Clara Dehman

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Department of Physics, University of Alicante, 03690 Alicante, Spain

Education

Ph.D. in Physics **Nov 2019 — Nov 2023**
Autonomous University of Barcelona, Spain

- *Thesis Title:* Unveiling the Physics of Neutron Stars: A 3D expedition into MAgneto-Thermal evolution in Isolated Neutron Stars with "`MATINS`"
- *Honors:* Cum Laude Distinction · International Mention · IEEC Best Thesis Award · SEA Thesis Award (Special Mention)

International Joint M.Sc. in Theoretical Nuclear Physics **Oct 2017 — Sep 2019**
Erasmus Mundus NucPhys Program, European Union
Degrees Awarded:

i) Laurea Magistrale in Fisica, *University of Padova, Italy* — 110/110 + Cum Laude
ii) Master de Sciences, Technologies, Santé, Mention Physique, *University of Caen Normandy, France*
iii) Máster Universitario Erasmus Mundus en Física Nuclear, *Spanish Consortium Universities* — Matrícula de honor

B.Sc. in Physics **Oct 2014 — Aug 2017**
Lebanese University, Lebanon — Ranked 1st in Physics Department

Research Positions

Juan de la Cierva Postdoctoral Fellow **Mar 2024 — present**
University of Alicante, Spain

- *Project:* Investigate the chiral magnetic effect, magnetic helicity, origin of magnetar magnetic fields, long-period transients, and sub-grid scaling.
- *Advisor:* Jose A. Pons

Transitional Postdoctoral Researcher **Nov 2023 — Feb 2024**
Institute of Space Sciences (ICE-CSIC), Barcelona, Spain

- *Project:* Modeled 3D neutron star magnetic field evolution and benchmarked results against X-ray observations.
- *Advisor:* Nanda Rea

Visiting Ph.D. Fellow **Apr — Dec 2023**
Nordita, Stockholm, Sweden

- *Project:* Studied the role of magnetic helicity in the inverse cascade of neutron star magnetic fields.
- *Advisor:* Axel Brandenburg

Doctoral Researcher **Nov 2019 — Nov 2023**
Institute of Space Sciences, Barcelona, Spain

- *Project:* Developed `MATINS`, a 3D code for magneto-thermal evolution of isolated neutron stars; applied it to cooling (± hyperons), magnetar outbursts, and interior–magnetosphere coupling using physics-informed neural networks.
- *Advisors:* Nanda Rea, Daniele Viganò, Jose A. Pons

Graduate Researcher **Feb — Sep 2019**
University of Barcelona, Spain *Grade:* 10/10 + *Matrícula de Honor*

- *Project:* Computed finite-temperature equations of state using the BCPM energy density functional for post neutron star mergers and late-stage proto-neutron stars.
- *Advisors:* Artur Polls, Xavier Viñas, Mario Centelles

Intern **Sep 2018 — Jan 2019**
Laboratory of Corpuscular Physics, Caen, France

- *Project:* Developed metamodeling approaches for nuclear equations of state to interpret experimental data, focusing on the neutron star mass–radius relation and tidal deformability.
- *Advisors:* Francesca Gulminelli

Intern **Mar — Jun 2018**
National Institute for Nuclear Physics, Legnaro Laboratories, Italy

- *Project:* Measured fusion cross sections of a ^{28}Si beam on a ^{100}Mo target at various energies to probe many-body quantum tunneling.
- *Advisors:* Giovanna Montagnoli, Alberto Stefanini

Fellowships & Research Fundings

Competitive Fellowships & Scholarships as PI

Total secured: €121,700, excluding €92,470 APOSTD Fellowship (declined)

- **Feb 2025 – Jan 2027:** *Juan de la Cierva Postdoctoral Fellowship*, Spanish Ministry of Science and Innovation — nationally competitive (10% success rate) — €74,734
- **Oct 2024 – Sep 2026:** *APOSTD Postdoctoral Fellowship*, Government of Valencia, Spain — €92,470 (declined in favor of the more prestigious Juan de la Cierva Fellowship).
- **Apr 2023 – Dec 2023:** *Nordita Visiting PhD Fellowship,* Nordita, Sweden — 80,000 kr
- **Oct 2017 – Sep 2019:** *EACEA Scholarship,* Erasmus Mundus Joint MSc Program, European Union — €37,000
- **Sep 2012 – Jun 2014:** *English Micro-Scholarship Program,* American Embassy, Lebanon — $2,000

Collaborative Research Grants as contributor

Contributed to research grants totaling €2,944,000

- **Mar 2024 – Dec 2026:** *BLADES (Birth, Life, And Death of Extreme Sources), CIPROM 2022/13 Grant,* Government of Valencia, Spain — PI: Jose A. Pons, €584,000
- **Mar 2024 – Dec 2026:** *Relativistic Computational Astrophysics, ASFAE/2022/26 Grant,* Government of Valencia, Spain — PI: Miguel A. Aloy, €300,000
- **Apr 2022 – Dec 2024:** *SGR-Cat 2021 (01269) Grant,* Government of Catalonia, Spain — PI: Vanessa Graber, €60,000

- **Nov 2019 – Feb 2024:** *Magnesia (The magnetar census and impact of highly magnetic neutron stars on the explosive and transient Universe) ERC Consolidator Grant,* European Research Council — PI: Nanda Rea, €2,000,000

Awards & Certificates

- **Feb 2026:** *Seal of Excellence* — European Commission (Score: 94.6/100)
- **Dec 2024:** *IEEC Best Doctoral Thesis Award 2024* — €1,500 awarded to me, plus €1,000 allocated to my thesis supervisors as part of the prize.
- **May 2024:** *Special Mention, SEA Thesis Award 2024* — for outstanding research quality in a highly competitive category
- **Mar 2019:** *Certificate in Data Analysis and Machine Learning*, Michigan State University (USA) and University of Oslo (Norway)
- **Apr 2017:** *ERASMUS*$^{+}$ *Joint Master Program (NucPhys)* — selected among top 20% of international applicants (CV and Interview)

Invited Talks & Seminars (19 Total)

- **Sept 2026:** *Talk*, XII International Conference on Nuclear Physics in Astrophysics, Cluj-Napoca, Romania
- **Jun 2026:** *Review Talk*, Frontier Research in Astrophysics - V, Palermo, Italy
- **Apr 2026:** *Talk*, SCALES conference, Vortex motion from laboratory to the stars, Warsaw, Poland
- **Apr 2026:** *Strong Gravity Seminar*, Perimeter Institute, Waterloo, Canada
- **Apr 2026:** *Seminar*, Canadian Institute for Theoretical Astrophysics, Canada
- **Jun 2025:** *Talk*, Fòrum IEEC 2025, Casa Convalescència (UAB), Barcelona, Spain
- **May 2025:** *Talk*, Extreme Physics of Neutron Star Interiors, Princeton University, USA
- **May 2025:** *Review Talk*, Workshop on Modern Equation of State and Spectroscopy in Neutron Stars, Alcalá University, Spain
- **Feb 2025:** *Talk*, Breaking New Ground in Supernova Physics, Fukuoka University, Japan
- **Dec 2024:** *Review Talk*, IReNA-INT Joint Workshop on Thermal and Magnetic Evolution, University of Washington, USA
- **Sep 2024:** *Talk*, Frontier Workshop in Astrophysics IV, Palermo, Italy
- **Jun 2023:** *Astrophysics Seminar*, University of Valencia, Spain
- **May 2023:** *Astrophysics Seminar*, Nordita, Sweden [Link]
- **Jun 2022:** *Astrocoffee Seminar*, Goethe University, Germany [Link]
- **May 2022:** *Seminar*, NucPhys Master Program, GANIL, France
- **Dec 2021:** *Seminar*, Hadronic, Nuclear & Atomic Physics Group, University of Barcelona, Spain [Link]
- **Nov 2021:** *Astrophysics Seminar*, University of Alicante, Spain
- **Dec 2020:** *Talk*, Stars & Compact Objects Meeting, Flatiron Institute, New York, USA
- **Mar 2019:** *Seminar*, Hadronic, Nuclear & Atomic Physics Group, University of Barcelona, Spain

Contributed Talks & Seminars (11 Total)

- **Jun 2025:** *Talk*, EAS Annual Meeting, University College Cork, Ireland
- **Jul 2024:** *Talk*, 10$^{\text{th}}$ International Conference on Quarks and Nuclear Physics, University of Barcelona, Spain

- **Jun 2024:** *Talk*, XMM-Newton Workshop 2024, European Space Agency, Madrid, Spain
- **May 2024:** *Special Seminar*, Institute of Space Sciences, Barcelona, Spain
- **Apr 2024:** *Astrophysics Seminar*, University of Alicante, Spain
- **May 2022:** *Talk*, Pharos Conference, University of La Sapienza, Rome, Italy
- **Mar 2022:** *Seminar*, Institute of Space Sciences, Barcelona, Spain [Link]
- **Nov 2021:** *Talk*, IAU Symposium 363 (online)
- **Jun 2021:** *Talk*, EAS Annual Meeting (online)
- **Nov 2020:** *Seminar*, Institute of Space Sciences, Barcelona, Spain [Link]
- **Mar 2020:** *Talk*, PHAROS Conference, Patras, Greece (canceled due to COVID-19)

Software Development & Open Access Tools

Since Sep 2020: Lead developer of `MATINS` — a 3D code for the MAgneto–Thermal evolution in Isolated Neutron Stars — `MATINS` webpage

- *Open access:* github.com/ice-csic-astroexotic/MATINS
- *Lead developers:* **C. Dehman**, D. Viganò, S. Ascenzi
- *Implementation:* Written in Fortran 90 with OpenMP parallelization, optimized for Intel compilers (better performance than GNU).

Supervision

PhD Students — *Co-supervisor; University of Alicante, Spain*
- Joan Llorens Ripoll — Ambipolar diffusion in neutron star cores (since Mar 2025)

MSc Students — *Co-mentor; Institute of Space Sciences, Spain*
- Riccardo Ricci — Magnetar activity and crustal failures (since Oct 2025)
- Marco Ermolli — Impact of microphysics on neutron star cooling (Jan – Jul 2021)

BSc Students — *Main supervisor; University of Alicante, Spain*
- Ahlam Makboul — Glitch timing and magnitude of PSR J0537–6910: probing crust–magnetic field interactions (since Oct 2025)

Teaching (112 Hours Total)

Instructor — Introduction to Modeling in Physics — **Editions 2024 & 2025**
University of Alicante, Spain — *45 hr — 95 BSc students*

Instructor — Nuclear and Particle Physics — **Editions 2024 & 2025**
University of Alicante, Spain — *54 hr — 112 BSc students*

Lecturer — Stellar Astrophysics — **Jan — Mar 2025**
University of Alicante, Spain — *12 hr — 14 BSc students*

Invited Lecturer — Research in Computational Astrophysics — **May 2025**
University of Alicante, Spain — *1 hr — 10 MSc students*

Scientific Community Service, Outreach & Visibility

Scientific Meeting Organization

SOC: Scientific Organizing Committee; LOC: Local Organizing Committee
- **Sept 2026:** *SOC & LOC*, 22nd Pencil Code User Meeting, University of Alicante, Spain [Link]

- **Nov 2022:** *LOC*, Exploring the Hot and Energetic Universe: the 3rd scientific conference dedicated to the Athena X-ray observatory, Barcelona, Spain [Link]
- **May 2022:** *LOC*, PHAROS Final Conference 2022: The multi-messenger physics and astrophysics of neutron stars, University of La Sapienza, Rome, Italy [Link]

Reviewing & Evaluation Activities

- **Jan 15, 2026:** *PhD committee member – Juan A. Gil Granados*, Univ. of Barcelona, Spain
- **Since Jun 2025:** *Expert evaluator for PhD proposals* (2 proposals evaluated), Valencian Agency for Assessment and Prospective, Spain
- **Since 2022:** *Reviewer* for Nature Astronomy; Nature Communications; The Astrophysical Journal; Journal of Physics G; Monthly Notices of the Royal Astronomical Society; Frontiers in Astronomy and Space Sciences; Classical and Quantum Gravity

Outreach Activities

- **Feb 2026:** *Invited Outreach talk* — International Day of Girls and Women in Science (University of Alicante, Spain)
- **Nov 2022:** *Astronomical Observation* — Contributed to organizing an astronomical observation (Autonomous University of Barcelona, Spain; [Link])
- **Sep 2022:** *Research Night* — Observation night for school children (Igualada, Spain)
- **Feb 2022:** *Outreach talk* — International Day of Girls and Women in Science (ICE-CSIC, Spain; [Link])
- **2021–2023:** *Magnet ICE Outreach* — Collaborated with teachers at Gabriel Castellà i Raich in creating innovative science projects to promote student integration in a school facing segregation issues (Igualada, Spain).

Press Releases (14 total)

- **Jul 2024**: *Descubren tres estrellas de neutrones jóvenes inusualmente frías para su edad*, europapress
- **Jul 2024:** *Investigadores de la UA detectan estrellas de neutrones inusualmente frías,* TODOAlicante
- **Jul 2024:** *Investigadores de la UA participan en el descubrimiento de tres estrellas de neutrones demasiado frías para su edad,* Actualidad Universitaria
- **Jun 2024:** *NASA's Chandra Peers Into Densest and Weirdest Stars,* NASA
- **Jun 2024:** *Too young to be so cool: lessons from three neutron stars,* ESA
- **Jun 2024:** *Un equip d'astrònoms de l'IEEC descobreix tres estrelles de neutrons massa fredes per a la seva edat,* IEEC
- **Jun 2024:** *Troppo giovani per essere così fredde,* MEDIA INAF
- **Jun 2024:** *A team of ICE-CSIC astronomers discovers three neutron stars too cold for their age,* ICE-CSIC
- **Dec 2022:** *Astronomers observe outburst of the young magnetar Swift J1818.0–1607,* Phys Org
- **Jun 2020**: *NASA discovers youngest 'cosmic baby' neutron star,* Independent
- **Jun 2020:** *Astronomers just discovered the youngest ever 'baby' dead star,* CNET
- **Jun 2020:** *Astronomers find baby pulsar – a rare magnetar – born just 240 years ago,* Astronomy Now
- **Jun 2020:** *Astronomers discover youngest magnetar ever,* Sci News

- **Jun 2020:** *Hallan estrella 'bebé' que explica origen de las explosiones en el universo,* La Vanguardia

Invited Interview

- **Jun 2024:** *Invited Interview* at University of Elche, Spain [Link]
- **Dec 2023:** *Invited Interview* at ICE-CSIC, Barcelona, Spain [Interview; Newsletter]

Languages, Memberships & Trainings

Collaborations & Memberships

SCALES European COST Action CA24139 (since Nov 2025) • NewAthena Science Community (since Mar 2025) • Einstein Telescope Collaboration (since Sep 2022) • AIHUB, Artificial Intelligence Initiative of Spain's National Research Council (since Mar 2022) • Pharos European COST Action CA16214 (2019 – 2022)

Leadership Training

Project Citizen (AMIDEAST & American Embassy, Lebanon, 2014) • Intel Youth Innovation Camp (INJAZ, 2013) • Personal Strategic Planning (IAPTL, 2013) • Leadership Program (AMIDEAST & INJAZ, 2012)

Languages

Arabic (C2, mother tongue) • English (C2, fluent; Advanced Cambridge 183/210, TOEFL 805/900) • French (C2, fluent) • Spanish (B2, intermediate) • Italian (B2, intermediate)

List of Publications

Curated selection of 21 peer-reviewed articles: 7 as first author, 2 as co–first author (including one in Nature Astronomy), and one invited Living Review, accessible via ADS, arXiv, ORCID, and Google Scholar — **Citations:** 455+ | **h-index:** 13

In Press

21. J.A. Pons, **C. Dehman**, D. Viganò: 2026. *Magnetic, thermal and rotational evolution of isolated neutron stars*. Accepted for publication in Living Reviews in Computational Astrophysics (arXiv:2509.06699).

Published

20. A. Suvorov, **C. Dehman***, J.A. Pons: 2026. *Late-blooming magnetars: awakening as ultra-long period objects after a dormant cooling epoch*. ApJ 1000, 55 (Equal contribution by first two authors; CA: C. Dehman). (arXiv:2505.05373,DOI).

19. **C. Dehman** and J.A. Pons: 2025. *Magnetar field dynamics shaped by chiral anomalies and helicity*. Phys. Rev. Research 7, 033231 (arXiv:2505.06196,DOI).

18. A. Suvorov, **C. Dehman**, J.A. Pons: 2025. *Revealing the nature of ultra-long period objects with space-based gravitational-wave interferometers*. ApJ 991, 134 (arXiv:2505.06125,DOI).

17. **C. Dehman** and A. Brandenburg: 2025. *Reality of inverse cascading in neutron star crusts*. A&A 694, A39 (arXiv:2408.08819,DOI).

16. S. Ascenzi, D. Viganò, **C. Dehman** et al.: 2024. *3D code for MAgneto–Thermal evolution in Isolated Neutron Stars, MATINS: thermal evolution and light curves*. MNRAS 533, 201 (arXiv:2401.15711,DOI).

15. **C. Dehman**, M. Centelles, X. Viñas: 2024. *Impact of the hot inner crust on compact stars at finite temperature*. A&A 687, A236 (arXiv:2401.16957,DOI).

14. A. Marino*, **C. Dehman***, K. Kovlakas*, N. Rea* et al.: 2024. *Constraints on the dense matter equation of state from young and cold isolated neutron stars*. Nature Astron. 8, 1020 (arXiv:2404.05371,DOI). *(Equal contribution by these authors).*

13. J. Urbàn, P. Stefanou, **C. Dehman**, J.A. Pons: 2023. *Modeling force-free neutron star magnetospheres using physics-informed neural networks*. MNRAS 524, 32 (arXiv:2303.11968,DOI).

12. **C. Dehman**, D. Viganò, S. Ascenzi et al.: 2023. *3D evolution of neutron star magnetic-fields from a realistic core-collapse turbulent topology*. MNRAS 523, 5198 (arXiv:2305.06342,DOI).

11. **C. Dehman**, J.A. Pons, D. Viganò, N. Rea: 2023. *How bright can old magnetars be? Assessing the impact of magnetized envelopes and field topology on neutron star cooling*. MNRAS Lett. 520, L42 (arXiv:2301.02261,DOI).

10. A.Y. Ibrahim, A. Borghese, N. Rea et al.: 2023. *Deep X-ray and radio observations of the first outburst of the young magnetar Swift J1818.0-1607*. ApJ 943,20 (arXiv:2211.12391,DOI).

9. **C. Dehman**, D. Viganò, J.A. Pons, N. Rea: 2023. *3D code for MAgneto–Thermal evolution in Isolated Neutron Stars, MATINS: the magnetic field formalism*. MNRAS 518, 1222

(arXiv:2209.12920,DOI).

8. N. Rea, F. Coti Zelati, **C. Dehman** et al.: 2022. *Constraining the nature of the 18 min periodic radio transient GLEAM-X J162759.5-523504.3 via multi-wavelength observations and magneto-thermal simulations*. ApJ 940, 72 (arXiv:2210.01903,DOI).

7. F. Anzuini, A. Melatos, **C. Dehman** et al.: 2022. *Thermal luminosity degeneracy of magnetized neutron stars with and without hyperon cores*. MNRAS 515, 3014 (arXiv:2205.14793,DOI).

6. F. Anzuini, A. Melatos, **C. Dehman** et al.: 2022. *Fast cooling and internal heating in hyperon stars*. MNRAS 509, 2609 (arXiv:2110.14039,DOI).

5. D. Viganò, A. Garcia-Garcia, J.A. Pons, **C. Dehman** et al.: 2021. *Magneto-thermal evolution of neutron stars with coupled Ohmic, Hall and ambipolar effects via accurate finite-volume simulations*. Comput. Phys. Commun. 265, 108001 (arXiv:2104.08001,DOI).

4. A.M. Stefanini, G. Montagnoli, M. D'Andrea, M. Giacomin, **C. Dehman** et al.: 2021. *New insights into sub-barrier fusion of* $^{28}Si + {}^{100}Mo$. J. of Phys. G 48, 055101 (ADS,DOI).

3. F. Coti Zelati, A. Borghese, G.L. Israel et al.: 2021. *The new magnetar SGR J1830-0645 in outburst*. ApJ Lett. 907, L34 (arXiv:2011.08653,DOI).

2. **C. Dehman**, D. Viganò, N. Rea et al.: 2020. *On the rate of crustal failures in young magnetars*. ApJ Lett. 902, L32 (arXiv:2010.00617,DOI).

1. P. Esposito, N. Rea, A. Borghese et al.: 2020. *A very young radio-loud magnetar*. ApJ Lett. 896, L30 (arXiv:2004.04083,DOI).

Monograph: PhD Thesis

C. Dehman: 2023. *Unveiling the Physics of Neutron Stars: A 3D expedition into MAgneto-Thermal evolution in Isolated Neutron Stars with MATINS,* Universitat Autònoma de Barcelona, Catalan Open Research Area (arXiv:2405.00133,DOI).