

# Guillermo Franco Abellán

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## Personal details

**Birth date:** December 3, 1995  
**Birthplace:** Murcia, Spain  
**Citizenship:** Spanish

## Research interests

I'm a theoretical cosmologist, with a special interest in the phenomenology of particle physics models in cosmological observations. During my PhD, I derived state-of-the-art cosmological constraints on a large number of  $\Lambda$ CDM extensions, mostly motivated by the  $H_0/S_8$  tensions, the neutrino mass problem, and inflation. As a postdoc, I focus on developing new deep learning tools in simulation-based inference (SBI) in order to accelerate and refine parameter inference for cosmology.

## Academic positions

Nov. 2025 – current **Postdoctoral Researcher** at Institut de Física Corpuscular (IFIC), CSIC-Universitat de València, Spain  
Nov. 2022 – Sep. 2025 **Postdoctoral Researcher** at GRAPPA Institute, University of Amsterdam, The Netherlands

## Education

Oct. 2019 – Oct. 2022 **Ph.D. in Physics, specialising in Cosmology**, Université de Montpellier, France  
Supervisors: Vivian Poulin and Julien Lavalley  
Thesis title: *Searching for new physics with CMB precision cosmology*, [available online](#)  
Date of defense: July 18, 2022  
Sep. 2018 – June 2019 **M.Sc. in Astroparticle Physics and Cosmology**, Université de Montpellier, France  
Highest promotion grade (17.7/20)  
Master internship: *Signatures of dark matter in the CMB*  
Sep. 2013 – June 2018 **B.Sc. in Physics**, Universidad de Murcia, Spain and Universität Ulm, Germany (Exchange). Highest promotion grade (8.1/10)  
Bachelor's thesis: *An introduction to supersymmetry*

## Mentoring and supervision

2024 – 2025 **Supervision of Master student**, University of Amsterdam, The Netherlands  
Master's Degree Candidate: Nicola Terzaghi  
2023 – 2024 **Co-supervision of PhD student**, University of Amsterdam, The Netherlands  
PhD candidate: Fabian Zimmer  
2023 – 2025 **Co-supervision of PhD student**, University of Amsterdam, The Netherlands  
PhD candidate: Oleg Savchenko

## Teaching experience

- 2023 – 2024 Teaching assistant for *Student Seminar Theoretical Physics*, Master's Course (24h)  
University of Amsterdam, The Netherlands
- 2023 Teaching assistant for *Academic Skills for Research*, Master's Course (40h)  
University of Amsterdam, The Netherlands
- 2020 Tutored for *Fundamentals of Physics for Biologists*, Undergrad Course (64h)  
Université de Montpellier, France

## General Skills

- Languages** Spanish (*native*), English (*fluent*), French (*fluent*)
- Coding** PYTHON/PYTORCH (*advanced*), C/C++ (*advanced*), MATHEMATICA (*basic*)
- Scientific Software** CLASS (*developer*), SWYFT (*developer*), MONTEPYTHON, COBAYA, GETDIST, SASHIMI, PYBIRD (*basic*), PYLIANS, PINOCCHIO (*basic*)
- Misc.** L<sup>A</sup>T<sub>E</sub>X, Bash scripting, HTML (*basic*), git, Slurm

## Scientific contributions

- Since 2023 Referee for journals (A&A, JCAP, OJA, EPJ C)
- Since 2023 Member of Euclid collaboration (Theory Science Working Group)
- 2022 – 2025 Handler of official Twitter/X and Bluesky accounts for GRAPPA
- March 2023 Crash course on the CLASS code (2h), University of Amsterdam, The Netherlands

## Organizational skills

- May 2024 Member of Local Organizing Committee for *European AI for Fundamental Physics Conference (EuCAIFCon, 30 Apr.-3 May 2024)*. Amsterdam, The Netherlands
- 2023 – 2024 Organizer of bi-weekly *Amsterdark* Seminar Series
- Nov. 2023 Co-organizer of ISAPP PhD school *Exploring the dark universe (13-19 Nov. 2023)*. Texel island, The Netherlands

## Outreach

- July 2022 *Anomalies en cosmologie: faire la lumière sur le secteur sombre de l'univers*, Journée des chercheurs non-permanents du LUPM, U. de Montpellier (France)
- Apr. 2021 *Anomalías en cosmología: arrojando luz sobre el universo oscuro*, Invited talk for physics bachelor students, U. de Murcia (Spain)
- Nov. 2019 *Dark Matter: the invisible structure of the Universe*, Public talk at Phd Pub, Montpellier (France)

## References

Vivian Poulin  
LUPM, University of Montpellier  
[vivian.poulin@umontpellier.fr](mailto:vivian.poulin@umontpellier.fr)

Shin'ichiro Ando  
GRAPPA, University of Amsterdam  
[s.ando@uva.nl](mailto:s.ando@uva.nl)

Christoph Weniger  
GRAPPA, University of Amsterdam  
[c.weniger@uva.nl](mailto:c.weniger@uva.nl)

Julien Lesgourgues  
RWTH Aachen  
[lesgourg@physik.rwth-aachen.de](mailto:lesgourg@physik.rwth-aachen.de)

## Selected list of talks/seminars

As of January 10, 2026

Oct 2025	<b>Contributed Talk</b> , <i>Atelier Théorie, Univers et Gravitation, TUG 2025</i> , IPhT-Saclay (France)
July 2025	<b>Invited Talk</b> , <i>Ptolemy International Workshop</i> , Nijmegen (The Netherlands)
May 2025	<b>Seminar</b> , <i>Central European Institute for Cosmology and Fundamental Physics, CEICO</i> , Prague (Czech Republic)
Oct. 2024	<b>Contributed Talk</b> , <i>International Conference on Particle Physics and Cosmology, COSMO'24</i> , Kyoto (Japan)
June 2024	<b>Invited Talk</b> , <i>Exploring the Dark Side of the Universe, EDSU-Tools 2024</i> , Île de Noirmoutier (France)
May 2024	<b>Contributed Talk</b> , <i>European AI for Fundamental Physics, EuCAIFCon 2024</i> , Amsterdam (The Netherlands)
Jan. 2024	<b>Seminar</b> , <i>Centre de Physique Théorique, CPT</i> , Marseille (France)
Oct. 2023	<b>Contributed Talk</b> , <i>Atelier Théorie, Univers et Gravitation, TUG 2023</i> , Paris (France)
June 2023	<b>Seminar</b> , <i>Université Libre de Bruxelles, ULB</i> , Brussels (Belgium)
June 2023	<b>Contributed Talk</b> , <i>Third EuCAPT Annual Symposium</i> , Geneva @CERN (Switzerland)
May 2023	<b>Contributed Talk</b> , <i>Progress on Old and New Themes in cosmology, PONT 2023</i> , Avignon (France)
Mar. 2023	<b>Seminar</b> , <i>Instituto de Astrofísica de Canarias, IAC</i> , Tenerife (Spain) [remote]
Nov. 2022	<b>Seminar</b> , <i>Physics Reports Seminar Series</i> [remote]
Sep. 2022	<b>Seminar</b> , <i>University of the Western Cape, UWC</i> , Cape Town (South Africa) [remote]
July 2022	<b>Invited Talk</b> , <i>Intriguing inconsistencies in the growth of structure over cosmic time</i> , Sesto (Italy)
June 2022	<b>Seminar</b> , <i>Laboratoire de Physique des 2 Infinis Irène Joliot-Curie, IJCLab</i> , Orsay (France)
June 2022	<b>Contributed Talk</b> , <i>News from the dark (Episode 7: On Dark Matter Subhalos)</i> , Montpellier (France)
Jan. 2022	<b>Contributed Talk</b> , <i>56<sup>th</sup> Rencontres de Moriond (Cosmology session)</i> , La Thuile (Italy)
Dec. 2021	<b>Seminar</b> , <i>Max Planck Institute for Astrophysics</i> , Garching (Germany) [remote]
Nov. 2021	<b>Seminar</b> , <i>Stony Brook University, SBU</i> , Long Island (US)
Nov. 2021	<b>Seminar</b> , <i>University of Maryland, UMD</i> , Washington D.C. (US)
Nov. 2021	<b>Seminar</b> , <i>John Hopkins University, JHU</i> , Baltimore (US)
Nov. 2021	<b>Seminar</b> , <i>Scuola Internazionale Superiore di Studi Avanzati, SISSA</i> , Trieste (Italy)
Oct. 2021	<b>Seminar</b> , <i>Institut de Ciències del Cosmos, ICC</i> , Barcelona (Spain) [remote]
Oct. 2021	<b>Seminar</b> , <i>Instituto de Física Teórica, IFT</i> , Madrid (Spain)
Apr. 2021	<b>Contributed Talk</b> , <i>Rencontres de Physique des Particules, RPP 2021</i> , Tours (France) [remote]

As of January 10, 2026

[\[InspireHEP profile\]](#)

I am the author of 15 papers and 3 preprints (with <10 authors). These works accumulate more than 1300 citations and I have an h-index of 12. I have published in high-impact journals such as JCAP, JHEP, PRD and Physics Reports. One paper has now accrued over 500 citations (Ref. (A15)).

- (A1) **G.F. Abellán**, *Neutrino decays as a natural explanation of the neutrino mass tension*, [2601.04312](#)
- (A2) N. Terzaghi\*, **G.F. Abellán**, F. Zimmer and S. Ando, *Impact of neutrino decays on the Cosmic Neutrino Background anisotropies*, [2510.15818](#)
- (A3) **G.F. Abellán**, N. Anau Montel, O. Savchenko and C. Weniger, *How to embed any likelihood into SBI: Application to Planck + Stage IV galaxy surveys and Dynamical Dark Energy*, *Phys. Rev. D* **112** (2025) 103526 [[2507.22990](#)]
- (A4) O. Savchenko\*, **G.F. Abellán**, F. List, N. Anau Montel and C. Weniger, *Fast Sampling of Cosmological Initial Conditions with Gaussian Neural Posterior Estimation*, [2502.03139](#)
- (A5) F. Zimmer\*, **G.F. Abellán** and S. Ando, *Effects of primordial fluctuations on relic neutrino simulations*, *JCAP* **10** (2024) 098 [[2407.14582](#)]
- (A6) **G.F. Abellán**, G. C. Herrera, M. Martinelli, O. Savchenko, D. Sciotti and C. Weniger, *Fast likelihood-free inference in the LSS Stage IV era*, *JCAP* **11** (2024) 057 [[2403.14750](#)]
- (A7) **G.F. Abellán**, M. Braglia, M. Ballardini, F. Finelli and V. Poulin, *Probing Early Modification of Gravity with Planck, ACT and SPT*, *JCAP* **12** (2023) 017 [[2308.12345](#)]
- (A8) N. Schöneberg, **G.F. Abellán**, T. Simon, A. Bartlett, Y. Patel and T. L. Smith, *Comparative analysis of interacting stepped dark radiation*, *Phys. Rev. D* **108** (2023) 123513 [[2306.12469](#)]
- (A9) **G.F. Abellán** and G. Facchinetti, *Minihalos as probes of the inflationary spectrum: accurate boost factor calculation and new CMB constraints*, *JCAP* **06** (2023) 032 [[2304.02996](#)]
- (A10) N. Schöneberg and **G.F. Abellán**, *A step in the right direction? Analyzing the Wess Zumino Dark Radiation solution to the Hubble tension*, *JCAP* **12** (2022) 001 [[2206.11276](#)]
- (A11) J. I. Juan, P. D. Serpico and **G.F. Abellán**, *The QCD phase transition behind a PBH origin of LIGO/Virgo events?*, *JCAP* **07** (2022) 009 [[2204.07027](#)]
- (A12) T. Simon, **G.F. Abellán**, P. Du, V. Poulin and Y. Tsai, *Constraining decaying dark matter with BOSS data and the effective field theory of large-scale structures*, *Phys. Rev. D* **106** (2022) 023516 [[2203.07440](#)]
- (A13) T. L. Smith, M. Lucca, V. Poulin, **G.F. Abellán**, L. Balkenhol, K. Benabed et al., *Hints of early dark energy in Planck, SPT, and ACT data: New physics or systematics?*, *Phys. Rev. D* **106** (2022) 043526 [[2202.09379](#)]
- (A14) **G.F. Abellán**, Z. Chacko, A. Dev, P. Du, V. Poulin and Y. Tsai, *Improved cosmological constraints on the neutrino mass and lifetime*, *JHEP* **08** (2022) 076 [[2112.13862](#)]
- (A15) N. Schöneberg, **G.F. Abellán**, A. Pérez Sánchez, S. J. Witte, V. Poulin and J. Lesgourgues, *The  $H_0$  Olympics: A fair ranking of proposed models*, *Phys. Rept.* **984** (2022) 1 [[2107.10291](#)]
- (A16) **G.F. Abellán**, R. Murgia and V. Poulin, *Linear cosmological constraints on 2-body decaying dark matter scenarios and the  $S_8$  tension*, *Phys. Rev. D* **104** (2021) 123533 [[2102.12498](#)]
- (A17) R. Murgia, **G.F. Abellán** and V. Poulin, *Early dark energy resolution to the Hubble tension in light of weak lensing surveys and lensing anomalies*, *Phys. Rev. D* **103** (2021) 063502 [[2009.10733](#)]
- (A18) **G.F. Abellán**, R. Murgia, V. Poulin and J. Lavalle, *Implications of the  $S_8$  tension for decaying dark matter with warm decay products*, *Phys. Rev. D* **105** (2022) 063525 [[2008.09615](#)]

\* = Student supervised for the project

### Collaboration papers (> 10 authors)

- COSMOVERSE NETWORK collaboration, E. Di Valentino et al., *The CosmoVerse White Paper: Addressing observational tensions in cosmology with systematics and fundamental physics*, *Phys. Dark Univ.* **49** (2025) 101965 [[2504.01669](#)]
- EUCLID collaboration, L. W. K. Goh et al., *Euclid preparation. Cosmology Likelihood for Observables in Euclid (CLOE). 5. Extensions beyond the standard modelling of theoretical probes and systematic effects*, [2510.09147](#)
- E. Abdalla et al., *Cosmology intertwined: A review of the particle physics, astrophysics, and cosmology associated with the cosmological tensions and anomalies*, *JHEAp* **34** (2022) 49 [[2203.06142](#)]

### Proceedings

- O. Savchenko, F. List, **G.F. Abellán**, N. Anau Montel and C. Weniger, *Mean-Field Simulation-Based Inference for Cosmological Initial Conditions*, in *38th conference on Neural Information Processing Systems*, 10, 2024, [2410.15808](#)
- **G.F. Abellán**, *The  $H_0$  Olympics: a fair ranking of proposed models*, Proceedings of the 56<sup>th</sup> Rencontres de Moriond (2022 Cosmology) p. 63