

Harshil Kamdar

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EDUCATION

Harvard University

Cambridge, MA

Ph.D. Astronomy and Astrophysics

2016-Present

M.S. Computational Science & Engineering

2016-Present

Awards: Department of Energy Computational Science Graduate Fellow (\$200k+ award)

Relevant Coursework: Stochastic Methods for Data Analysis, Inference and Optimization; Advanced Machine Learning; Noise and Data Analysis in Astrophysics; Advanced Numerical Methods; Parallel Computing

University of Illinois at Urbana-Champaign

Urbana, IL

B.A. Physics, Astronomy (minors in Mathematics, Computer Science)

2014

Awards: Robert E. Hetrick Senior Thesis Prize, Stanley J. Wyatt Memorial Award (\$500 award), NSF Blue Waters Computational Internship (\$5k award), Harry E. Preble Award for Undergraduate Research (\$1k award)

RESEARCH EXPERIENCE

Harvard University

Cambridge, MA

DOE Computational Science Graduate Fellow, PhD. Thesis

2016 – Present

- Developed numerical simulations from scratch to study the dynamical and chemical history of the Milky Way
- Ran star-by-star resolution simulations on 10,000+ core supercomputer
- Implemented innovative clustering methods to compare noisy observational data of the Milky Way with our simulations to study the nature of star formation.
- Designed a machine learning model to infer the non-parametric gravitational potential of our galaxy from observations of stars

National Renewable Energy Laboratory

Golden, CO

Summer Practicum

May 2018 – August 2018

- Developed graph convolutional neural networks (GCNN) in TensorFlow to predict the bandgaps in crystals
- Applied the GCNN technique to one of the largest publicly-available databases of crystal properties
- Collaborated with other scientists at NREL to enable rapid exploration of crystals for solar energy research

University of Illinois at Urbana-Champaign

Urbana, IL

NSF Blue Waters Computational Intern, Senior Thesis

2012 – 2016

- Built a framework to compare the applicability of different machine learning techniques on predicting the physical properties of galaxies using the distribution of the surrounding dark matter halo properties
- Applied our models to two of the largest cosmological simulations ever run to predict the properties of millions of galaxies.

TEACHING/ADVISING EXPERIENCE

Harvard University

Cambridge, MA

- Teaching Fellow: Prediction: The Past and Present of the Future (Gen Ed 1112)

2020

NSF Latino Initiative Program, Smithsonian Astrophysical Observatory

Cambridge, MA

- Mentored an URM college student from the Boston area and help them with their research project
- Advised student on graduate application process and edit application materials

University of Illinois at Urbana-Champaign

Urbana, IL

- Grader: Extraterrestrial Life (Astronomy 330)

2015

SELECTED LEADERSHIP EXPERIENCE

Communicating Science Conference (ComSciCon; <https://comscicon.com>)

Cambridge, MA

Leadership Team Chair

August 2020 – present

Renewals Chair	June 2019 – July 2020
Logistics Organizing Committee Chair	May 2018 – July 2020

- Organized 3 national conferences to date on written and oral communication skills for graduate students in all fields of science & engineering
- Chair and coordinate volunteer Leadership Team of more than 15 people
- Led fundraising and management of nearly \$300,000 budget to date from more than 10 university and professional society partners
- Past chair of 12-graduate student organizing committee; inviting expert speakers, advertising workshops, and reviewing 1,000+ applications from across the country per event

Resident Tutor, Mather House

Cambridge, MA

Fellowships Tutor, Hiring Tutor, Intramurals Tutor

August 2017 – present

- Provide academic advising and residential support to students in an undergraduate house at Harvard College
- Support and edit students' applications for the Rhodes, Marshall, Churchill, and other fellowships
- Co-lead a hiring team of 10+ tutors to read 400+ applications every year to recruit 2-10 new tutors every year.

GSAS Graduate Student Council

Cambridge, MA

Representative

2016 – 2020

- Represent the Graduate School of Arts & Sciences at the Harvard-wide Graduate Student Council
- Drafted resolutions and released statements on issues affecting graduate students across the university

Science by the Pint

Cambridge, MA

Organizer and Moderator

2016 – 2018

- Organized events at local pubs where STEM professors present their research in an informal setting

PUBLICATIONS (7 TOTAL; 5 AS FIRST AUTHOR; CITATIONS: 80+)

Green, G., Ting, Y.S., **Kamdar, H.M.**, et al., 2020, *in preparation*.

Deep Potential: Learning the Gravitational Potential from Phase-Mixed Tracers

Speagle, J., Zucker, C., Cargile, P., et al., 2020, *submitted*.

Mapping the Milky Way in 5-D with 170 Million Stars at High Galactic Latitude

Kamdar, H.M., Conroy, C., Ting, Y.S., et al., 2020, *submitted*. [[arXiv:2007.10990](https://arxiv.org/abs/2007.10990)]

Spatial and Kinematic Clustering of Stars in the Galactic Disk

Kamdar, H.M., Conroy, C., Ting, Y.S., et al. 2019, *Astrophysical Journal Letters*, 884(2), L42. [[arXiv:1904.02159](https://arxiv.org/abs/1904.02159)]

Stars that Move Together Were Born Together

Kamdar, H.M., Conroy, C., Ting, Y.S., et al. 2019, *Astrophysical Journal*, 884 (2), 173. [[arXiv:1902.10719](https://arxiv.org/abs/1902.10719)]

A Dynamical Model for Clustered Star Formation in the Milky Way Disk

Kamdar, H.M., Turk, M.J., and Brunner, R.J. 2016, *Monthly Notices of the Royal Astronomical Society*, 457, 1162 [[arXiv:1510.07659](https://arxiv.org/abs/1510.07659)]

Machine Learning and Cosmological Simulations II: Hydrodynamical Simulations

Kamdar, H.M., Turk, M.J., and Brunner, R.J. 2016, *Monthly Notices of the Royal Astronomical Society*, 455, 642 [[arXiv:1510.06402](https://arxiv.org/abs/1510.06402)]

Machine Learning and Cosmological Simulations I: Semi-Analytical Models

PRESENTATIONS († = INVITED)

Talks

Carnegie Observatories

Dec 2020

MIT: Computational Research in Boston and Beyond

Dec 2020

Linking the Galactic and Extragalactic: Stellar dynamics and stellar populations of the Milky Way and its siblings

Dec 2020

†The Ohio State University: CCAPP Seminar

Nov 2020

Galread – Princeton University	Oct 2020
[†] Milky Way Meeting – The Max Planck Institute for Astronomy	July 2020
[†] Department of Energy Computational Science Graduate Fellowship Program Review – Arlington, VA	July 2020
[†] Institute for Theory & Computation Luncheon Talk – Cambridge, MA	Oct 2019
International Astronomical Union Symposium 353 – Shanghai, China	June 2019
53rd ESLAB Gaia Symposium – Noordwijk, Netherlands	April 2019
KITP Program: Dynamical Models for Stars and Gas in Galaxies in the Gaia Era – Santa Barbara, CA	Mar 2019
Life and Times of the Milky Way – Shanghai, China	Nov 2018
Machine Learning Journal Club, Harvard University – Cambridge, MA	March 2018, April 2018
Eisenstein Group Meeting, Harvard University – Cambridge, MA	Dec 2017
[†] Astrophysics, Cosmology, and Gravitation Seminar – Urbana, IL	Feb 2016
Dept of Physics Undergraduate Research Symposium – Urbana, IL	Jan 2016
DES Chicagoland Meeting – Urbana, IL	Dec 2015

Posters

The Local Group: Assembly & Evolution	Sep 2020
DOE CSGF Program Review	July 2017, 2018, 2019
227th American Astronomical Society Meeting	Jan 2016
Undergraduate Research Symposium	Apr 2015, 2016
Annual Computational Science & Engineering Meeting – National Center for Supercomputing Applications	Apr 2014

TECHNICAL SKILLS

Programming and Computation: Python, PyTorch, PyMC3, Altair, Plotly, GeoPandas, CUDA, Tensorflow, AWS, C, OpenMP/MPI, Matplotlib, NumPy, SciPy, JAX, Pandas, Scikit-Learn, D3.js, Git, R, rasterio

Machine Learning and Statistics: Clustering, Bayesian inference, neural networks and deep learning, Markov chain Monte Carlo (MCMC), normalizing flows

PERSONAL

Citizenship: USA

Languages: English, Gujarati, Hindi