

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 beyond- Λ CDM models in CMB and LSS observations. During my PhD, I derived state-of-the-art cosmological constraints on a large number of Λ 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^AT_EX, 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
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Shin'ichiro Ando
GRAPPA, University of Amsterdam
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Christoph Weniger
GRAPPA, University of Amsterdam
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Julien Lesgourgues
RWTH Aachen
lesgourg@physik.rwth-aachen.de

Selected list of talks/seminars

As of November 17, 2025

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

As of November 17, 2025

[\[InspireHEP profile\]](#)

I am the author of 15 papers and 2 pre-prints (with <10 authors). These works accumulate more than 1200 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. (A14)).

- (A1) N. Terzaghi*, **G.F. Abellán**, F. Zimmer and S. Ando, *Impact of neutrino decays on the Cosmic Neutrino Background anisotropies*, [2510.15818](#)
- (A2) **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 \[2507.22990\]](#)
- (A3) 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](#)
- (A4) F. Zimmer*, **G.F. Abellán** and S. Ando, *Effects of primordial fluctuations on relic neutrino simulations*, [JCAP **10** \(2024\) 098 \[2407.14582\]](#)
- (A5) **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 \[2403.14750\]](#)
- (A6) **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 \[2308.12345\]](#)
- (A7) 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 \[2306.12469\]](#)
- (A8) **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 \[2304.02996\]](#)
- (A9) 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 \[2206.11276\]](#)
- (A10) 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 \[2204.07027\]](#)
- (A11) 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 \[2203.07440\]](#)
- (A12) 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 \[2202.09379\]](#)
- (A13) **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 \[2112.13862\]](#)
- (A14) 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 \[2107.10291\]](#)
- (A15) **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 \[2102.12498\]](#)
- (A16) 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 \[2009.10733\]](#)
- (A17) **G.F. Abellán**, R. Murgia, V. Poulin and J. Lavalley, *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 56th Rencontres de Moriond (2022 Cosmology) p. 63