

# Ivan ESTEBAN

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**Research Focus:** Neutrino and dark matter phenomenology in the laboratory, astrophysics, and cosmology

## PROFESSIONAL EXPERIENCE

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CCAPP Postdoctoral Fellow, Ohio State University

2020 - PRESENT

## EDUCATION

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**PhD in Particle Physics, University of Barcelona**

SUMMER 2020

Graded outstanding with honors (*Cum Laude*)

Outstanding PhD Award of the Faculty of Physics

Funded by an FPU PhD Fellowship, awarded by the Spanish Ministry of Education, also offered a private La Caixa Fellowship

**Master in Astrophysics, Particle Physics and Cosmology, University of Barcelona**

SUMMER 2016

Graded outstanding with honors in my Master Thesis,

“Neutrino oscillations and CP violation: analysis of  $\text{NO}\nu\text{A}$  data”

Graduated with an average grade of 9.7/10.0

Master Outstanding Award

**Bachelor’s degree in Physics, University of the Basque Country**

SUMMER 2015

Minor on Fundamental Physics

Graduated with excellence honors, with an average grade of 9.91/10.00

University award for the Outstanding Graduate in Physics

Spanish National Graduate Award

## PUBLICATIONS (18 research papers, 2714 citations)

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P.-W. Chang, I. Esteban, J. F. Beacom, T. A. Thompson and C. M. Hirata “Towards powerful probes of neutrino self-interactions in supernovae”, [arXiv:2206.12426](https://arxiv.org/abs/2206.12426) [[hep-ph](#)].

I. Esteban, S. Prohira and J. F. Beacom, “Detector Requirements for Model-Independent Measurements of Ultrahigh Energy Neutrino Cross Sections”, *Phys. Rev. D* **106** (2022) no.2, 023021, [arXiv:2205.09763](https://arxiv.org/abs/2205.09763) [[hep-ph](#)].

P. Coloma, I. Esteban, M. C. Gonzalez-Garcia, L. Larizgoitia, F. Monrabal and S. Palomares-Ruiz, “Bounds on new physics with data of the Dresden-II reactor experiment and COHERENT”, *JHEP* **05** (2022), 037, [arXiv:2202.10829](https://arxiv.org/abs/2202.10829) [[hep-ph](#)].

I. Esteban, O. Mena and J. Salvado, “Non-standard neutrino cosmology dilutes the lensing anomaly”, *Phys. Rev. D* **106** (2022) no.8, 083516, [arXiv:2202.04656](https://arxiv.org/abs/2202.04656) [[astro-ph.CO](#)].

C. A. Argüelles, I. Esteban, M. Hostert, K. J. Kelly, J. Kopp, P. A. N. Machado, I. Martinez-Soler and Y. F. Perez-Gonzalez, “MicroBooNE and the  $\nu_e$  Interpretation of the MiniBooNE Low-Energy Excess”, *Phys. Rev. Lett.* **128** (2022), 24, [arXiv:2111.10359](https://arxiv.org/abs/2111.10359) [[hep-ph](#)]. Public code in [GitHub](#).

I. Esteban, S. Pandey, V. Brdar and J. F. Beacom, “Probing secret interactions of astrophysical neutrinos in the high-statistics era”, *Phys. Rev. D* **104** (2021), 12, [arXiv:2107.13568](https://arxiv.org/abs/2107.13568) [[hep-ph](#)]. Public code in [GitHub](#).

I. Esteban and J. Salvado, “Long Range Interactions in Cosmology: Implications for Neutrinos”, *JCAP* **05** (2021), 036, [arXiv:2101.05804](https://arxiv.org/abs/2101.05804) [[hep-ph](#)]. Public code in [GitHub](#).

I. Esteban, M. C. Gonzalez-Garcia, M. Maltoni, T. Schwetz and A. Zhou, “The fate of hints: updated global analysis of three-flavor neutrino oscillations”, *JHEP* **09** (2020), 178, [arXiv:2007.14792](https://arxiv.org/abs/2007.14792) [[hep-ph](#)].

- P. Coloma, I. Esteban, M. C. Gonzalez-Garcia and J. Menendez, “Determining the nuclear neutron distribution from Coherent Elastic neutrino-Nucleus Scattering: current results and future prospects”, *JHEP* **08** (2020), 030, [arXiv:2006.08624 \[hep-ph\]](#).
- I. Esteban, M. C. Gonzalez-Garcia and M. Maltoni, “On the effect of NSI in the present determination of the mass ordering”, [arXiv:2004.04745 \[hep-ph\]](#).
- P. Coloma, I. Esteban, M. C. Gonzalez-Garcia and M. Maltoni, “Improved global fit to Non-Standard neutrino Interactions using COHERENT energy and timing data”, *JHEP* **02** (2020), 023, [arXiv:1911.09109 \[hep-ph\]](#).
- M. Dentler, I. Esteban, J. Kopp and P. Machado, “Decaying Sterile Neutrinos and the Short Baseline Oscillation Anomalies”, *Phys. Rev. D* **101** (2020) no.11, 115013, [arXiv:1911.01427 \[hep-ph\]](#).
- D. Baxter, J.I. Collar, P. Coloma, C.E. Dahl, I. Esteban, P. Ferrario, J.J. Gomez-Cadenas, M.C. Gonzalez-Garcia, A.R.L. Kavner, C.M. Lewis, F. Monrabal, J. Muñoz Vidal, P. Privitera, K. Ramanathan and J. Renner, “Coherent Elastic Neutrino-Nucleus Scattering at the European Spallation Source”, *JHEP* **02** (2020) 123, [arXiv:1911.00762 \[physics.ins-det\]](#).
- I. Esteban, J. Lopez-Pavon, I. Martinez-Soler and J. Salvado, “Looking at the axionic dark sector with ANITA”, *Eur. Phys. J. C* **80** (2020) no.3, 259, [arXiv:1905.10372 \[hep-ph\]](#).
- I. Esteban, M. C. Gonzalez-Garcia and M. Maltoni, “On the Determination of Leptonic CP Violation and Neutrino Mass Ordering in Presence of Non-Standard Interactions: Present Status”, *JHEP* **1906** (2019) 055, [arXiv:1905.05203 \[hep-ph\]](#).
- I. Esteban, M. C. Gonzalez-Garcia, A. Hernandez-Cabezudo, M. Maltoni and T. Schwetz, “Global analysis of three-flavour neutrino oscillations: synergies and tensions in the determination of  $\theta_{23}$ ,  $\delta_{CP}$ , and the mass ordering”, *JHEP* **01** (2019) 106, [arXiv:1811.05487 \[hep-ph\]](#).
- I. Esteban, M. C. Gonzalez-Garcia, M. Maltoni, I. Martinez-Soler, and J. Salvado, “Updated Constraints on Non-Standard Interactions from Global Analysis of Oscillation Data”, *JHEP* **08** (2018) 180, [arXiv:1805.04530 \[hep-ph\]](#).
- I. Esteban, M. C. Gonzalez-Garcia, M. Maltoni, I. Martinez-Soler, and T. Schwetz, “Updated fit to three neutrino mixing: exploring the accelerator-reactor complementarity”, *JHEP* **01** (2017) 087, [arXiv:1611.01514 \[hep-ph\]](#).
- R. Alves Batista, M. A. Amin, G. Barenboim, N. Bartolo, D. Baumann, A. Bauswein, E. Bellini, D. Benisty, G. Bertone, P. Blasi, *et al.* “EuCAPT White Paper: Opportunities and Challenges for Theoretical Astroparticle Physics in the Next Decade”, [arXiv:2110.10074 \[astro-ph.HE\]](#).
- J. M. Berryman, N. Blinov, V. Brdar, T. Brinckmann, M. Bustamante, F. Y. Cyr-Racine, A. Das, A. de Gouvêa, P. B. Denton, P. S. B. Dev, *et al.* “Neutrino Self-Interactions: A White Paper”, [arXiv:2203.01955 \[hep-ph\]](#).
- C. A. Argüelles, G. Barenboim, M. Bustamante, P. Coloma, P. B. Denton, I. Esteban, Y. Farzan, E. F. Martínez, D. V. Forero, A. M. Gago, *et al.* “Snowmass White Paper: Beyond the Standard Model effects on Neutrino Flavor”, [arXiv:2203.10811 \[hep-ph\]](#).

## SELECTED CONFERENCE TALKS AND POSTERS (Presented 25 talks and 6 posters, not all shown here)

- “Gravitational CMB lensing illuminates neutrino interactions.” Poster presented at the *Neutrino22 Conference*. Prize for the best cosmology poster, together with being selected among the overall top 6 posters.
- “Ultra-high energy neutrinos and physics opportunities.” Talk presented at the *Neutrino Theories (NuTs) Extended Workshop*, Madrid 2022.
- “Long-range neutrino interactions and cosmology.” Talk presented at the *Neutrino Cosmology Day*, Munich 2022.
- “Coherent neutrino scattering: a window into neutron distributions.” Talk presented at the *Neutrino-Nucleus Interactions in the Standard Model and Beyond*, virtual CERN 2022.
- “Astrophysical neutrino self-interactions in the high-statistics era.” Selected hot topic talk at *TAUP 2021*.
- “Astrophysical neutrino self-interactions in the high-statistics era.” Talk presented at the *2021 Division of Particles and Fields APS meeting*.
- “Exploring neutrino long range interactions from the cosmos.” Talk presented at *Pheno 2021*.
- “Precision measurements in neutrino experiments.” Talk presented at the *First EuCAPT Annual Symposium*, 2021.
- “European Spallation Source: the future of Coherent Neutrino Scattering.” Talk presented at the *2021 Rencontres de Moriond*.

“COHERENT neutrinos, today and tomorrow.” Poster and talk presented at *NuPhys 2019*.

“Light sterile neutrinos: an overview.” Talk given at the *nuSTORM Workshop*, CERN, 2019.

“MiniBooNE low-energy excess as a hint for neutrino decay.” Talk given at the *2019 Neutrino Platform Week: Hot Topics in Neutrino Physics*, CERN, 2019.

“Exploring the axionic dark sector with ANITA.” Poster and talk presented at the *Invisibles 19 School and Workshop*. Prize for the best poster.

“Global Analysis of Neutrino Oscillation Data Circa Autumn 2018.” Talk given at the *NuTheories workshop*, Pittsburgh, 2018.

“Light sterile neutrinos: a critical overview.” Talk given at the *15th International Workshop on Tau Lepton Physics*, 2018.

## INVITED SEMINARS (Invited to 11 seminars)

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“Neutrino secret interactions from outer space.” Seminar given at *Niels Bohr Institute*, December 2022.

“Ultra-high energy neutrinos and physics opportunities.” Seminar given at *Kansas University*, September 2022.

“Ultra-High Energy Astrophysical Neutrinos: A New Window to the Universe.” Seminar given at the *Technical University of Munich*, May 2022.

“Sterile neutrinos in 2021, why should we care?.” Seminar given at the *Institut de Fisica Corpuscular (Valencia)*, December 2021.

“Neutrino interactions from the Cosmos.” Seminar given at the *New Mexico University*, October 2021.

“Neutrino interactions from the Cosmos.” Seminar given at the *Fermilab theory division*, October 2021.

“Neutrino interactions from the Cosmos.” Seminar given at the *University of Cincinnati*, October 2021.

“Long Range Interactions in Cosmology: Implications for Neutrinos.” Seminar given at the *Northwestern University*, April 2021.

“Phenomenology of coherent neutrinos, today and tomorrow.” Seminar given at *Fermilab*, March 2021.

“Long Range Interactions in Cosmology: Implications for Neutrinos.” Seminar given at the *Campinas University*, March 2021.

“Long Range Interactions in Cosmology: Implications for Neutrinos.” Seminar given at the *Technical University of Munich*, February 2021.

## SERVICE AND OUTREACH

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Referee for Journal of Cosmology and Astroparticle Physics ( <i>JCAP</i> )	2022 - PRESENT
Referee for Physical Review Letters ( <i>PRL</i> )	2020 - PRESENT
Referee for Computer Physics Communications	2020 - PRESENT
Referee for Physical Review D ( <i>PRD</i> )	2019 - PRESENT
Referee for The European Physical Journal C ( <i>EPJ C</i> )	2019 - PRESENT
Referee for Journal of High Energy Physics ( <i>JHEP</i> )	2017 - PRESENT
Reviewer of applications to the DOE Office of Science Graduate Student Research Program Reviewed 2 applications to pursue a PhD thesis project at a DOE national laboratory.	SUMMER 2022
Co-organizer of the weekly CCAPP Astroparticle Physics journal club	2021 - PRESENT
“Neutrinos: shedding light on the secrets of antimatter” Outreach article in the Basque <i>Elhuyar</i> magazine.	DECEMBER 2021
Delivered the “Neutrinos” tutorial at the <i>Invisibles21 School</i>	SPRING 2021
“Neutrinos in the South Pole” Outreach interview in the public Basque radio station.	MARCH 2021

<i>Bloom Carroll Local Science Fair</i> Tutored a high school student in her Science Fair project. Evaluated other projects.	WINTER 2020
<i>"Neutrinos: seeing the invisible"</i> Outreach talk given to the general public as part of the <i>European Researchers Night</i> .	FALL 2019
<i>"Neutrinos: seeing the invisible"</i> Outreach talk given to the general public as part of the <i>Pint of Science</i> program.	SPRING 2019
<i>"Neutrino oscillations: in the frontier of the Standard Model"</i> Outreach talk given to physics undergraduate students.	FALL 2018
<i>Member of the UB Physics Faculty Council</i> Student Representative in the Academic, Research, Doctorate and Equality Commissions of the Physics Faculty in the University of Barcelona.	WINTER 2016 - SUMMER 2018
<i>Member of the outreach association Quadrivium</i> Gave two 1-hour talks about General Relativity in Barcelona's community centers.	SPRING 2018
<i>Organizer of the "Encontres amb el Tercer Cicle"</i> Organized four outreach lecture cycles given by PhD students, attended by about 100 people each.	FALL 2017 - SPRING 2020
<i>Member of the Local Organizing Committee in the 4th Workshop on the QCD Structure of the Nucleon (Bilbao)</i>	JULY 2016
<i>President of Zimatek, the Basque association of Physics and Electronic Engineering students</i> Organized three lecture cycles attended by about 100 people each. Coordinated various trips of about 50 students to different research facilities.	FALL 2013 - SPRING 2015

## UNDERGRADUATE RESEARCH EXPERIENCE

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<i>Deutsches Elektronen-Synchrotron (DESY), summer student</i> Data analysis in the DESY-CMS group.	SUMMER 2015
<i>Brookhaven National Laboratory, summer stay</i> Data analysis in the eRHIC group, hardware work in the STAR experiment.	SUMMER 2014

## SKILLS

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### LANGUAGES

ENGLISH: Fluent, level C2 (Certificate of Proficiency in English)  
 SPANISH: Mother tongue  
 BASQUE: Fluent, level C1 (Euskararen Gaitasun Agiria)  
 CATALAN: Basic understanding

### COMPUTER SKILLS

Python, C++  
 MultiNest  
 Linux server at user level  
 $\text{\LaTeX}$   
 Basic Knowledge of ROOT, Java and FORTRAN