Bikash Ranjan Dinda, Ph.D.

Curriculum Vitae • Updated: 27th August 2025

Current Position:	Postdoc at Department of Physics & Astronomy, University of the Western Cape, Cape Town, South Africa.
Research Interests:	Late-Time Cosmology, Dark Energy, Machine Learning, 21 cm Cosmology, Large-Scale Structure Formation, Weak Lensing, Inflation
Tools:	Machine Learning (PyTorch, scikit-learn); Bayesian Inference (PyMultiNest, Cobaya); Cosmology Codes (CAMB, CLASS); Programming (Python)
D.o.B:	26th February 1989
Current Address:	Unit 5, Paul House, 17 Wilkinson Street, 17B Dean Street, Newlands, Cape Town, 7700 South Africa.
Home Address:	Gopalpur, Hatgopalpur, East Medinipur, West Bengal, India. Pin - 721454

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arXiv author search
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Research Expertise

- **Machine Learning** application to cosmology e.g. **Gaussian Process Regression (GPR)**, **Artificial Neural Network (ANN)**, and **Richardson-Lucy (RL) deconvolution** [3], [6], [7], [10], [11].
- **Model agnostic tests** of cosmological models and theories from observational data [5].
- Cosmological **data analysis** [8], [21].
- Modelling and computation of **post re-ionization 21 cm power spectrum**. Forecast for **sample variance** and **system noises** from telescope specifications such as **Square Kilometer Array (SKA)** [9], [12], [14].
- **Reconstruction** of late-time cosmology and different cosmological observables using **cosmography** approach with Taylor series and **Pade series** expansion [13], [16].
- Cosmological **perturbation theory**: **general relativistic** and **Newtonian** (both **first-order** and **second-order**) [18], [19], [20], [22].
- Computation of **weak lensing** convergence **power spectrum** and **bispectrum** using first and second order Newtonian perturbation theory [18], [22].
- Computation of **galaxy power spectrum** using relativistic perturbation on large cosmological scales [19], [20].

Research Expertise (continued)

- Computation of **nonlinear matter power spectrum** on **mildly non-linear scales** using **semi-numerical resummation technique** [17].
- **N-body Simulation** [15].
- Model building for late time cosmology (**dark energy** and modified gravity models) [8].
- **Inflation**ary model building [23].

Research Publications

Journal Articles (Published)

1. **B. R. Dinda** and R. Maartens, "Physical vs phantom dark energy after DESI: thawing quintessence in a curved background," *MNRASL*, vol. 542, no. 1, pp. L31–L35, Jun. 2025. DOI: 10.1093/mnrasl/slaf063. arXiv: 2504.15190 [astro-ph.CO].
2. **B. R. Dinda**, "Cosmic curvature on large-scale structures with homogeneous dark energy," *Phys. Rev. D*, vol. 111, no. 10, p. 103 533, 2025. DOI: 10.1103/jbkz-91yq. arXiv: 2312.01393 [astro-ph.CO].
3. **B. R. Dinda** and R. Maartens, "Model-agnostic assessment of dark energy after DESI DR1 BAO," *JCAP*, vol. 01, p. 120, 2025. DOI: 10.1088/1475-7516/2025/01/120. arXiv: 2407.17252 [astro-ph.CO].
4. **B. R. Dinda**, R. Maartens, S. Saito, and C. Clarkson, "Improved null tests of ΛCDM and FLRW in light of DESI DR2," *JCAP*, vol. 08, p. 018, 2025. DOI: 10.1088/1475-7516/2025/08/018. arXiv: 2504.09681 [astro-ph.CO].
5. **B. R. Dinda**, "A new diagnostic for the null test of dynamical dark energy in light of DESI 2024 and other BAO data," *JCAP*, vol. 09, p. 062, 2024. DOI: 10.1088/1475-7516/2024/09/062. arXiv: 2405.06618 [astro-ph.CO].
6. **B. R. Dinda**, "Analytical Gaussian Process Cosmography: Unveiling Insights into Matter-Energy Density Parameter at Present," *Eur. Phys. J. C*, vol. 84, p. 402, 2024. DOI: 10.1140/epjc/s10052-024-12774-x. arXiv: 2311.13498 [astro-ph.CO].
7. **B. R. Dinda** and N. Banerjee, "A comprehensive data-driven odyssey to explore the equation of state of dark energy," *Eur. Phys. J. C*, vol. 84, no. 7, p. 688, 2024. DOI: 10.1140/epjc/s10052-024-13064-2. arXiv: 2403.14223 [astro-ph.CO].
8. **B. R. Dinda** and N. Banerjee, "Constraints on the speed of sound in the k-essence model of dark energy," *Eur. Phys. J. C*, vol. 84, no. 2, p. 177, 2024. DOI: 10.1140/epjc/s10052-024-12547-6. arXiv: 2309.10538 [astro-ph.CO].
9. A. Bassi, **B. R. Dinda**, and A. A. Sen, "Post-reionization 21-cm power spectrum for bimetric gravity and its detectability with SKA1-mid telescope," *J. Astrophys. Astron.*, vol. 44, no. 2, p. 93, 2023. DOI: 10.1007/s12036-023-09980-6. arXiv: 2306.03875 [astro-ph.CO].
10. **B. R. Dinda**, "Minimal model-dependent constraints on cosmological nuisance parameters and cosmic curvature from combinations of cosmological data," *Int. J. Mod. Phys. D*, vol. 32, no. 11, p. 2 350 079, 2023. DOI: 10.1142/S0218271823500797. arXiv: 2209.14639 [astro-ph.CO].
11. **B. R. Dinda** and N. Banerjee, "Model independent bounds on type Ia supernova absolute peak magnitude," *Phys. Rev. D*, vol. 107, no. 6, p. 063 513, 2023. DOI: 10.1103/PhysRevD.107.063513. arXiv: 2208.14740 [astro-ph.CO].
12. **B. R. Dinda**, M. W. Hossain, and A. A. Sen, "21-cm power spectrum in interacting cubic Galileon model," *J. Astrophys. Astron.*, vol. 44, no. 2, p. 85, 2023. DOI: 10.1007/s12036-023-09976-2. arXiv: 2208.11560 [astro-ph.CO].
13. **B. R. Dinda**, "Cosmic expansion parametrization: Implication for curvature and Ho tension," *Phys. Rev. D*, vol. 105, no. 6, p. 063 524, 2022. DOI: 10.1103/PhysRevD.105.063524. arXiv: 2106.02963 [astro-ph.CO].
14. S. C. Hotinli, T. Binnie, J. B. Muñoz, **B. R. Dinda**, and M. Kamionkowski, "Probing compensated isocurvature with the 21-cm signal during cosmic dawn," *Phys. Rev. D*, vol. 104, no. 6, p. 063 536, 2021. DOI: 10.1103/PhysRevD.104.063536. arXiv: 2106.11979 [astro-ph.CO].

15 J. Zhang, **B. R. Dinda**, M. W. Hossain, A. A. Sen, and W. Luo, "Study of cubic Galileon gravity using N-body simulations," *Phys. Rev. D*, vol. 102, no. 4, p. 043 510, 2020. DOI: 10.1103/PhysRevD.102.043510. arXiv: 2004.12659 [astro-ph.CO].

16 **B. R. Dinda**, "Model independent parametrization of the late time cosmic acceleration: Constraints on the parameters from recent observations," *Phys. Rev. D*, vol. 100, no. 4, p. 043 528, 2019. DOI: 10.1103/PhysRevD.100.043528. arXiv: 1904.10418 [astro-ph.CO].

17 **B. R. Dinda**, "Nonlinear power spectrum in clustering and smooth dark energy models beyond the BAO scale," *J. Astrophys. Astron.*, vol. 40, no. 2, p. 12, 2019. DOI: 10.1007/s12036-019-9584-3. arXiv: 1804.07953 [astro-ph.CO].

18 **B. R. Dinda**, "Weak lensing probe of cubic Galileon model," *JCAP*, vol. 06, p. 017, 2018. DOI: 10.1088/1475-7516/2018/06/017. arXiv: 1801.01741 [astro-ph.CO].

19 **B. R. Dinda** and A. A. Sen, "Imprint of thawing scalar fields on the large scale galaxy overdensity," *Phys. Rev. D*, vol. 97, no. 8, p. 083 506, 2018. DOI: 10.1103/PhysRevD.97.083506. arXiv: 1607.05123 [astro-ph.CO].

20 **B. R. Dinda**, M. Wali Hossain, and A. A. Sen, "Observed galaxy power spectrum in cubic Galileon model," *JCAP*, vol. 01, p. 045, 2018. DOI: 10.1088/1475-7516/2018/01/045. arXiv: 1706.00567 [astro-ph.CO].

21 A. I. Lonappan, S. Kumar, Ruchika, **B. R. Dinda**, and A. A. Sen, "Bayesian evidences for dark energy models in light of current observational data," *Phys. Rev. D*, vol. 97, no. 4, p. 043 524, 2018. DOI: 10.1103/PhysRevD.97.043524. arXiv: 1707.00603 [astro-ph.CO].

22 **B. R. Dinda**, "Probing dark energy using convergence power spectrum and bi-spectrum," *JCAP*, vol. 09, p. 035, 2017. DOI: 10.1088/1475-7516/2017/09/035. arXiv: 1705.00657 [astro-ph.CO].

23 **B. R. Dinda**, S. Kumar, and A. A. Sen, "Inflationary generalized Chaplygin gas and dark energy in light of the Planck and BICEP2 experiments," *Phys. Rev. D*, vol. 90, no. 8, p. 083 515, 2014. DOI: 10.1103/PhysRevD.90.083515. arXiv: 1404.3683 [astro-ph.CO].

Preprints

1 S. L. Guedezounme, **B. R. Dinda**, and R. Maartens, "Phantom crossing or dark interaction?" Jul. 2025. arXiv: 2507.18274 [astro-ph.CO].

Post Ph.D. experience

2024 – Current **Postdoc**, Department of Physics & Astronomy, University of the Western Cape, Cape Town 7535, South Africa. Mentor: Prof. Roy Maartens.

2022 – 2024 **Postdoc**, Department of Physical Sciences, Indian Institute of Science Education and Research (IISER) Kolkata. Mentor: Prof. Narayan Banerjee.

2019 – 2021 **Postdoc**, Department of Theoretical Physics, Tata Institute of Fundamental Research (TIFR), Mumbai. Mentor: Prof. Subhabrata Majumdar.

Education

2012 – 2019 **Ph.D., Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi** in Cosmology, Physics.
Thesis title: *Understanding The Accelerating Universe: Model building and Observational Signatures.*
Supervisor: *Prof. Anjan Ananda Sen*

2010 – 2012 **M.Sc., Indian Institute of Technology, Bombay** in Physics.
Special Project: *Cosmology*.
Supervisor: *Prof. Urjit Yajnik*

2006 – 2010 **B.Sc., University of Calcutta** in Physics (Honours).

Skills

Coding — Python (main), Fortran (basic), C (basic)

Cosmological tools — CAMB, CLASS, Cobaya, emcee, PyMultiNest, PyTorch, scikit-learn, GPy, Astropy, HMcode, Cosmic Emulator, CosmicPy, iCosmo

Miscellaneous Experience

Awards and Achievements

2024 — National Post Doctoral Fellowship (SERB-**NPDF**).

2018–2019 — **Balzan Fellowship** for the Balzan Centre for Cosmological Studies Program (CCS).

2014–2017 — **Senior research fellow, CSIR, India** (from 1st October 2014 to 30th September 2017).

2012–2014 — **Junior research fellow, CSIR, India** (from 1st October 2012 to 30th September 2014).

Certification

2012 — **NET exam** 2012 (June).

2010 — **JAM exam** 2010.

Talks Delivered

2025 — Delivered a talk on "**Is Phantom Crossing Real?**" at University of the Western Cape on 13th August 2025.

Delivered a talk on "**Model-Agnostic Assessment of Dark Energy after DESI DR1 BAO**" at COLOURS workshop at Institut Pascal, Paris on 10th June 2025.

Delivered a talk on "**Dark Energy after DESI**" at Missouri University of Science & Technology on 28th April 2025.

Delivered a talk on (1) "**Improved null tests of ΛCDM and FLRW in light of DESI DR2**" and (2) "**Physical vs phantom dark energy after DESI: thawing quintessence in a curved background**" at Missouri University of Science & Technology on 21st April 2025.

Delivered a talk on "**Model-agnostic assessment of Dark Energy after DESI DR1 BAO**" at University of the Western Cape on 19th February 2025.

2024 — Delivered an online talk on "**Model-agnostic assessment of Dark Energy after DESI DR1 BAO**" for UWC-S&T seminar on 23rd August 2024.

Delivered an online talk on "**Unveiling Ω_{m0} independently: a journey and consistency quest with first-order perturbation theory**" in cosmology research group, Observatório Nacional (RJ / Brazil) on 15th January 2024.

2023 — Delivered a talk on "**Model-independent reconstruction of the evolution of dark energy using Gaussian process regression**" in the 10th International Conference on Gravitation and Cosmology: New Horizons and Singularities in Gravity, 6th–9th December 2023, organized by Department of Physics, IIT Guwahati, Assam, India.

2022 — Delivered a review talk on "**Dark energy in light of current observational data**" in Cosmology@CCSP_1: An Inaugural Conference on Current Status of Cosmology, 17th–19th October 2022, organized by The Thanu Padmanabhan Centre for Cosmology and Science Popularization (CCSP), SGT University, Gurugram, Delhi-NCR, India.

Talks Delivered (continued)

- Delivered an online talk on "**21 cm power spectrum in interacting cubic Galileon model**" in Physics Data and Astronomical Technology (PDAT) Laboratory, K. N. Toosi University of Technology, Iran on 12th September 2022.

2021

- Delivered an online talk on "**Cosmic expansion Parametrization: implication for cosmic curvature and Hubble tension**" in Indian Institute of Technology Madras, India on 26th June 2021.

2020

- Delivered a Ph.D. thesis competition talk on "**Understanding The Accelerating Universe: Model building and Observational Signatures.**" at the IAGRG meeting, IIT Gandhinagar, India on 20th December 2020. (Secured in top 4 positions).

- Delivered a talk on "**Model independent parametrization of the late time cosmic acceleration: Constraints on the parameters from recent observations**" in Visva-Bharati University, Santiniketan, India on 13th January 2020.

2019

- Delivered a talk on "**Model independent parametrization of the late time cosmic acceleration: Constraints on the parameters from recent observations**" in Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi, India on 2nd September 2019.

- Delivered a talk on "**Model independent constraints on dark energy from the 21-cm intensity mapping surveys with SKA1**" in International Centre for Theoretical Sciences, Tata Institute of Fundamental Research, Bangalore, India on 7th January 2019.

2018

- Delivered a talk on "**Model independent constraints on dark energy parameters from the 21-cm intensity mapping surveys with SKA-I**" in Kodaikanal Solar Observatory (KSO), Indian Institute of Astrophysics, Tamilnadu, India on 18th December 2018.

- Delivered a talk on "**Signature of dark energy in galaxy power spectrum on the large cosmological scale and the weak lensing statistics**" in SNS, Pisa, Trieste, Italy on 6th July 2018.

- Delivered a talk on "**Signature of dark energy in galaxy power spectrum on the large cosmological scale and the weak lensing statistics**" in SISSA, Trieste, Italy on 3rd July 2018.

- Delivered a talk on "**Future Constraints on Dark Energy using 21cm observations with SKA1-MID**" in The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy on 21st June 2018.

- Delivered a talk on "**Signature of dark energy in galaxy power spectrum on the large cosmological scale**" in Department of Theoretical Physics, Tata Institute of Fundamental Research, Mumbai, India on 3rd April 2018.

2017

- Delivered a talk on "**Future Constraints on Dark Energy using 21cm observations with SKA1-MID**" in Presi21cm Conference, titled "Universe after the first 200 million years: Cosmic Dawn, Reionization, and post-reionization using 21-cm" in Presidency University on 13th December 2017.

- Delivered a talk on "**Imprint of thawing scalar fields on large scale galaxy overdensity**" in 29th IAGRG meeting in IIT Guwahati on 20th May 2017.

2014

- Delivered a couple of talks on "**Non-Gaussianity and its application to inflationary models**" in CTP, JMI 2014.

Poster Presentations

2024 Presented a poster on "**Model-agnostic assessment of dark energy after DESI DR1 BAO**" in South African Radio Astronomy Observatory (SARAO) Conference in East London on 27th November 2024.

2018 Presented a poster on "**Signature of dark energy/modified gravity in galaxy power spectrum on the large cosmological scale**" in The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy on 3rd July 2018.

Teaching Experience

2021 Taught postgraduate-level General Relativity to MSc Physics students at St. Xavier's College, Mumbai, India. The course covered tensor calculus, geodesics, Einstein's field equations, and applications in cosmology and black hole physics.

2015 Assisted in Quantum Field Theory coursework and problem-solving sessions at the Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi, India.

2014 Assisted in Quantum Field Theory coursework and problem-solving sessions at the Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi, India.

Peer Review Activity

2025 Reviewed revised manuscript "The DESI CPL Phantom Fit is Positive Evidence for Non-Phantom Dynamical Dark Energy" (Manuscript ID: AAS66927) for ApJ Letters, July 2025.

Reviewed manuscript "DESI and SNe: Dynamical Dark Energy, Ω_m Tension or Systematics?" (Manuscript ID: MN-25-0310-L) for Monthly Notices of the Royal Astronomical Society: Letters (MNRAS Letters), February 2025.

2024 Reviewed manuscript "A Dynamical System Analysis of Non-Interacting Cold Dark Matter and Dark Energy at Perturbation Level" (Manuscript ID: DARK-D-24-00179) for Physics of the Dark Universe, March 2024.

2023 Reviewed manuscript "A Study of Discrete Dynamical System to Compare ΛCDM Cosmology with Quintessence Dark Energy Model" (Manuscript ID: DARK-D-23-00280) for Physics of the Dark Universe, May 2023.

Reviewed manuscript "Variable-Time Flow Cosmology" (Manuscript ID: DARK-D-23-00075) for Physics of the Dark Universe, February 2023.

2021 Reviewed manuscript "Cosmological Evolution of the Chameleon Exponential Harmonic Field" (Manuscript ID: JOAA-D-21-00120) for Journal of Astrophysics and Astronomy (JOAA), July 2021.

2019 Reviewed manuscript "Cosmological Constant, Matter, Cosmic Inflation and Coincidence" (Manuscript ID: MPLA-D-19-00545) for Modern Physics Letters A (MPLA), October 2019.

2018 Invited to review a manuscript titled "Mass Function of Nearby Galaxy Clusters: Determining σ_8" (Manuscript ID: MPLA-D-18-00101) for Modern Physics Letters A (MPLA), October 2018.

Referees

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For More Details, Please Visit My Website

https://bikash-r-dinda.github.io/