# 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, widefield photometric surveys, millimeter-wave surveys, cosmological simulations, data processing

2016 - 2020 **B.Sc., University of Michigan, Ann Arbor** in Physics.
Advisor: August Evrard
Thesis title: *"Stellar property statistics of massive halos in cosmological simulations"*.

## Research Publications

Summary (2020-2025): 41 publications with 563 citations, h-index of 15

- 13 publications as first author
- 3 publications as primary advisor to student (3 more upcoming)
- 12 publications as second-author or with other major contributions (contributions detailed at end of citation)
- 13 publications with supporting contributions (data infrastructure, internal reviewer etc.)

### First Author & other major contributions

25 "The DECADE cosmic shear project II: photometric redshift calibration of the source galaxy sample," D. Anbajagane, A. Alarcon, R. Teixeira, *et al.*, 2025. arXiv: 2502.17675.

24 "The DECADE cosmic shear project III: validation of analysis pipeline using spatially inhomogeneous data," D. Anbajagane, C. Chang, N. Chicoine, *et al.*, 2025. arXiv: 2502.17676.

23 "The DECADE cosmic shear project IV: cosmological constraints from 107 million galaxies across 5,400 $deg^2$ of the sky," D. Anbajagane, C. Chang, A. Drlica-Wagner, *et al.*, 2025. arXiv: 2502.17677.

22 "The DECADE cosmic shear project I: A new weak lensing shape catalog of 107 million galaxies," D. Anbajagane, C. Chang, Z. Zhang, *et al.*, 2025. arXiv: 2502.17674.

21 "Dark Energy Survey Year 6 Results: Synthetic-source Injection Across the Full Survey Using Balrog," D. Anbajagane, M. Tabbutt, J. Beas-Gonzalez, *et al.*, 2025. arXiv: 2501.05683.

20 "The NGC3109 Satellite System: The First Systematic Resolved Search for Dwarf Galaxies Around a SMC-mass Host," A. Doliva-Dolinsky, B. Mutlu-Pakdil, D. Anbajagane, *et al.*, 2025. arXiv: 2505.05570, *Contrib: Built entire synthetic source injection pipeline.*

19 "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.*

18 "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*.

17 "Testing halo models for constraining astrophysical feedback with multi-probe modeling: I. 3D Power spectra and mass fractions," S. Pranjal R., S. Pandey, D. Anbajagane, E. Krause, and K. Dolag, 2025. arXiv: 2507.13317, *Contrib: Full halo model pipeline, analysis, interpretation*.

16 "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.*

15 "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.

14 "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. arXiv: 2409.03822.

13 "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*.

12 "Beyond the 3rd moment: A practical study of using lensing convergence CDFs for cosmology with DES Y3," D. Anbajagane, C. Chang, A. Banerjee, *et al.*, *MNRAS*, 2023. arXiv: 2308.03863.

11 "Cosmological shocks around galaxy clusters: A coherent investigation with DES, SPT & ACT," D. Anbajagane, C. Chang, E. J. Baxter, *et al.*, *MNRAS*, 2023. arXiv: 2310.00059.

10 "Merger Response of Halo Anisotropy Properties," K. Wang, P. Mansfield, D. Anbajagane, and C. Avestruz, *ApJ*, 2023. arXiv: 2311.08664, *Contrib: Simulations, methodology, analysis*.

9 "Shocks in the stacked Sunyaev-Zel'dovich profiles of clusters II: Measurements from SPT-SZ + Planck Compton-y map," D. Anbajagane, C. Chang, B. Jain, *et al.*, *MNRAS*, 2022. arXiv: 2111.04778.

8 "Galaxy velocity bias in cosmological simulations: towards per cent-level calibration," D. Anbajagane, H. Aung, A. E. Evrard, *et al.*, *MNRAS*, 2022. arXiv: 2110.01683.

7 "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.

6 "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*.

5 "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*.

4 "A multisimulation study of relativistic SZ temperature scalings in galaxy clusters and groups," E. Lee, D. Anbajagane, P. Singh, *et al.*, *MNRAS*, 2022. arXiv: 2207.05834, *Contrib: Simulations, analysis, interpretation*.

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 "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*.

1 "Stellar property statistics of massive haloes from cosmological hydrodynamics simulations: common kernel shapes," D. Anbajagane, A. E. Evrard, A. Farahi, *et al.*, *MNRAS*, 2020. arXiv: 2001.02283.

### As primary advisor to student

3 "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.

2 "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.

1 "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.

### Upcoming publications

5 "The DECADE cosmic shear project V: cosmology and astrophysics from 280 million galaxies across $13,000\text{deg}^2$ of the sky," D. Anbajagane, C. Chang, *et al.*, 2025.

4 "Nonlinear structures in novel universes: signatures of cosmological collider physics in the weak lensing field," D. Anbajagane and H. Lee, 2025.

3 "Nonlinear structures in novel universes: signatures of inflationary resonances, excitations, and symmetry-breaking," D. Anbajagane and H. Lee, 2025.

2 "DECADE + DES Y3 Weak Lensing Mass Map: A 13,000 deg2 View of Cosmic Structure from 280 Million Galaxies," M. Gatti, D. Anbajagane, C. Chang, *et al.*, 2025.

### Supporting contributions

13 "Dark Energy Survey Year 6 Results: Photometric Data Set for Cosmology," K. Bechtol, I. Sevilla-Noarbe, A. Drlica-Wagner, *et al.*, 2025. arXiv: 2501.05739.

12 "Dark Energy Survey Year 3 Results: Cosmological Constraints from Cluster Abundances, Weak Lensing, and Galaxy Clustering," DES Collaboration, T. M. C. Abbott, M. Aguena, *et al.*, 2025. arXiv: 2503.13632.

11 "Superclustering with the Atacama Cosmology Telescope and Dark Energy Survey: II. Anisotropic large-scale coherence in hot gas, galaxies, and dark matter," M. Lokken, A. van Engelen, M. Aguena, *et al.*, *ApJ*, 2025. arXiv: 2409.04535.

10 "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, J. C. Hill, A. Alarcon, *et al.*, 2025. arXiv: 2506.07432, *Contrib: Simulations, model validation.*

9 "Dark Energy Survey Year 3 results: $w$CDM cosmology from simulation-based inference with persistent homology on the sphere," J. Prat, M. Gatti, C. Doux, *et al.*, 2025. arXiv: 2506.13439.

8 "Dark Energy Survey: Modeling strategy for multiprobe cluster cosmology and validation for the Full Six-year Dataset," C.-H. To, E. Krause, C. Chang, *et al.*, 2025. arXiv: 2503.13631, *Contrib: Calibrations for galaxy clustering sample*.

7. "Dark Energy Survey Year 6 Results: Cell-based Coadds and Metadetection Weak Lensing Shape Catalogue," M. Yamamoto, M. R. Becker, E. Sheldon, *et al.*, 2025. arXiv: 2501.05665.
6. "Weak Gravitational Lensing around Low Surface Brightness Galaxies in the DES Year 3 Data," N. Chicoine, J. Prat, G. Zacharegkas, *et al.*, *arXiv e-prints*, 2024. arXiv: 2407.19081.
5. "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, G. Campailla, N. Jeffrey, *et al.*, *arXiv e-prints*, 2024. arXiv: 2405.10881.
4. "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, N. Jeffrey, L. Whiteway, *et al.*, *PRD*, 2024. arXiv: 2310.17557.
3. "A Pride of Satellites in the Constellation Leo? Discovery of the Leo VI Milky Way Satellite Galaxy with DELVE Early Data Release 3," C. Y. Tan, W. Cerny, A. Drlica-Wagner, *et al.*, *arXiv e-prints*, 2024. arXiv: 2408.00865.
2. "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.
1. "THE THREE HUNDRED project: The GIZMO-SIMBA run," W. Cui, R. Dave, A. Knebe, *et al.*, *MNRAS*, 2022. arXiv: 2202.14038.

## Teaching

Spring 2023, 2024 — **Intro to Astrophysics**, Teaching Assistant & Guest lecturer

Summer 2020, 2021 — **General Relativity**, Teaching assistant for Michigan Math and Science Scholars — a 3 week summer program for highschool students

## Awards and Honors

2025 — **DES Builder,** recognition for building key DES infrastructure, primarily related to image processing and other survey calibrations/characterizations.

2023 — **CCAPP Price Award,** "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, 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 $5000 each to three students annually for excellence in interdisciplinary research and academic pedagogy

**James B. Angell Scholar,** University of Michigan

## Service

2023-Now — **Organizer, Broader Horizons seminar series**, Astronomy and Astrophysics, University of Chicago. *Lead a seminar series that invites former dept. alumni — who have since moved onto non-academic roles — to visit the dept. and present their experiences to our community.*

## Service (continued)

2022-Now — **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

2025- — Benjamin Cohen, *Probing the physics of inflation with dwarf galaxies*

2024- — Camilla Delgado, *Connecting simulation subgrid models to baryon imprints*

Elisa (Jiayi) Gao, *Modelling the distribution of halo concentration with normalizing flows*

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, *Observability of novel cosmological signatures on large-scales*

Samuel Charney [PhD at UWash], *Analytic model of cosmological shocks around galaxy clusters*

## Invited seminars/talks

2025 — Stanford University, KIPAC seminar

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

2022 — MIT Kavli institute, Brown Bag Seminar

## Skills

Languages — English (native), Tamil (native), French (Intermediate)

Coding — Python, Bash/Unix, C/C++, SQL, distributed computing