

Dhayaa Anbajagane, Ph.D. Candidate

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Education

- 2020 - 2026 📖 **Ph.D., University of Chicago** in Astronomy and Astrophysics.
Advisor: Chihway Chang
Thesis: *"Constraining the physics of inflation using wide-field weak lensing and tSZ surveys"*
Research Interests: Weak lensing, inflation, wide-field photometric surveys, millimeter-wave surveys, cosmological simulations, data processing
- 2016 - 2020 📖 **B.Sc., University of Michigan, Ann Arbor** in Physics.
Advisor: August Evrard
Thesis: *"Stellar property statistics of massive halos in cosmological simulations"*.

Research Positions

- 2026 - 📖 **NASA Einstein Fellow** at Stanford
📖 **KIPAC Fellow** at Stanford/SLAC.

Research Publications

Summary (2020-2025): 55 publications with 862 citations, h-index of 18

- 16 publications as first author (330 citations, h-index of 11)
- 3 publications as primary advisor to student (3 more upcoming)
- 18 publications as second-author or with other major contributions (contributions detailed at end of citation)
- 22 publications with supporting contributions (data/pipeline infrastructure, catalog generation, internal reviewer, etc.).

First author publications

- 16 "The Dark Energy Camera All Data Everywhere cosmic shear project V: Constraints on cosmology and astrophysics from 270 million galaxies across 13,000 deg² of the sky," D. Anbajagane et al., 2025. arXiv: 2509.03582.
- 15 "Primordial Physics in the Nonlinear Universe: signatures of inflationary resonances, excitations, and scale dependence," D. Anbajagane and H. Lee, 2025. arXiv: 2509.02695.
- 14 "Primordial Physics in the Nonlinear Universe: mapping cosmological collider models to weak-lensing observables," D. Anbajagane and H. Lee, 2025. arXiv: 2509.02693.
- 13 "The DECADE cosmic shear project IV: cosmological constraints from 107 million galaxies across 5,400 deg² of the sky," D. Anbajagane et al., *The Open Journal of Astrophysics*, 2025. arXiv: 2502.17677.
- 12 "The DECADE cosmic shear project III: validation of analysis pipeline using spatially inhomogeneous data," D. Anbajagane et al., *The Open Journal of Astrophysics*, 2025. arXiv: 2502.17676.

- 11 “The DECADE cosmic shear project II: photometric redshift calibration of the source galaxy sample,” D. Anbajagane et al., *The Open Journal of Astrophysics*, 2025. arXiv: 2502.17675.
- 10 “The DECADE cosmic shear project I: A new weak lensing shape catalog of 107 million galaxies,” D. Anbajagane et al., *The Open Journal of Astrophysics*, 2025. arXiv: 2502.17674.
- 9 “Dark Energy Survey Year 6 Results: Synthetic-source Injection Across the Full Survey Using Balrog,” D. Anbajagane et al., *The Open Journal of Astrophysics*, 2025. arXiv: 2501.05683.
- 8 “Map-level baryonification: Efficient modelling of higher-order correlations in the weak lensing and thermal Sunyaev-Zeldovich fields,” D. Anbajagane, S. Pandey, and C. Chang, *The Open Journal of Astrophysics*, 2024. eprint: 2409.03822.
- 7 “Primordial non-Gaussianities with weak lensing: information on non-linear scales in the ULAGAM full-sky simulations,” D. Anbajagane, C. Chang, H. Lee, and M. Gatti, *J. Cosmology Astropart. Phys.*, 2024. arXiv: 2310.02349.
- 6 “Cosmological shocks around galaxy clusters: A coherent investigation with DES, SPT & ACT,” D. Anbajagane et al., *MNRAS*, 2023. arXiv: 2310.00059.
- 5 “Beyond the 3rd moment: A practical study of using lensing convergence CDFs for cosmology with DES Y3,” D. Anbajagane et al., *MNRAS*, 2023. arXiv: 2308.03863.
- 4 “Shocks in the stacked Sunyaev-Zel’dovich profiles of clusters II: Measurements from SPT-SZ + Planck Compton-y map,” D. Anbajagane et al., *MNRAS*, 2022. arXiv: 2111.04778.
- 3 “Galaxy velocity bias in cosmological simulations: towards per cent-level calibration,” D. Anbajagane et al., *MNRAS*, 2022. arXiv: 2110.01683.
- 2 “Baryonic imprints on DM haloes: population statistics from dwarf galaxies to galaxy clusters,” D. Anbajagane, A. E. Evrard, and A. Farahi, *MNRAS*, 2022. arXiv: 2109.02713.
- 1 “Stellar property statistics of massive haloes from cosmological hydrodynamics simulations: common kernel shapes,” D. Anbajagane et al., *MNRAS*, 2020. arXiv: 2001.02283.

Other major contributions

- 18 “A DECADE of dwarfs: first detection of weak lensing around spectroscopically confirmed low-mass galaxies,” C.-H. To et al., 2025. arXiv: 2509.20458, *Contrib: data, validation, interpretation*.
- 17 “DECADE+DES Y3 Weak Lensing Mass Map: A 13,000 deg² View of Cosmic Structure from 270 Million Galaxies,” M. Gatti et al., 2025. arXiv: 2509.03798, *Contrib: data, validation, interpretation*.
- 16 “Dark Energy Survey Year 3 Results: Cosmological constraints from second and third-order shear statistics,” R. C. H. Gomes et al., 2025. arXiv: 2508.14018, *Contrib: simulation-based covariance, validation*.
- 15 “Testing halo models for constraining astrophysical feedback with multi-probe modeling: I. 3D Power spectra and mass fractions,” S. Pranjali R., S. Pandey, D. Anbajagane, E. Krause, and K. Dolag, 2025. arXiv: 2507.13317, *Contrib: Full halo model pipeline, analysis, interpretation*.
- 14 “Map-level baryonification: unified treatment of weak lensing two-point and higher-order statistics,” A. J. Zhou, M. Gatti, D. Anbajagane, S. Dodelson, M. Schaller, and J. Schaye, 2025. arXiv: 2505.07949, *Contrib: Full baryon modelling pipeline, analysis, interpretation*.
- 13 “The NGC 3109 Satellite System: The First Systematic Resolved Search for Dwarf Galaxies Around an SMC-mass Host,” A. Doliva-Dolinsky et al., *ApJ*, 2025. arXiv: 2505.05570, *Contrib: Built entire synthetic source injection pipeline*.

- 12 “Cosmology with second and third-order shear statistics for the Dark Energy Survey: Methods and simulated analysis,” R. C. H. Gomes, S. Sugiyama, B. Jain, M. Jarvis, D. Anbajagane, M. Gatti, et al., 2025. arXiv: 2503.03964, *Contrib: simulation-based covariance, validation*.
- 11 “Deciphering baryonic feedback with galaxy clusters,” C.-H. To, S. Pandey, E. Krause, N. Dalal, D. Anbajagane, and D. H. Weinberg, *J. Cosmology Astropart. Phys.*, 2024. arXiv: 2402.00110, *Contrib: Simulations, validation, interpretation*.
- 10 “Accurate connected modeling of gas thermodynamics and matter distribution,” S. Pandey, J. Salcido, C.-H. To, J. C. Hill, D. Anbajagane, E. J. Baxter, et al., *Phys. Rev. D*, 2025. arXiv: 2401.18072, *Contrib: Simulations, modeling*.
- 9 “Cosmological Constraints from Combining Galaxy Surveys and Gravitational Wave Observatories,” E. L. Gagnon, D. Anbajagane, J. Prat, C. Chang, and J. Frieman, *The Open Journal of Astrophysics*, 2023. arXiv: 2312.16289, *Contrib: Primary academic mentor, coordinated and helped with entire analysis*.
- 8 “Merger Response of Halo Anisotropy Properties,” K. Wang, P. Mansfield, D. Anbajagane, and C. Avestruz, *ApJ*, 2023. arXiv: 2311.08664, *Contrib: Simulations, methodology, analysis*.
- 7 “Baryonic Imprints on DM Halos: the concentration-mass relation and its dependence on halo and galaxy properties,” M. Shao and D. Anbajagane, *The Open Journal of Astrophysics*, 2024. arXiv: 2311.03491, *Contrib: Primary academic mentor, coordinated and helped with entire analysis*.
- 6 “Baryonic imprints on DM haloes: the concentration-mass relation in the C AMELS simulations,” M. Shao, D. Anbajagane, and C. Chang, *MNRAS*, 2023. arXiv: 2212.05964, *Contrib: Primary academic mentor, coordinated and helped with entire analysis*.
- 5 “A multisimulation study of relativistic SZ temperature scalings in galaxy clusters and groups,” E. Lee et al., *MNRAS*, 2022. arXiv: 2207.05834, *Contrib: Simulations, analysis, interpretation*.
- 4 “Correlations of Dark Matter, Gas, and Stellar Profiles in Dark Matter Halos,” A. Farahi, D. Nagai, and D. Anbajagane, *ApJ*, 2022. arXiv: 2204.13578, *Contrib: Simulations, analysis*.
- 3 “The scatter in the galaxy-halo connection: a machine learning analysis,” R. Stiskalek, D. J. Bartlett, H. Desmond, and D. Anbajagane, *MNRAS*, 2022. arXiv: 2202.14006, *Contrib: Simulations, analysis*.
- 2 “KLLR: A Scale-dependent, Multivariate Model Class for Regression Analysis,” A. Farahi, D. Anbajagane, and A. E. Evrard, *ApJ*, 2022. arXiv: 2202.09903, *Contrib: Co-lead developer of software, methodology validation*.
- 1 “A test of the standard cosmological model with geometry and growth,” U. Andrade, D. Anbajagane, R. von Marttens, D. Huterer, and J. Alcaniz, *J. Cosmology Astropart. Phys.*, 2021. arXiv: 2107.07538, *Contrib: Co-analysis lead*.

Supporting contributions

- 22 “Quantifying the impact of selection effects on FRB DM- z relation cosmological inference,” K. Sharma, V. Ravi, L. Connor, E. Krause, S. Pranjal R., and D. Anbajagane, *arXiv e-prints*, 2025. eprint: 2511.16850.
- 21 “Dark Energy Survey Year 3 results: Simulation-based w CDM inference from weak lensing and galaxy clustering maps with deep learning. I. Analysis design,” A. Thomsen et al., 2025. eprint: 2511.04681 (astro-ph.CO).
- 20 “Dark Energy Survey Year 6 Results: Redshift Calibration of the Weak Lensing Source Galaxies,” B. Yin et al., 2025. arXiv: 2510.23566.

- 19 “Dark Energy Survey Year 6 Results: Clustering-redshifts and importance sampling of Self-Organised-Maps $n(z)$ realizations for 3×2 pt samples,” W. d’Assignies et al., *arXiv e-prints*, 2025. arXiv: 2510.23565.
- 18 “SBI3PCF: Simulation-based inference with the integrated 3PCF,” D. Gebauer, A. Halder, S. Seitz, and D. Anbajagane, 2025. eprint: 2510.13805 (astro-ph.CO).
- 17 “DELVE Milky Way Satellite Census I: Satellite Population and Survey Selection Function,” C. Y. Tan et al., 2025. arXiv: 2509.12313.
- 16 “Dark Energy Survey Year 6 Results: Redshift Calibration of the MagLim++ Lens Sample,” G. Giannini et al., *arXiv e-prints*, 2025. arXiv: 2509.07964.
- 15 “Dark Energy Survey Year 6 Results: improved mitigation of spatially varying observational systematics with masking,” M. Rodriguez-Monroy et al., 2025. arXiv: 2509.07943.
- 14 “Probing baryonic feedback and cosmology with 3×2 -point statistic of FRBs and galaxies,” K. Sharma et al., *arXiv e-prints*, 2025. arXiv: 2509.05866.
- 13 “Dark Energy Survey Year 3 results: w CDM cosmology from simulation-based inference with persistent homology on the sphere,” J. Prat et al., 2025. arXiv: 2506.13439.
- 12 “Constraints on cosmology and baryonic feedback with joint analysis of Dark Energy Survey Year 3 lensing data and ACT DR6 thermal Sunyaev-Zel’dovich effect observations,” S. Pandey et al., 2025. arXiv: 2506.07432.
- 11 “Dark Energy Survey Year 3 Results: Cosmological Constraints from Cluster Abundances, Weak Lensing, and Galaxy Clustering,” DES Collaboration et al., 2025. arXiv: 2503.13632.
- 10 “Dark energy survey: Modeling strategy for multiprobe cluster cosmology and validation for the full six-year dataset,” C.-H. To et al., *Phys. Rev. D*, 2025. arXiv: 2503.13631.
- 9 “Dark Energy Survey Year 6 Results: Photometric Data Set for Cosmology,” K. Bechtol et al., 2025. arXiv: 2501.05739.
- 8 “Dark Energy Survey Year 6 Results: Cell-based Coadds and METADETECTION Weak Lensing Shape Catalogue,” M. Yamamoto et al., *MNRAS*, 2025. arXiv: 2501.05665.
- 7 “Superclustering with the Atacama Cosmology Telescope and Dark Energy Survey. II. Anisotropic Large-scale Coherence in Hot Gas, Galaxies, and Dark Matter,” M. Lokken et al., *ApJ*, Apr. 2025. arXiv: 2409.04535.
- 6 “A Pride of Satellites in the Constellation Leo? Discovery of the Leo VI Milky Way Satellite Ultra-faint Dwarf Galaxy with DELVE Early Data Release 3,” C. Y. Tan et al., *ApJ*, 2025. arXiv: 2408.00865.
- 5 “Weak Gravitational Lensing around Low Surface Brightness Galaxies in the DES Year 3 Data,” N. Chicoine et al., *The Open Journal of Astrophysics*, 2024. arXiv: 2407.19081.
- 4 “Dark Energy Survey Year 3 results: Simulation-based cosmological inference with wavelet harmonics, scattering transforms, and moments of weak lensing mass maps. II. cosmological results,” M. Gatti et al., *Phys. Rev. D*, 2025. arXiv: 2405.10881.
- 3 “Subhalos in Galaxy Clusters: Coherent Accretion and Internal Orbits,” C. Han, K. Wang, C. Avestruz, and D. Anbajagane, *arXiv e-prints*, 2023. arXiv: 2312.08337.
- 2 “Dark Energy Survey Year 3 results: Simulation-based cosmological inference with wavelet harmonics, scattering transforms, and moments of weak lensing mass maps. Validation on simulations,” M. Gatti et al., *PRD*, 2024. arXiv: 2310.17557.
- 1 “THE THREE HUNDRED project: The GIZMO-SIMBA run,” W. Cui et al., *MNRAS*, 2022. arXiv: 2202.14038.

Teaching

- Spring 2023, 2024  **Intro to Astrophysics**, Teaching Assistant & Guest lecturer for ASTRO 133, Introduction to Astrophysics for Majors
- Summer 2020, 2021  **General Relativity**, Teaching Assistant for Michigan Math and Science Scholars — a 3 week summer program for high school students

Awards and Honors

- 2026  **NASA Hubble Einstein Fellowship**
 **Stanford KIPAC Fellowship**
 **NASA Brinson Fellowship (Declined)**
 **Perimeter Institute Senior Named Fellowship (Declined)**
 **Princeton Spitzer Fellowship (Declined)**
 **Berkeley BCCP Fellowship (Declined)**
- 2025  **DES Builder**, recognition for building key DES infrastructure, primarily related to image processing, catalog generation, redshift/shear estimation, and other survey calibrations/characterizations.
- 2023  **CCAPP Price Prize**, “recognizes research excellence and exceptional promise in areas related to initiatives of the Center of Cosmology and Astroparticle physics at Ohio State University.” Awarded to two students per year, globally.
 **DELVE Builder**, recognition for leading development of weak lensing pipeline, shear catalogs, redshift catalogs, and calibrations for the DELVE survey
- 2020  **NSF Graduate Research Fellow**, awarded \$100,000+ over 3 years for development of personal research program.
- 2019  **Honors Fellow**, University of Michigan. Awarded \$10,000 for developing undergraduate thesis work within an interdisciplinary cohort. Given to 25 students per year.
 **Graf-Meiland Scholar**, University of Michigan. Awards \$5,000 each to three students annually for excellence in interdisciplinary research and academic pedagogy

Service

- 2022-Now  **Working group lead, Synthetic Source Injection**, Dark Energy Survey. *Lead a group of grad students, postdocs, and senior researchers in developing data-driven methods to calibrate the image data and processing pipelines for the Dark Energy Survey legacy dataset. Our group produced the largest synthetic, calibration catalog to date.*
 **Organizer, Broader Horizons seminar series**, Astronomy and Astrophysics, University of Chicago. *Lead a seminar series that invites former dept. alumni to visit the dept. and present their academic/industry experiences to our community.*
 **Graduate Rep., Committee on dept. community**, Astronomy and Astrophysics, University of Chicago. *Oversee community-wide survey of dept., used to inform dept. policy changes. Lead procurement and development of dept. resources for our community, such as student guides, alumni lists, professional development seminars etc.*
- 2023  **Volunteer lecturer, Lifelong learning** Served as a speaker for the Lifelong learning program, giving astronomy talks to senior citizens.
 **Volunteer assistant, Space Explorers** Served as voluntary teaching assistant in program for high school students in the Chicago south side community

Mentoring

- 2026-  Kyle Miller, *PNG constraints with WL 3pt functions*
Ben Sherwin, *Baryons and Cosmology from 3pt cross-correlations*
Lyla Choi, *Non-linear predictions of cosmological colliders*
- 2025-  Manuel Gaido, *Population-level cosmology analyses of optical galaxy clusters*
Raul Teixeira, *Systematics calibration of clustering in weak lensing samples*
- 2024-  Camilla Delgado, *Connecting simulation subgrid models to baryon imprints*
Elisa (Jiayi) Gao, *Modelling the distribution of halo concentration with normalizing flows*
- 2025-2026  Benjamin Cohen, *Probing the physics of inflation with dwarf galaxies*
- 2023-2024  Zhuoqi (Jackie) Zhang [PhD at Stanford], *Validation of the DECADE cosmic shear catalog*
Nathalie Chicoine [PhD at UPitt], *Modelling choices for DECADE cosmic shear*
- 2022-2024  Mufan (Jon) Shao [PhD at Princeton], *Baryonic effects on halo properties*
Raul Teixeira [PhD at Duke], *Photometric redshift estimates in the DECADE survey*
Louise Gagnon [Consultant at IBM], *Observability of primordial signatures on large-scales*
Samuel Charney [PhD at UWash], *Analytic model of cosmological shocks around galaxy clusters*

Invited seminars/talks

- 2025  Perimeter Institute, Cosmology Seminar
Cosmo25, Carnegie Mellon
ETH Zurich, Cosmology Seminar
UC Berkeley, Cosmology seminar
SLAC, cosmological surveys seminar
Stanford University, KIPAC seminar
Stanford University, KIPAC tea talk
Fermilab, Particle physics and cosmology seminar
AAS 245th Meeting, DES Special Session
- 2024  CAMELS 2024, CCA workshop
Princeton University, Cosmology Seminar
University of Maryland, Theory and Computation Seminar
- 2023  OSU Center for Cosmology and Particle Physics, Price Prize Seminar

Skills

- Writing  Authored and self-published twenty novels, with over 30,000 copies sold.
- Languages  English (native), Tamil (native), French (Intermediate)
- Coding  Python, Bash/Unix, C/C++, SQL, distributed computing