Curriculum vitae

Personal information

Debottam Nandi
Center for Cosmology and Science Popularization (CCSP)
SGT University, Gurugram, Haryana 122505, India

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Male/Married/Indian

Date of Birth: May 8, 1989

Permanent address:
Bagnan college Road
Khalore, Bagnan, Howrah
West Bengal - 711303, India

Temporary address:
2nd floor, 162, Bhai Parmanand Colony
GTB Nagar
Delhi - 110009, India

Summary

— **12 years** of Research Experience.

- **5** years of Ph.D.
- **4** years of Postdoctoral Experience.
- **3** years of DST-INSPIRE faculty.
- **16** published (**5** single-author papers), **4** submitted to journal, **4** to be submitted.
- **2** Ph.D. students, **5** project students.

— **9 years** of Teaching Experience.

- **1** Semester at St. Xavier's College, Kolkata.
- **6** Semesters at IISER Trivandrum, Kerala.
- **5** Semesters at IIT Madras, Chennai.
- **6** Semesters at University of Delhi, Delhi.

Current Position

12/2024 - Present **Assistant Professor (Senior),**
Center for Cosmology and Science Popularization (CCSP),
SGT University, Gurugram, Haryana 122505, India

Ph.D. and Project Students

- **Ph.D. students:**
  1. Dhiraj Kuniyal (Apr '22 - onward).
  2. Manjeet Kaur (existing Ph.D. student, actively collaborating since Sep '21, thesis submitted).
- **Project students:**
  1. Rohan Roy (Sep '23 - onward).
  2. Simran Yadav (May '23 - Oct '24).

3. Arnab Sarkar (Dec '23 - Oct '24).
4. Anil Kandel (May - Oct '23).
5. Sharath Raghavan (Apr - Oct '22).

- **Collaborating doctoral student:** Darshan Beniwal, University of Delhi.

Educational Qualification

09/2021 - 12/2024 **DST-INSPIRE faculty**
Department of Physics and Astrophysics, University of Delhi, India.

01/2021 - 09/2021 **Research Associate**
IISER Mohali, Mohali, Punjab, India.

09/2017 - 09/2020 **Institute Postdoctoral fellow**
IIT Madras, Chennai, India.

08/2012 - 07/2017 **Ph.D. in Physics** (successfully defended on July 6, 2017)
Thesis title: *Hamiltonian formalism of cosmological perturbations and higher derivative theories,* [arXiv:1707.02976].
Supervisor: Prof. S. Shankaranarayanan
IISER Trivandrum, India.

07/2009 - 06/2011 **Master of Science (Physics)**
University of Calcutta, Kolkata, India
Percentage: 70.2%, FIRST DIVISON

07/2006 - 06/2009 **Bachelor of Science (Physics Honors)**
University of Calcutta, Kolkata, India
Percentage: 72.7%, FIRST DIVISON

07/2004 - 05/2006 **Higher Secondary Education**
West Bengal Council of Higher Secondary Education, West Bengal, India
Percentage: 89.4%, FIRST DIVISON

07/2002 - 05/2004 **Secondary Education**
West Bengal Board of Secondary Education, West Bengal, India
Percentage: 88.3%, FIRST DIVISON

Academic Achievements

- Awarded **DST-INSPIRE faculty** fellowship - 2020.
- (2020 - 2021) **Research Associate,** IISER Mohali, India.
- (2017 - 2020) **Postdoctoral position,** IIT Madras, India.
- (2014 - 2017) **CSIR-SRF** position at IISER Thiruvananthapuram, Trivandrum, India.
- (2012 - 2014) **CSIR-JRF** position at IISER Thiruvananthapuram, Trivandrum, India.
- (2012) **CSIR-NET (June)** All India Rank of 27 (out of 10,000).
- (2012) **JEST** All India Rank of 185 (out of 5,000).
- (2012) **GATE** All India Rank of 1061 (out of 20,000).
- (2011) **CSIR-NET (June) Lectureship category** All India Rank of 324 (out of 10000).
- (2011) **GATE** All India Rank of 623 (out of 20,000).
- (2009) **JAM** All India Rank of 322 (out of 50,000).

Research interests

Gravitation and Cosmology: mainly focused on **the physics of the early Universe.**

— Different early universe paradigms including inflation and classical bounce,

— Primordial black holes and primordial gravitational waves,

— Primordial magnetogenesis.

— Dynamical/stability analysis,

— Modified theories of gravity,

Currently, I am also looking into issues related to **late time universe** such as H_0 tension, σ_8, etc.

Publications, Preprints & In Preparation [arXiv] [inSPIRE]

In Preparation

24. **D. Nandi**, *Re-visiting backreaction of perturbations in early universe,* to be submitted.

23. **D. Nandi**, *Re-visiting backreaction of perturbations in bouncing universe,* to be submitted.

22. **D. Nandi,** Simran Yadav, Rohan Roy and Arnab Sarkar, *SIGWs and PBHs with non-conevntional slow-roll parameter.*

21. **D. Nandi** and D. Choudhury, *Primordial magnetogenesis induced by dark photon,* to be submitted.

Preprints

20. S. Yadav, **D. Nandi** and M. Kaur, *Enhancing inflationary model predictions via refined slow-roll dynamics,* [arXiv:2407.01713], submitted to journal.

19. D. Kumar, **D. Nandi** and D. Choudhury, *Exploring the Hubble Tension: A Novel Approach through Cosmological Observations,* [arXiv:2310.03509], submitted to journal.

18. **D. Nandi** and M. Kaur, *Viable bounce from non-minimal inflation,* [arXiv:2206.08335], submitted to journal.

17. **D. Nandi** and P. Saha, *Einstein or Jordan: seeking answers from the reheating constraints,* [arXiv:1907.10295], submitted to journal.

Published

16. M. Kaur, **D. Nandi** and S. Raghavan, *Unifying inflationary and reheating solution, JCAP* **05** (2024) 045, [arXiv:2309.10570].

15. M. Kaur, **D. Nandi**, D. Choudhury and T. R. Seshadri, *Universe bouncing its way to inflation, Int.J.Mod.Phys.D* **33** (2024) 02, 2450006, [arXiv:2302.13698].

14. **D. Nandi** and M. Kaur, *Inflation vs. Ekpyrosis - comparing stability in general non-minimal theory, Phys.Dark Univ.* **44** (2024) 101430, [arXiv:2302.03413].

13. S. Das, S. Hussain, **D. Nandi**, R. O. Ramos and R. Silva, *Stability analysis of warm quintessential dark energy model, Phys. Rev.* **D108** (2023) 083517, [arXiv:2306.09369].

12. A. Kushwaha, A. Naskar, **D. Nandi** and S. Shankaranarayanan, *Effective field theory of magnetogenesis identify necessary and sufficient conditions , JCAP* **01** (2023) 045, [arXiv:2207.05162].

11. **D. Nandi**, *Inflationary magnetogenesis: solving the strong coupling and its non-Gaussian signatures, JCAP* **08** (2021) 039, [arXiv:2103.03159].

10. **D. Nandi**, *Stability of a viable non-minimal bounce, Universe* **7** (2021) 62, [arXiv:2009.03134].

9. **D. Nandi**, *Bounce from Inflation, Phys. Lett. B* **809** (2020) 135695, [arXiv:2003.02066].

8. **D. Nandi** and L. Sriramkumar, *Can non-minimal coupling restore the consistency relation in bouncing universe?, Phys. Rev.* **D101** (2020) 043506, [arXiv:1904.13253].

7. R. Kothari and **D. Nandi**, *B-Mode auto-bispectrum due to matter bounce, JCAP* **10** (2019) 026, [arXiv:1901.06538].

6. **D. Nandi**, *Note on stability in conformally connected frames, Phys. Rev.* **D99** (2019) 103532, [arXiv:1904.00153].

5. **D. Nandi**, *Stable contraction in Brans-Dicke cosmology, JCAP* **05** (2019) 040, [arXiv:1811.09625].

4. **D. Nandi** and S. Shankaranarayanan, *Vector Galileon and inflationary magnetogenesis, JCAP* **01** (2018) 039, [arXiv:1704.06897].

3. **D. Nandi** and S. Shankaranarayanan, *Complete Hamiltonian analysis of cosmological perturbations at all orders II: Non-canonical scalar field, JCAP* **10** (2016) 008, [arXiv:1606.05747].

2. **D. Nandi** and S. Shankaranarayanan, *Complete Hamiltonian analysis of cosmological perturbations at all orders, JCAP* **06** (2016) 038, [arXiv:1512.02539].

1. **D. Nandi** and S. Shankaranarayanan, *'Constraint consistency' at all orders in cosmological perturbation theory, JCAP* **08** (2015) 050, [arXiv:1502.04036].

Workshops and Conferences

Oral Presentation

- **Testing gravity with Multimessenger astronomy,** IIT Bombay, Mumbai, July 22 - 24, 2014.
  Title: Viable bounce from inflation.
- **Cosmology@CCSP_2**, SGT University, Budhera, Haryana, November 29 - December 1, 2023.
  Title: Viable bounce from inflation.
- **Chennai Symposium on Gravitation and Cosmology (CSGC),** IIT Madras, Chennai, January 22 - 24, 2020.
  Title: Reheating constraints in conformally connected theories.
- **Indian Association for General Relativity and Gravitation (IAGRG),** BITS Pilani, Hyderabad, January 3 - 5, 2019.
  Title: Stable contraction in Brans-Dicke cosmology.
- **Varying Constants and Fundamental Cosmology (VARCOSMOFUN'16),** Szczecin, Poland, September 12 - 17, 2016.
  Title: Complete Hamiltonian analysis of cosmological perturbations.

Poster Presentation

- **International Conference on Gravitation and Cosmology (ICGC),** IISER Mohali, December 10 - 14, 2019.
- **Astronomical Society of India,** Kashmir University, Srinagar, May 10 - 13, 2016.
- **International Conference on Gravitation and Cosmology (ICGC),** IISER Mohali, Mohali, India, December 14 - 18, 2015.
- **Indian Association for General Relativity and Gravitation (IAGRG),** Raman Research Institute, Bangalore, March 18 - 20, 2015.

Others

- **XVI Workshop on High Energy Physics Phenomenology (WHEPP 2019),** IIT Guwahati, Assam, India, December 1 - 10, 2019.
- **III Saha Theory Workshop: Aspects of Early Universe Cosmology,** SINP Kolkata, India, January 16 - 20, 2017.
- **Emergent Space-time in Quantum Gravity and Fundamental Cosmology,** AEI, Potsdam, Germany, September 26 - 29, 2016.
- **IIA Cosmology meeting,** IIA Bangalore, India, April 9 - 11, 2014.
- **Astronomical Society of India**, Trivandrum, February 19 - 22, 2013.
- **IUCAA Sponsored Workshop on Cosmology: Present Observation Constraints on Cosmological parameters,** University of Delhi, India, January 28 - February 2, 2013.
- **Lecture Workshop on pQCD and Higgs Physics,** IIT Bombay, India, January 7 - 10, 2013.

Talks and International Visits

- **University of Bologna,** Italy, October 9 - 15, 2016.
  Title: Complete Hamiltonian analysis of cosmological perturbations.
- **Albert Einstein Institute (AEI),** Potsdam, Germany, September 24 - October 8, 2016.
  Title: Complete Hamiltonian analysis of cosmological perturbations.
- **Lancaster University,** UK, September 23, 2016.
  Title: Complete Hamiltonian analysis of cosmological perturbations.
- **Institute of Cosmology and Gravitation (ICG),** Portsmouth, UK, September 20 - 22, 2016.
  Title: Complete Hamiltonian analysis of cosmological perturbations.
- **NIKHEF,** Amsterdam, Netherlands, September 18 - 20, 2016.
  Title: Complete Hamiltonian analysis of cosmological perturbations.

Teaching Experience

University of Delhi

Jan - Mar '23 **Special Lecture Series:** "Gauge-invariant Cosmological Perturbation Theory."
Department of Physics & Astrophysics, University of Delhi, India.

Aug '24 (ongoing) Teaching faculty, Classical Mechanics, M.Sc. core course,
Department of Physics & Astrophysics, University of Delhi, India.

Sep '23 - Jan '24 Teaching faculty, Classical Mechanics, M.Sc. core course,
Department of Physics & Astrophysics, University of Delhi, India.

May - Aug '23 Teaching faculty, Classical Electrodynamics, M.Sc. core course,
Department of Physics & Astrophysics, University of Delhi, India.

Dec '22 - Apr '23 Teaching faculty, Classical Mechanics, M.Sc. core course,
Department of Physics & Astrophysics, University of Delhi, India.

May - Aug '22 Teaching faculty, Classical Electrodynamics, M.Sc. core course,
Department of Physics & Astrophysics, University of Delhi, India.

Dec '21 - Apr '22 Teaching faculty, Classical Mechanics, M.Sc. core course,
Department of Physics & Astrophysics, University of Delhi, India.

IIT Madras

Jan - May '20	Teaching Assistant, General Relativity and Cosmology, B-Tech - M.Sc. course Faculty: Dr. Chandrakant Mishra (IIT-Madras) IIT-Madras, Chennai, India.
Aug - Dec '19	Teaching Assistant, Experimental classes, B-Tech - M.Sc. course IIT-Madras, Chennai, India.
Jan - May '19	Teaching Assistant, General Relativity and Cosmology, B-Tech - M.Sc. course Faculty: Dr. Chandrakant Mishra (IIT-Madras) IIT-Madras, Chennai, India.
Aug - Dec '18	Teaching Assistant, Experimental classes, B-Tech - M.Sc. course IIT-Madras, Chennai, India.
Jan - May '18	Teaching Assistant, Experimental classes, B-Tech - M.Sc. course IIT-Madras, Chennai, India.

IISER Trivandrum

Jan - May '16	Teaching Assistant, Math-tools - II, 1^{st} year BS-MS course Faculty: Dr. Rajeev Kini (IISER-TVM) IISER-TVM, Trivandrum, India.
Aug - Dec '15	Teaching Assistant, Math-tools - I, 1^{st} year BS-MS course Faculty: Dr. Archana Pai (IISER-TVM) IISER-TVM, Trivandrum, India.
Jan - May '15	Teaching Assistant, Math-tools - II, 1^{st} year BS-MS course Faculty: Dr. Manoj Namboothiri (IISER-TVM) IISER-TVM, Trivandrum, India.
Jan - May '14	Teaching Assistant, Math-tools - II, 1^{st} year BS-MS course Faculty: Dr. Manoj Namboothiri (IISER-TVM) IISER-TVM, Trivandrum, India.
Aug - Dec '13	Teaching Assistant, Math-tools - I, 1^{st} year BS-MS course Faculty: Dr. Nicolas Sabu (IIST-TVM) IISER-TVM, Trivandrum, India.
Jan - May '13	Teaching Assistant, Electrodynamics, 1^{st} year BS-MS course Faculty: Dr. Anil Shaji (IISER-TVM) IISER-TVM, Trivandrum, India.

St. Xavier's College

Jan - Jun '12	Part-time teacher, Acoustics and Mechanics St. Xavier's College, Kolkata, India.

Numerical Skills

• **Coding skills:** I have basic coding knowledge in MATLAB, MATHEMATICA, FORTRAN and PYTHON.
• **Special skill(s):** CADABRA is a computer algebra system (CAS) designed specifically for the solution of problems encountered in field theory. Most of the field equations which contains very large number of terms in my works are computed using CADABRA.

Known Languages

- Bengali - Read/Write/Communicate
- English - Read/Write/Communicate
- Hindi - Read/Communicate

References

1. **Prof. S. Shankaranarayanan (Thesis supervisor)**
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7. **Dr. Sourav Sur**
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