Pankaj Bhambhani

Seeking new opportunities for research, education and science communication.

MSc Astrophysics, Liverpool John Moores University

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EDUCATION

University of California Irvine Certificate Program – Science Policy and Advocacy for STEM Scientists — Jul – Sep 2023

Liverpool John Moores University (LJMU) MSc – Astrophysics — 2019 – 2021
Relevant Coursework – Astrophysical Concepts, Cosmology, Astronomical Techniques, Time-Domain Astrophysics

University of Michigan Cosmology Summer School — June 2020
Topics covered – cosmological parameter estimation, multi-probe cosmology, redshift surveys, weak lensing, galaxy clusters

Dhirubhai Ambani Institute of Info & Comm Tech. Bachelor of Technology (CGPI - 8.62/10) — 2009 – 2013
Relevant Coursework: Electromagnetic Theory, Quantum Mechanics, Statistics, Linear Algebra, Multivar. Calculus, Algorithms

PUBLICATIONS, TALKS AND OTHER CONTENT

A. **Bhambhani, P.** et al. *Red riding on hood: Exploring how galaxy color depends on environment*, Monthly Notices of the Royal Astronomical Society, Volume 522, Issue 3, July 2023, Pages 4116–4131 https://doi.org/10.1093/mnras/stad1218

B. **Bhambhani, P.**, Hurd, H. and Caldeira, J., 2020, June. *BayesCurve: Read your Strong Gravitational Lens with Bayesian Neural Network*s. American Astronomical Society Meeting Abstracts#236 (Vol. 236, pp. 241-04) bit.ly/poster_aas

C. *India:Climate Challenges and Opportunities for Astronomy and Space Sciences*.A4E Symposium Dec 2022 bit.ly/a4e_talk

D. *Red riding on hood:Exploring how galaxy color depends on environment* Church of the Cosmos Feb 2023 bit.ly/cotc_talk

E. *How Remotely Sensed Performance Zone Maps Improve Agriculture Assessments.* Nov 2020 bit.ly/cibo_blog_post

F. *Special Relativity from Geometry*. Feb 2019 bit.ly/sr_post

G. *Visualizing single-spin experiments from Leonard Susskind's Quantum Mechanics course.* June 2023 bit.ly/qm_post

H. *Unlocking the Potential: Policy Recommendations for Empowering Doctoral Students through the NRF Bill* UC Irvine Science Policy and Advocacy Certificate Program Sep 2023 bit.ly/scipol_report

I. Twitter thread on how one can develop a scientific mindset: 1000+ Likes and 50 Retweets. bit.ly/sci_thread

J. Twitter thread on the benefits of astronomy for mental well-being. bit.ly/astro_mental_health_thread

K. Cosmic Charcha: YouTube Hindi Podcast on latest Astronomy events Cosmic Charcha Podcast | Episode 2 | YouTube

L. Contributed to r/askscience Reddit AMA as a Cosmology expert, Cosmology From Home July 2023 bit.ly/cosmo_ama

OUTREACH

Astronomers for Planet Earth (A4E) Contributing Member — Mar 2022 - Present

- A4E is an international grassroots movement of amateur and professional astronomers advocating for climate action.
- At their 2022 symposium, I lead a workshop on how astronomers can address climate challenges in India – **Publication C**

Stargazing India Science Communicator — Dec 2021 - Present

- Amateur astronomy organization based in Kutch since 1991. I offer support with stargazing and roadside astronomy.
- I was part of a team of 4 astronomers that hosted a stargazing session in the Rann of Kutch for a cohort from RBI.

Church of the Cosmos, Cambridge, MA, USA. Meetup Co-organizer — Oct 2018 – Dec 2020

- Co-organized a meetup group to promote scientific literacy among the local community in the Boston area.
- I hosted sessions, created banners to promote events,, and maintained our online presence on Discord.
- I also gave a talk about my thesis work to a general audience – see **Publication D.**

RESEARCH

Environmental and dark matter halo effects on galaxy populations LJMU Masters Thesis May 2020 – Apr 2023

- I studied the effect of local environment on the colour distribution of galaxy populations, using data from the Galaxy and Mass Assembly (GAMA) survey.
- We found that the number of red (non star-forming) galaxies in a region increases with local environmental density. There is also a residual effect of the large scale structure – in particular voids seem to have more red galaxies.
- This work was published in the MNRAS Journal - see **publication A.**
- **Skills – Data Analysis, Python, Pandas, Numpy, Stan, Altair.** Supervisor - Dr. Ivan Baldry

Fermilab – Deep Skies Group Independent Researcher Apr 2019 – Dec 2020

- Employed Bayesian Neural Networks (BNNs) on telescope images to learn parameters for theoretical models in astronomy. These models predict the phenomenon of strong gravitational lensing of sources by foreground galaxies.
- Assessed the usefulness of BNNs by studying output distributions and the resulting uncertainties (epistemic, aleatoric).
- Presented my work as a poster at the 236th meeting of the American Astronomical Society - see **publication B**.
- **Skills – Bayesian Neural Networks, Variational Inference, PyTorch, FastAI, Python**

PROFESSIONAL EXPERIENCE

CIBO Technologies, Inc. Data Scientist Jun 2018 – Present

- Using data from space satellites such as Landsat and Sentinel-2, I build models to identify management practices of agricultural fields – such as the crop type, planting date and harvest date. The model is highly scalable and can run on large regions of the continental United States. We have 2 pending patents, and are drafting a publication.
- I am also involved with technical writing for the algorithms developed by our team. See **publication E.**
- **Skills – Bayesian Inference, Data Analysis, Python, Scala, Technical Writing.**

CourseHero. – Freelance Tutor Jul – Dec 2022

- I use my knowledge of astrophysics, mathematics and statistics to help students with their coursework problems.

Private Tutor Jul – Oct 2022

- I tutored an astrophysics PhD student with learning python, statistics and data analysis in the context of astronomy.

OTHER PROJECTS

PyStar - Model for a Zero-Age Main-Sequence (ZAMS) star Feb 2020

- Built a simple mathematical model for the structure of a homogenous ZAMS star, based on Carroll & Ostlie, Appendix F.
- Used the basic equations for stellar structure and evolution, and also used Astropy to track physical quantities and units.
- **Technologies - Astropy, Python.** See github.com/pankajb64/pystar

Classification of Astronomical Objects from Light Curves Kaggle Data Science Challenge Oct – Dec 2018

- Using simulated data from Vera Rubin Observatory, I trained a deep learning model with 60% accuracy across all classes.
- I have been awarded the LSST Workshop Prize and invited to present at the upcoming LSST Supernova Workshop.
- **Technologies – Deep Learning, Keras, Sklearn, Pandas, Numpy, Python.** See github.com/pankajb64/plasticc-kaggle

PRIZES/CERTIFICATES/MEMBERSHIPS

- Alumni of the Royal Astronomical Society and the American Astronomical Society.
- Scheduled to receive a workshop prize at the upcoming LSST Supernova Workshop, see entry 2 of "Other Projects" for details. Workshop currently postponed due to Covid.
- Received a Silver Honour Certificate at the International Astronomy and Astrophysics Competition (IAAC) 2020 for finishing in the top 7% of all participants.
- Successfully completed the course *Writing With Flair: How To Become An Exceptional Writer* offered by former Wall Street Journal editor Shani Raja. Certificate of completion: https://www.udemy.com/certificate/UC-54e2ec00-a115-4ab3-8125-cf3efcc364e5/