Dr. Harish Chandra Das

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www.twitter.com/hcdas_astro
https://github.com/hcdas

Research Interset

Nuclear Matter, Equation of State, Neutron Star, Gravitational Waves, Dark Matter

Employment

January 2026 – continuing — **Alexander von Humboldt Fellow**, Frankfurt, Germany

September 2023 – September 2025 — **INFN Postdoc Fellow**, Catania, Italy

April 2023 – August 2023 — **Visiting Scientist,** Institute of Physics, Bhubaneswar, India

Education

2019 – 2023 — **Ph.D,** Institute of Physics, Bhubaneswar, India.
Thesis title: *Impacts of dark matter interaction on nuclear and neutron star matter within the relativistic mean-field model*
Supervisor: Prof. S. K. Patra

2018 – 2019 — **Diploma in Advanced Physics,** Institute of Physics, Bhubaneswar, India.
Thesis title: *"Study of quark and gluon jet structure."*
Supervisor: Prof. A. K. Nayak

2015 – 2017 — **M.Sc.,** Ravenshaw University, Cuttack, India.

2012 – 2015 — **B.Sc.,** RIHS, F. M. University, Balasore, India.

Scholarship, Fellowships

2026 - ... — **Alexander von Humboldt Fellowship, Germany**

2023- 2025 — INFN Postdoc Fellowship, Italy

2020-2023 — Senior Research Fellow (SRF) by DAE, India

2018-2020 — Junior Research Fellow (JRF) by DAE, India.

2012-2017 — Central Sector Scholarship by DST, India.

Scholarship, Fellowships (continued)

2015-2017	Institute of Mathematics & Applications, S&T Department, Odisha, India.
2012-2015	Senior Merit Scholarship, MPSC, Odisha, India.
2010-2012	Junior Merit Scolarship, MPSC, Odisha, India.

Reviewer of the journals

Since 2025	**Classical and Quantum Gravity, European Physical Journal C, Qeios, Physical Review C, Journal of Physics G, Journal of Cosmology and Astroparticle Physics**
Since 2023	**Physical Review D**, **European Physical Journal A**
Since 2022	**European Physical Journal Plus**
Since 2021	**Monthly Notices of Royal Astronomy Society**
Since 2020	**Physics of the Dark Universe**
Since 2021	**Nuclear Physics A**

Skills

Languages	Odia, Hindi, Bengali, English
Coding	Python, Fortran, C++, Mathematica, LaTeX, …
System	Unix (Apple), Linux (Ubuntu, Fedora), Windows
HPC	Parallel computing, SLURM, and PBS

Research Publications

I. Papers in International Refereed Journals

1. B.X. Zhou, **H. C. Das**, J.B. Wei, G.F. Burgio, Z.H. Li, and H.-J. Schulze
Cooling of dark neutron stars
Physical Review D **112**, 123035 (2025), arXiv:2508.09704

2. S. R. Mohanty, U. Mali, **H. C. Das**, B. Kumar, and P. Landry
Astrophysical constraints on neutron star f-modes with a nonparametric equation of state representation
Physical Review D **112**, 123043 (2025), arXiv:2410.16689

3. P. Routaray, V. Parmar, **H. C. Das**, B. Kumar, G. F. Burgio, and H.-J. Schulze
Effects of asymmetric dark matter on a magnetized neutron star: A two-fluid approach
Physical Review D **110**, 103045 (2025), arXiv:2412.21097

4. **H. C. Das**, and G. F. Burgio
Neutron Decay Anomaly and Its Effects on Neutron Star Properties
Universe **11**, 159 (2025), arXiv:2505.09190

5. S. K. Biswal, **H.C. Das**, Ankit Kumar, Bharat Kumar, R. Jena, P. Dash, and S. K. Patra
Correlation between the curvature and some properties of the neutron star
International Journal of Modern Physics E **34**, 2450052 (2025), arXiv:2012.13673

6. D. Dey, Jeet Amrit Pattnaik, **H.C. Das**, Ankit Kumar, R.N. Panda and S.K. Patra
Dark matter influence on quarkyonic stars: a relativistic mean field analysis
Journal of Cosmology and Astroparticle Physics **2025**, 056 (2025), arXiv:2401.02190

7. Pinku Routaray, **H. C. Das**, J. A. Pattnaik, Bharat Kumar.
Constraining neutron star properties and dark matter admixture with the NITR-I equation of state: Insights from observations and universal relations
International Journal of Modern Physics E **33**, 2450052 (2024), arXiv:2307.12748

8. G. F. Burgio, **H. C. Das**, and I. Vidana
The nuclear symmetry energy and the neutron skin thickness in nuclei
Front. Astron. Space Sci. **11**, 1505560 (2024), arXiv:2410.15856

9. L. L. Lopes, **H. C. Das**.
Role of local anisotropy in hybrid stars.
European Physical Journal C **84**, 1049 (2024), arXiv:2405.00072.

10. Hong-Ming Liu, Jin-Biao Wei, Zeng-Hua Li, G. F. Burgio, **H. C. Das**, H.-J. Schulze.
Dark matter effects on the properties of neutron stars: compactness and tidal deformability
Physical Review D **110**, 023024 (2024), arXiv:2403.17024

11. **H. C. Das**, Jin-Biao Wei, G. F. Burgio, H.-J. Schulze.
Neutron star cooling and mass distributions
Physical Review D **109**, 123018 (2024), arXiv:2403.02222

12. S. R. Mohanty, S. Ghosh, P. Routaray, **H. C. Das**, Bharat Kumar.
The impact of anisotropy on neutron star properties: insights from $I - f - C$ universal relations.
JCAP **2024**, 054 (2024), arXiv:2305.15724.

13. L. L. Lopes, **H. C. Das**.
Spherically symmetric anisotropic strange stars.
European Physical Journal C **84**, 166 (2024), arXiv:2312.00310.

14. Pinku Routaray, S R Mohanty, **H. C. Das**, S. Ghosh, P.J. Kalita, V. Parmar, Bharat Kumar.
Investigating Dark Matter-Admixed Neutron Stars with NITR Equation of State in Light of PSR J0952-0607.
Journal of Cosmology and Astroparticle Physics **2023** 10, 073 (2023), arXiv:2304.05100.

15. Vishal Parmar, **H. C. Das**, M. K. Sharma, S. K. Patra.
Influence of dark matter on magnetized neutron stars.
Physical Review D **108**, 083003 (2023), arXiv:2306.17510.

16. **H. C. Das**, L. L. Lopes
Anisotropic Strange Stars in the Spotlight: Unveiling Constraints through Observational Data
Monthly Notices of the Royal Astronomical Society **525**, 3571 (2023), arXiv:2306.00326

17. L. L. Lopes, **H. C. Das**.
Strange Stars within Bosonic and Fermionic Admixed Dark Matter.
Journal of Cosmology and Astroparticle Physics **05**, 034 (2023), arXiv:2301.00567.

18. Pinku Routaray, **H. C. Das**, S. Sen, Bharat Kumar, Grigoris Panotopoulos, Tianqi Zhao.
Radial Oscillations of Dark Matter admixed Neutron Stars
Physical Review D **107**, 103039 (2023), arXiv:2211.12808.

19. **H. C. Das**, J. A. Pattnaik, S. K. Patra.

Constraining the surface curvature of an anisotropic neutron star.
Physical Review D **107**, 083007 (2023), arXiv:2301.12673.

20. Vishal Parmar, **H. C. Das**, M. K. Sharma, S. K. Patra.
Magnetised neutron star crust within effective relativistic mean-field model
Physical Review D **107**, 043022 (2023), arXiv:2211.07339.

21. **H. C. Das**
I-Love-C relation for anisotropic neutron star.
Physical Review D **106**, 103518 (2022), arXiv:2208.12566.

22. Vishal Parmar, **H. C. Das**, Ankit Kumar, Ankit Kumar, M. K. Sharma, S. K. Patra.
Pasta properties of the neutron star within effective relativistic mean-field model.
Physical Review D **106**, 023031 (2022), arXiv:2203.16827.

23. Ankit Kumar, **H. C. Das**, S. K. Patra.
Thermal Relaxation of Dark Matter Admixed Neutron Star.
Monthly Notices of the Royal Astronomical Society **513**, 1820 (2022), arXiv:2203.02132.

24. Vishal Parmar, **H. C. Das**, Ankit Kumar, M. K. Sharma, S. K. Patra.
Crustal properties of a neutron star within an effective relativistic mean-field model.
Physical Review D **105**, 043017 (2022), arXiv:2111.07278.

25. **H. C. Das**, Ankit Kumar, Bharat Kumar, S. K. Patra.
Dark Matter Effects on the Compact Star Properties.
Galaxies **10**, 1 (2022), arXiv:2112.14198.
N. B.- Review article

26. Ankit Kumar, **H. C. Das**, Jeet Amrit Pattnaik, S. K. Patra
Systematic study for the surface properties of neutron stars
Physical Review C **105**, 045804 (2022), arXiv:2112.03519.

27. **H. C. Das**, Ankit Kumar, S. K. Biswal, S. K. Patra.
Impacts of dark matter on the f-mode oscillation of hyperon star.
Physical Review D **104**, 123006 (2021), arXiv:2109.01851.

28. Ankit Kumar, **H. C. Das**, S. K. Patra.
Incompressibility and symmetry energy of a neutron star.
Physical Review C **104**, 055804 (2021), arXiv:2105.07721.

29. **H. C. Das**, Ankit Kumar, Bharat Kumar, S. K. Biswal, S. K. Patra.
BigApple force and its implications to finite nuclei and astrophysical objects.
International Journal of Modern Physics E **30**, 2150088 (2021), arXiv:2009.10690.

30. **H. C. Das**, Ankit Kumar, S. K. Patra.
Dark matter admixed neutron star as a possible compact component in the GW190814 merger event.
Physical Review D **104**, 063028 (2021), arXiv:2109.01853.

31. Ankit Kumar, **H. C. Das**, M. Bhuyan , S. K. Patra.
Thermal impacts on the properties of nuclear matter and young neutron star.
Nuclear Physics A **1015**, 122315 (2021), arXiv:2103.11635.

32. **H. C. Das**, Ankit Kumar, S. K. Patra.
Effects of dark matter on the in-spiral properties of the binary neutron star.

Monthly Notices of the Royal Astronomical Society **507**, 4053 (2021), arXiv:2104.01815.

33. I. A. Rather, U. Rahaman, M. Imran, **H. C. Das**, A. A. Usmani, S. K. Patra.
Rotating neutron stars with quark cores.
Physical Review C **103**, 055814 (2021), arXiv:2102.04067.

34. Ankit Kumar, **H. C. Das**, M. Kaur, M. Bhuyan , S. K. Patra.
Application of the coherent density fluctuation model to study the nuclear matter properties of finite nuclei within the relativistic mean-field formalism.
Physical Review C **103**, 024305 (2021), arXiv:2002.02135.

35. **H. C. Das**, Ankit Kumar, Bharat Kumar, S. K. Biswal, S. K. Patra.
Impacts of dark matter on the curvature of the neutron star.
Journal of Cosmology and Astroparticle Physics **01**, 007 (2021), arXiv:2007.05382.

36. Ankit Kumar, **H. C. Das**, S. K. Biswal, S. K. Patra.
Warm dense matter and cooling of supernovae remnants.
European Physical Journal C , **80**, 775 (2020), arXiv:2005.08320.

37. I. A. Rather, Ankit Kumar, **H. C. Das**, M. Imran, A. A. Usmani, S. K. Patra.
Constraining bag constant for hybrid neutron stars.
International Journal of Modern Physics E **29**, 2050044 (2020), arXiv:2002.00616.

38. **H. C. Das**, Ankit Kumar, Bharat Kumar, S. K. Biswal, T. Nakatsukasa, Ang Li, S. K. Patra
Effects of dark matter on the nuclear and neutron star matter.
Monthly Notices of the Royal Astronomical Society **495**, 4893-4903 (2020), arXiv:2002.00594.

II. Preprint Papers

1. **H. C. Das**
Influence of Dark Matter on Hybrid and Twin Stars
2509.04831

III. Papers in National Symposium and Conferences

1. Ankit Kumar, **H. C. Das**, Debabrata Dey, S. K. Patra.
Impacts of Dark Matter on Thermal Emission of Neutron Star.
XXV DAE-BRNS High Energy Physics Symposium 304, 73-75.

2. **H. C. Das**, Ankit Kumar, Vishal Parmar, S. K. Patra.
Pressure Anisotropy Effects on Surface Curvature of the Neutron Star.
XXV DAE-BRNS High Energy Physics Symposium 304, 76-78.

3. Vishal Parmar, **H. C. Das**, Ankit Kumar, M. K. Sharma, S. K. Patra.
Sensitivity of Surface Energy Parametrization on the Crustal Properties of Neutron Star.
XXV DAE-BRNS High Energy Physics Symposium 304, 687-689.

4. Vishal Parmar, **H. C. Das**, M. K. Sharma, S. K. Patra.
Exploring Neutron Star Properties: Effect of Dark Matter and Magnetic Field.
67th DAE Symposium on Nuclear Physics (2024), 785-786.

5. Jeet Amrit Pattnaik, D. Dey, **H. C. Das**, Ankit Kumar, R.N. Panda, S.K. Patra.
Tidal deformability of dark matter admixed neutron star within quarkyonic model in the conjunction of relativistic mean field formalism.

67th DAE Symposium on Nuclear Physics (2024), 805-806.

6. Pinku Routaray, **H. C. Das**, Bharat Kumar.
Universal relation in dark matter admixed neutron star.
67th DAE Symposium on Nuclear Physics (2024), 815-816.

7. D. Dey, Jeet Amrit Pattnaik, Ankit Kumar, **H.C. Das**, R.N. Panda, S.K. Patra.
Quarkyonic model for dark matter admixed neutron Star: A RMF perspective.
67th DAE Symposium on Nuclear Physics (2024), 807-808.

8. Pinku Routaray, Souhardya Sen, Bharat Kumar, **H. C. Das**.
Radial oscillations of the dark matter admixed neutron star.
66th DAE Symposium on Nuclear Physics (2023), 794-795.

9. **H. C. Das**, Jeet Amrit Pattanaik, S. K. Patra.
Anisotropy effects on the neutron star properties.
66th DAE Symposium on Nuclear Physics (2023), 764-765.

10. **H. C. Das**, Ankit Kumar, S. K. Patra.
f-mode oscillation of the dark matter admixed neutron star.
65th DAE Symposium on Nuclear Physics (2021), 468-469.

11. Ankit Kumar, **H. C. Das**, , S. K. Patra.
Properties of finite nuclei and neutron star using coherent density fluctuation model.
65th DAE Symposium on Nuclear Physics (2021), 466-467.

12. M. Kaur, A. Quddus, **H. C. Das**, M. Bhuyan, S. K. Patra.
Temperature-dependence of symmetry energy and its volume and surface components in some rare earth nuclei.
64th DAE Symposium on Nuclear Physics (2019), 214-215.

Academic Visits and Schools/Symposium/Conferences Attended

1. CSQCD 2026, 18-23rd May, 2025
Title:- "CSQCD 2026".
Carrer de l'Hospital, 64, Barcelona, Spain

2. CRC Retreat, 23-27th March 2026
Gustav-Stresemann-Institut, Bonn, Germany

3. DPG Spring Meeting, 15-20th March 2026
Title - "89 Annual Conference of the DPG".
Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany

4. Modern EOS Workshop, 26-28th May, 2025
Title:- "Modern Equations of State and Spectroscopy in Neutron-Star Matter".
University of Alcalá, Madrid, Spain

5. XMXS Workshop, 23rd - 27th September 2024
Title:- Extreme Matter in Extreme Stars 2024,
Lorentz Center@Oort, Leiden, Netherlands

6. Karpacz School, 16th-25th May 2024
Title:- 60th Karpacz Winter School on Theoretical Physics and WE-Heraeus Physics School,

Institute of Theoretical Physics, University of Wroclaw / Hotel "Artus", Karpacz.

7. GGI School, 26^{th}-08^{th} March 2024
   Title:- Frontiers in Nuclear and Hadronic Physics 2024,
   Galileo Galilei Institute, Florence, Italy.

8. XXV DAE-BRNS Symposium on High Energy Physics, 12-16^{th} December 2022
   IISER Mohali, Punjab, India.

9. 66^{th} DAE Symposium on Nuclear Physics, 01-05^{th} December 2022
   Cotton University, Guwahati, Assam, India

10. FNR 2022 workshop, 25^{th}-29^{th} July 2022
    Title:- *"Frontiers in Numerical Relativity 2022".*
    TPI, FSU Jena

11. INT workshop, 11-22^{th} July 2022
    Title:- *"Neutron Rich Matter on Heaven and Earth".*
    Institute of Nuclear Theory (INT), University of Washington, Physics-Astronomy, WA.

12. GW workshop, 23-25^{th} May 2022
    Title:- *"Gravitational Wave Open Data Workshop".*
    LIGO, USA.

13. Aspects of GR, 11-14^{th} March 2022
    Title:- *"Testing Aspects of General Relativity".*
    Indian Institute of Technology, Gandhinagar.

14. GWverse 2021, 30^{th} August-03^{th} September 2021
    Title:- *"Global meeting of the GWVerse COST action".*
    Lisbon, Portugal.

15. ECT* workshops, 22-23^{th} June 2021
    Title:- *"Key Reactions in Nuclear Astrophysics".*
    European Center for Theoretical Studies in Nuclear Physics and Related Areas, Torento.

16. ECT* workshops, 14-17^{th} June 2021
    Title:- *"Neutron stars as multi-messenger laboratories for dense matter".*
    European Center for Theoretical Studies in Nuclear Physics and Related Areas, Torento.

17. Summer School on Particle Physics, 30^{th} May–11^{th} June 2021
    ICTP, Trieste, Italy

18. Meeting of the National Research Group on Gravitational Waves, 30^{th} March–1^{th} April 2021
    "Gravitational waves: a new messenger to explore the universe",
    Institute Henri Poincaré, Paris.

19. SIGRAV International School 2021, 1–5^{th} February, 2021
    "Gravity of Compact Astrophysical Objects and Gravitational Waves",
    Italian society.

20. XXIV DAE-BRNS HEP Symposium, 14–18^{th} December, 2020

NISER, India.

21. Vitual Meeting on, 09–13th November 2020
"Less Travelled Path of Dark Matter: Axions and Primordial Black Holes",
ICTS, Banglore, India.

22. Virtual Meeting on *"Compact Stars and QCD 2020"*, 17–21th August 2020
ICTS, Banglore, India.

23. Centenary Celebration Conference 2–4th March, 2020
"Nuclear Structure and Nuclear Reactions",
AMU, India.

Presentations/Talks

Contributed Talks:

1. CSQCD 2026, 18-23rd May, 2025
Title:- "Dark matter effects on the properties of hybrid and twin stars".
Carrer de l'Hospital, 64, Barcelona, Spain

2. EOS Workshop, 26-28th May, 2025
Title:- "Magnetized Neutron Stars in the Presence of Dark Matter: A Two-Fluid Perspective".
University of Alcalá, Madrid, Spain

3. Karpacz School 16-25th May, 2024
Title:- "The cooling processes and distribution of mass in neutron stars".
Institute of Theoretical Physics, University of Wroclaw / Hotel "Artus", Karpacz.

4. INFN 2024 meeting 26-28th February, 2024
Title:- "Dark matter effects on the thermal properties of the neutron star".
INFN, Trento, Italy.

5. DAE-BRNS HEP Symposium talk 12th December, 2022
Title:- "Pressure anisotropy effects on surface curvature of the neutron star".
IISER Mohali, Punjab, India.

6. Poster Presentation, 66th DAE Symposium on Nuclear Physics, 2nd December 2022
Title:- "Anisotropy effects on the neutron star properties".
Cotton University, Guwahati, Assam, India

7. Annual Review Talk 6th July, 2022
Title:-"Impacts of dark matter on the f -mode oscillation of hyperon star".
Institute of Physics, Bhubaneswar, India.

8. 65th DAE Nuclear Physics Symposium 5th December, 2021
Title:-*"f -mode oscillation of the dark matter admixed neutron star"*.
Bhabha Atomic Research Centre, Mumbai, India.

9. Cortona Young 2021, video poster 09th-11th June 2021
Title:- *Curvature and its correlation with some properties of the neutron star*.
Galileo Galilei Institute, Italy

10. IHP talk 31st March, 2021

Title:-*"Neutron star in the presence of dark matter"*.
Institute Henri Poincaré, Paris.

11. Annual Review Talk — 10^{th} August, 2020
Title:-*"Effects of dark matter on the nuclear and neutron star matter"*.
Institute of Physics, Bhubaneswar, India.

12. Pre-Doctoral Project talk — 28^{th} June, 2019
Title:-*"Study of quark and gluon jet structure"*.
Institute of Physics, Bhubaneswar, India.

13. M.Sc Project talk — 10^{th} May, 2017
Title:-*"Nilson Model"*.
Ravenshaw University, Cuttack, India.

Invited Talks:

1. IITJ Talk — 04^{th} May, 2022
Title:- "Dark Matter Effects on Neutron Star Properties"
High Energy Physics & Astrophysics Group, IIT Jodhpur. India.

2. NTG Talk — 09^{th} January, 2021
Title:-"Curvature and its correlation with some properties of the neutron star",
Nuclear Theory Group, India.

References

- **Prof. Suresh Kumar Patra**

  Nuclear Theory Division, Institute of Physics, Bhubaneswar, Odisha-751005, India.

  patra@iopb.res.in

- **Prof. Fiorella Burgio**

  Department of Physics, INFN Catania, Italy.

  fiorella.burgio@ct.infn.it

- **Prof. Hans Josef Schulze**

  Department of Physics, INFN Catania, Italy.

  schulze@ct.infn.it

- **Prof. Issac Vidana**

  Department of Physics, INFN Catania, Italy.

  isaac.vidana@ct.infn.it

- **Prof. Jürgen Schaffner-Bielich**

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