysical Journal.

Hobbies

Chess, Digital Art, Pencil Sketching, Photography