

Alex Vañó-Viñuales

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Personal data

- **Current position:** Senior postdoctoral researcher at IAC3 Institute of Applied Computing & Community Code, Universitat de les Illes Balears; Carretera de Valldemossa, km 7.4, Parc BIT: Carrer Blaise Pascal, 6; 07121 Palma de Mallorca, Illes Balears, Spain
- **Date and place of birth:** 31st January 1987, Palma de Mallorca, Spain
- **Nationality:** Spanish, **Marital status:** single
- **ORCID:** 0000-0002-8589-006X, **ResearcherID:** E-9612-2016, **CiênciaID:** 861D-47A9-1768, **ScopusID:** 56613434600

Academic formation

- **PhD in Physics:** 18th September 2015
 - **University of the Balearic Islands, UIB,** 2011-2015
PhD thesis: “Free evolution of the hyperboloidal initial value problem in spherical symmetry”, supervised by Sascha Husa.
- **Master in Physics:** 23rd June 2011.
 - **University of the Balearic Islands, UIB,** 2010-2011
Master thesis: “Numerical evolution of the Einstein equations in spherical symmetry: the GBSSN equations and conformal compactification”, supervised by Sascha Husa.
- **Degree in Physics**
 - **University of the Balearic Islands, UIB,** 2005-2008, 2009-2010
Physics degree: 22nd September 2010 (average qualification: 3.39 (of 4) or 9.36 (of 10)).
 - **Friedrich-Schiller-Universität Jena, FSU,** 2008-2009
4th year of the Physics degree in this university as an Erasmus exchange student.

Research stays

- **TAPIR, Caltech, Pasadena, US**

Period of time: 01/05/2024 - 31/05/2024

Research topics: Numerical relativity, hyperboloidal evolutions and CCE

Visiting: SXS Collaboration

- **Kyoto University, Kyoto, Japan**
Period of time: 01/05/2023 - 31/05/2023
Research topics: Numerical relativity, hyperboloidal initial data including matter
Visiting: Koutarou Kyutoku
- **Perimeter Institute for Theoretical Physics, Waterloo, Ontario, Canada**
Period of time: 01/08/2022 - 30/08/2022
Research topics: Numerical relativity, hyperboloidal evolutions
Visiting: Erik Schnetter
- **IUCAA, Inter-University Centre for Astronomy and Astrophysics, Pune, India**
Period of time: 26/10/2017 - 17/11/2017
Research topics: Numerical relativity, evolutions of a massive scalar field
Invited by: Sanjeev Dhurandhar
- **FaMAF, Universidad Nacional de Córdoba, Córdoba, Argentina**
Period of time: 01/07/2014 - 31/08/2014
Research topic: Massless scalar field evolution on extreme Reissner-Nordström background
Advisor: Sergio Dain
- **Erwin Schrödinger Institute (ESI), Universität Wien, Vienna, Austria**
Period of time: 25/07/2011 - 19/08/2011
Research topic: Participation in the workshop “Dynamics of General Relativity”
Advisor: Sascha Husa
- **Universität Wien, Vienna, Austria**
Period of time: 01/07/2010 - 20/09/2010, summer 2010
Research topic: Spherical BSSN formulation on the Einstein equations (General Relativity)
Advisors: Mark Hannam and Sascha Husa
- **GSI (Helmholtzzentrum für Schwerionenforschung) - Darmstadt, Germany**
Period of time: 03/08/2009 - 25/09/2009, summer student programme 2009
Research topic: Particle physics experiment (Cherenkov effect)
Advisor: Carsten Schwarz
Student report: “Test of a DIRC prototype in a relativistic proton beam”
- **DESY (Deutsches Elektronen Syncrotron) - Zeuthen, Berlin, Germany**
Period of time: 23/07/2008 - 16/09/2008, summer student programme 2008
Research topic: Particle physics analysis (Higgs-strahlung process)
Advisors: Martin Ohlerich and Wolfgang Lohmann
Student report: “Spin measurement of recoiled particles in the Higgs-strahlung process”

Lectures and colloquia

- **Lecture series on “The hyperboloidal initial value problem in numerical relativity”,** imparted by AVV and David Hilditch at IUCAA (Inter-University Centre for Astronomy and Astrophysics), 30th October - 13th November 2017, IUCAA, Pune, India. Lectures by AVV:
 - Talk I: Numerical relativity evolutions of black hole binaries (30th October 2017)
 - Talk III: Concepts in the hyperboloidal initial value problem (6th November 2017)
 - Talk IV: Hyperboloidal numerical evolution in spherical symmetry (8th November 2017)
- **Colloquium given at IUCAA,** 2nd November 2017, IUCAA, Pune, India.
Title: “Numerical Relativity in the Era of Gravitational Wave Astronomy”

Seminars

1. **Seminar given at CENTRA, Instituto Superior Técnico, University of Lisbon,** 24th June 2025, Lisbon, Portugal. Title: “Numerical hyperboloidal compactification: waves on FLRW and neutron star initial data”
2. **Virtual Infinity seminar,** 16th May 2025, online. Title: Hyperboloidal neutron star and black hole in spherical symmetry <https://youtu.be/BYd9oQ7TQi8>
3. **Seminar given at the Department of Applied Mathematics and Theoretical Physics (DAMTP), University of Cambridge,** 21st February 2025, Cambridge, UK. Title: “Free conformally-rescaled hyperboloidal evolution: status and applications”
4. **Seminar given at Yukawa Institute for Theoretical Physics,** 27th November 2024, Kyoto University, Japan. Title: “Free hyperboloidal evolution: status and applications”
5. **Seminar given at TAPIR, Caltech,** 3rd May 2024, Pasadena, US. Title: “Current numerical efforts on free hyperboloidal evolutions”
6. **Virtual Infinity seminar,** 12th January 2024, online. Title: Conformal diagrams for strong-field hyperboloidal slices <https://youtu.be/FEry69wsT60>
7. **Seminar given at the University of the Balearic Islands,** 13th October 2023, Palma de Mallorca, Spain. Title: “Free hyperboloidal evolutions: current numerical efforts”
8. **Seminar given at Rikkyo University,** 8th June 2023, Tokyo, Japan.
Title: “Free hyperboloidal numerical evolutions”
9. **Seminar given at Yukawa Institute for Theoretical Physics,** 11th May 2023, Kyoto University, Japan. Title: “Current efforts on free hyperboloidal numerical evolutions”
10. **Seminar given to Academia Sinica, Taipei, Taiwan,** 17th February 2023, online.
Title: “Two approaches to (3D) free hyperboloidal evolution”
11. **General Relativity Seminar given at TPI, FSU Jena, Germany,** 30th November 2022.
“Towards 3D free hyperboloidal evolution” https://youtu.be/StpF8_1h5CA
12. **Seminar given to GRIT, CENTRA, IST, University of Lisbon,** 10th November 2022.
“Current efforts towards 3D free hyperboloidal evolution” https://youtu.be/StpF8_1h5CA
13. **Seminar given to the Astrophysical and Cosmological Relativity division at the Albert Einstein Institute,** 21st September 2022, Golm, Germany.
Title: “Current efforts on free hyperboloidal evolution”

14. **Seminar given to the Strong Gravity group at Perimeter Institute**, 24th August 2022, Waterloo, Canada. Title: “Free hyperboloidal evolution”
15. **Seminar given at a group meeting of the Gravity Group of The University of Mississippi**, 28th June 2022, online. Title: “Current numerical efforts on free hyperboloidal evolution”
16. **Seminar given to the Gravity Exploration Institute at Cardiff University**, 16th June 2022, Cardiff, UK and online. Title: “Current efforts on free hyperboloidal evolution”
17. **Seminar given to the Theoretical Astrophysics section at the Univ. of Tübingen**, 18th March 2022, Tübingen, Germany.
Title: “Current efforts on free evolution of the hyperboloidal initial value problem”
18. **Seminar given to GRIT, CENTRA, IST, University of Lisbon**, 28th February 2019. “Reaching infinity: free hyperboloidal evolution using conformal methods in spherical symmetry”
19. **Seminar given to the Gravitational Physics Group at Cardiff University**, 16th October 2015, Cardiff, United Kingdom. Title: “Free hyperboloidal evolution in spherical symmetry”
20. **Seminar given to the Relativity Group of the Universidad Nacional de Córdoba**, 10th July 2014, Córdoba, Argentina. “Unconstrained hyperboloidal evolution in spherical symmetry”

Invited talks to scientific conferences and meetings

1. **Black Holes, Neutron Stars, and Gravitational Waves @ Black Sea**, 16th - 20th June 2025, Varna, Bulgaria. Title: “Free hyperboloidal evolution and strong field initial data”
2. **Lichnerowicz Conference**, 11th - 13th June 2025, Institut Henri Poincaré, Paris, France. Title: “Numerical hyperboloidal compactification: waves on FLRW and Einstein equations”
3. **Structures and Dynamics in Cosmology**, 13th - 17th January 2025, TSIMF, Sanya, Hainan, China.
Title: “Hyperboloidal compactification for wave equations on FLRW backgrounds”
4. **New and Old Problems in Numerical Relativity**, 6th - 10th January 2025, TSIMF, Sanya, Hainan, China.
Title: “Hyperboloidal evolution, or how to smoothly reach (future null) infinity”
5. **Infinity on a Gridshell**, hyperboloidal meeting, 10th - 13th July 2023, Niels Bohr Institute, Copenhagen, Denmark.
Title: “Status of 3D free hyperboloidal conformal numerical evolutions”
6. **European Einstein Toolkit meeting 2022**, 29th August - 2nd September 2022, University College Dublin, Ireland.
Title: “Free hyperboloidal numerical evolutions”
7. **New frontiers in strong gravity**, 3rd - 16th July 2022, Benasque, Spain.
Title: “Free hyperboloidal evolution”
8. **Higgs Lecture & Workshop 2022**, 13th - 14th June 2022, King’s College London, UK.
Title: “Gravitational waves: from Einstein to infinity”
9. **European Einstein Toolkit Meeting 2019**, 2nd - 6th September 2019, King’s College London, UK.
Title: “Free evolution on hyperboloidal slices: spherical symmetry and extension plans”
10. **Workshop on Numerical and Mathematical Relativity 2016**, 8th - 10th September 2016, Oppurg, Germany.
Title: “Free evolution of the hyperboloidal initial value problem in spherical symmetry”

Other contributions to scientific conferences and meetings

1. **The 10th Anniversary of the Discovery of Gravitational Waves**, 15th - 17th September 2025, PartBIT, University of the Balearic Islands, Spain
Poster: "Towards pursuing gravitational waves along hyperboloidal slices"
2. **New Frontiers in NR 2025**, 21st - 25th July 2025, Palma de Mallorca, Spain
Talk: "Hyperboloidal highway to the frontier at future null infinity"
3. **24th International Conference on General Relativity and Gravitation (GR24) and 16th Edoardo Amaldi Conference on Gravitational Waves (Amaldi16)**, 14th - 18th July 2025, Glasgow, Scotland, UK
Talk: "Free hyperboloidal evolution: 4D reference metrics and status of 3D simulations"
4. **Japanese 33rd GR meeting (JGRG33)**, 2nd - 6th December 2024, Osaka, Japan
Talk: "4D reference metrics for free hyperboloidal evolution"
5. **Spanish-Portuguese Relativity Meeting (EREP) 2024**, 22nd - 26th July 2024, University of Coimbra, Portugal
Talk: "Reference metrics on hyperboloidal slices for free evolution"
6. **New horizons for Psi workshop**, 3rd - 5th July 2024, IST, University of Lisbon, Portugal
Poster: "Hyperboloidal conformal evolutions: Penrose diagrams and 3D simulations"
7. **Virtual Infinity Workshop 2024**, 1st - 2nd July 2024, online (Hyperboloidal Research Network).
Talk: "Towards relating Cauchy and hyperboloidal initial data"
8. **XVI Black Holes Workshop**, 19th - 20th December 2023, FEUP, Porto, Portugal
Talk: "Penrose diagrams for strong-field hyperboloidal slices"
9. **15th Edoardo Amaldi Conference on Gravitational Waves**, 17th - 21st July 2023, online
Poster: "Current 3D numerical efforts in hyperboloidal conformal evolutions"
10. **Talk given at the monthly Numerical Relativity community call**, 6th February 2023, online. Title: "Current status of 3D free hyperboloidal evolution"
11. **XV Black Holes Workshop**, 19th - 20th December 2022, ISCTE, Lisbon, Portugal.
Talk: "Causal visualization of collapsing hyperboloidal slices"
12. **Frontiers in Numerical Relativity 2022 (FNR2022)**, 25th - 29th July 2022, Jena, Germany.
Talk: "Free hyperboloidal evolution using conformal compactification"
13. **XIV Black Holes Workshop**, 20th - 21st December 2021, Aveiro, Portugal.
Talk: "Hyperboloidal trumpet black hole slices and their causal visualization"
14. **Spanish-Portuguese Relativity Meeting (EREP) 2021**, 13th - 16th September 2021, online (Aveiro, Portugal). Talk: "Hyperboloidal massless scalar field in 3D"
15. **Global meeting of the GWverse COST action**, 30th August - 3rd September 2021, Lisbon, Portugal, and online. Talk: "Hyperboloidal evolutions of the wave equation in 3D"
16. **North American Einstein Toolkit School 2021**, 26th - 30th July 2021, online (University of Illinois Urbana Champaign, USA). Lightning talk: "Hyperboloidal wave equation in 3D"
17. **XIII Black Holes Workshop**, 21st - 22nd December 2020, online (IST, Lisbon, Portugal).
Talk: "Penrose diagrams for visualising black hole hyperboloidal slices"

18. **ICERM Workshop 2**, 5th - 9th October 2020, online (Brown University, Providence, USA). Lightning talk: “Free evolution on hyperboloidal slices with conformal compactification”
19. **XII Black Holes Workshop**, 19th - 20th December 2019, Universidade do Minho, Guimarães, Portugal. Talk: “Hyperboloidal slices of black hole spacetimes in spherical symmetry”
20. **GR22 & Amaldi 13**, 7th - 12th July 2019, Valencia, Spain. Talk: “Reaching Infinity: Free Hyperboloidal Evolution Using Conformal Methods In Spherical Symmetry”
21. **Numerical Relativity beyond General Relativity**, 3rd - 9th June 2018, Benasque, Spain. Talk: “Reaching infinity in numerical simulations”
22. **27th Workshop on General Relativity and Gravitation in Japan (JGRG27)**, 27th November - 1st December 2017, Saijo, Higashi-hiroshima, Japan. Talk: “Free hyperboloidal evolution in spherical symmetry”
23. **The Physics of Extreme Gravity Stars**, 5th - 30th June 2017, Nordita, Stockholm, Sweden. Talk: “Free hyperboloidal evolution: results in spherical symmetry”
24. **Spanish-Portuguese Relativity Meeting (EREP) 2016**, 12th - 15th September 2016, Lisbon, Portugal. Talk: “Going beyond Bowen-York binary black hole initial data”
25. **21st International Conference on General Relativity and Gravitation (GR21)**, 10th - 15th July 2016, Columbia University, New York, USA. Talk: “Free hyperboloidal evolution of strong field initial data in spherical symmetry”
26. **BritGrav16**, 4th-5th April 2016, Nottingham, UK, Talk: “Free hyperboloidal evolution in spherical symmetry”
27. **14th Marcel Grossmann Meeting**, 12th - 18th July, 2015, University of Rome “La Sapienza”, Roma, Italy. Talk: “Free Hyperboloidal Evolution In Spherical Symmetry”
28. **Spanish Relativity Meeting (ERE) 2015**, 7th - 11th September 2015, Mallorca, Spain
Talk: “Free hyperboloidal evolution in spherical symmetry”
29. **Spanish Relativity Meeting (ERE) 2014**, 1st - 5th September 2014, Valencia, Spain
Talk: “Unconstrained hyperboloidal evolution of strong field initial data in spherical symmetry”
30. **NRDA 2013**, 18th - 21st September 2013, Club Pollentia Resort, Mallorca, Spain
Talk: “Spherical symmetry as a test case for unconstrained hyperboloidal evolution”
31. **Spanish Relativity Meeting (ERE) 2013**, 8th - 13th September 2013, Benasque, Spain
Talk: “Spherical symmetry as a test case for unconstrained hyperboloidal evolution”
32. **GR20 & Amaldi 10**, 7th - 13th July 2013, University of Warsaw, Poland
Poster: “Surfing BSSN and Z4 to null infinity (Spherical symmetry as a test case for unconstrained hyperboloidal evolution)”

Other talks

- *Introduction to the Einstein Toolkit* as part of the **Code Meetings** organised in CENTRA, IST, Lisbon, 24th February 2025.

Other scientific conferences, seminars and courses attended

- **North American Einstein Toolkit Workshop 2023**, 17th - 21st July 2023, Rochester Institute of Technology, USA, and online.
- **TCAN on BNS and BH/NS Worshop 2022**, 20th - 24th June 2022, online (Rochester Institute of Technology).
- **At the Interface of Mathematical Relativity and Astrophysics (22w5025), BIRS**, 24th - 29th April 2022, Banff, Alberta, Canada and online.
- **12th Central European Relativity Seminar (CERS)**, 21st - 23rd February 2022, Budapest, Hungary and online.
- **Yukawa International Seminar 2022a: Gravity - The Next Generation**, 14th - 18th February 2022, Yukawa Institute for Theoretical Physics, Kyoto University, Japan and online.
- **JGRG Workshop 2021**, 6th - 10th December 2021, online (Waseda Univ., Tokyo, Japan).
- **Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy**, IPAM long term program, 13th September - 17th December 2021, UCLA, USA, (online participation).
 - Workshop I: Computational Challenges in Multi-Messenger Astrophysics, 4th - 8th October
 - Workshop II: Mathematical and Numerical Aspects of Gravitation, 25th - 29th October
- **Current challenges in gravitational physics workshop**, 21st - 28th April 2021, online (SISSA, Trieste, Italy).
- **Science at the Horizon: the Next-Generation EHT**, 22th - 26th February 2021, online (Harvard University).
- **11th Central European Relativity Seminar**, 11th - 13th February 2021, online (Vienna, Austria).
- **JGRG Workshop 2020**, 23rd - 27th November 2020, online (Nagoya, Japan).
- **Iberian Gravitational Wave Meeting 2020 (IGWM2020)**, 19th - 20th October 2020, online (Barcelona, Spain).
- **Advances in Computational Relativity**, ICERM long term program, 9th September - 11th December 2020, Brown University, Providence, USA, (online participation).
 - Workshop 1: Advances and Challenges in Computational Relativity, 14th - 18th September
 - Workshop 2: Mathematical and Computational Approaches for Solving the Source- Free Einstein Field Equations, 5th - 9th October
 - Workshop 3: Mathematical and Computational Approaches for the Einstein Field Equations with Matter Fields 26th - 30th October
- **Testing General Relativity using Gravitational Waves**, 13th - 14th August 2020, online (IACS and IITGN, India).
- **BHPToolkit Spring 2020 workshop**, 25th - 27th May 2020, online (Prague, Czechia).
- **LIGO and Virgo's Waveform face-to-face meeting**, 30th October - 1st November 2018, Club Pollentia Resort, Mallorca, Spain

- **Colliding Stars and Black Holes: Gravity Exploration at Cardiff**, 29th - 30th May 2018, Cardiff University, Cardiff, United Kingdom
- **Niall Fest 2018**, 24th - 26th May 2018, University College Cork, Cork, Ireland
- **LIGO and Virgo's Waveform face-to-face meeting**, 17th - 19th October 2017, Harnack Haus Berlin, Berlin, Germany
- **3rd Iberian Gravitational-Wave Meeting**, 20th - 22nd March 2013, Valencia, Spain
Organization: Department of Astronomy and Astrophysics, University of Valencia
- **CoCoNut Meeting 2012**, 24th - 26th October 2012, UIB, Palma de Mallorca, Spain
Organization: Relativity and Cosmology Group of the University of the Balearic Islands
- **Workshop on Numerical and Mathematical Relativity 2012**, 11th - 13th October 2012, Oppurg, Germany. Organization: TPI Friedrich-Schiller-Universität Jena
- **Rattle and Shine: Gravitational Wave and Electromagnetic Studies of Compact Binary Mergers**, 30th July - 3rd August 2012, KITP, Santa Barbara, United States
- **SIGRAV Graduate School - X Edition: "Astrophysical Black Holes"**, 21st - 26th May 2012, Villa Olmo, Como, Italy
- **Spring Einstein Toolkit Workshop 2012**, 3rd - 6th April 2012, Georgia Tech, Atlanta, United States
- **2nd Iberian Gravitational Wave Meeting**, 15th - 17th February 2012, Barcelona, Spain
Organization: Gravitational Wave Astronomy - LISA Group of the CSIC-IEEC
- **PRACE Winter School: Hybrid programming on Massively Parallel Architectures**, 6th - 10th February 2012, CINECA Supercomputing Center, Bologna, Italy
- **IMPRSS Lecture Week No.3**, 30th October - 4th November 2011, Palma de Mallorca, Spain
Organization: International Max Planck Research School on Gravitational Wave Astronomy
Participation: contribution to project "ET@home"
- **Astro-GR@Mallorca 2011**, 5th - 9th September 2011, UIB, Palma de Mallorca, Spain
Organization: Albert Einstein Institute and Relativity Group of UIB
- **Dynamics of General Relativity Programme**, 25th July - 14th August 2011, ESI, Universität Wien, Vienna, Austria
- **Amaldi 9 & NRDA 2011**, 10th - 15th July 2011, Cardiff University, Cardiff, United Kingdom
- **Advances and Challenges in Computational General Relativity**, 20th - 22nd May 2011, Brown University, Providence, United States
- **4th Multidark Consolider Workshop**, 4th - 6th April 2011, IFT-UAM/CSIC, Madrid, Spain
Organization: Consolider-Ingenio 2010 project "MultiDark"
- **Iberian Gravitational Waves Meeting 2011**, 2nd - 4th February 2011, UIB, Spain
Organization: Relativity and Cosmology Group of the University of the Balearic Islands
- **Summer University Strasbourg 2008**, 29th June - 5th July 2008
Institution: UFR de Sciences Physiques, Université Louis Pasteur, Strasbourg, France

Supervision of students

At Instituto Superior Técnico (IST), University of Lisbon, Portugal, unless specified otherwise:

- **Bachelor students:** Tiago Valente and Miguel Parreira (2023), André Matias (2024)
- **Master students:** Pedro Baptista and João Dinis Álvares (2023 - 2024)
- **Master student:** Inês Andrade Rainho (2021 – 2022), Rafael Pinto (2022 - 2023), co-supervision
- **PhD students:** Krinio Marouda and Christian Peterson Bórquez (2021 – present), co-supervision
- **PhD student:** Shalabh Gautam, Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India, 2017-2021, co-supervision

Panels

- Internal examiner at the **PhD defence** of Isabel Suárez Fernández, 15th July 2022.
- Internal examiner at the **master defence** of Rita Santos, 7th November 2023.

Teaching

- **Minicourse “The Wave Equation on Curved Spacetimes”**, 11th School on Astrophysics and Gravitation, 1st - 6th September 2023, CENTRA, IST, University of Lisbon, Portugal.
- **“Introduction to Numerical Relativity” PhD course**, autumn semesters 2021 and 2022, Instituto Superior Técnico, University of Lisbon, Portugal.
- **“Introduction to Numerical Relativity” module** for the course “Advanced Topics in Computational Physics”, autumn semester 2020 and spring semester 2023 (together with David Hilditch), Instituto Superior Técnico, University of Lisbon.
- **Co-teaching of course** “Advanced General Relativity and Gravitational Waves” together with Bernard Schutz, spring semester 2019, Cardiff University, UK.
- **General Relativity exercise classes**, spring semester 2011-2012, University of the Balearic Islands, Spain.

Event organization – Scientific Organising Committee

- Funding (12k€) obtained for organising the meeting **Hyperboloidal Foliations and their Application** in the beginning of 2026 at the Erwin Schrödinger Institute (ESI), Vienna, Austria
- **European Einstein Toolkit Workshop 2023**, 19th-23th June 2023, University of Aveiro, Portugal, <https://euet2023.web.ua.pt/>, part of the Scientific Organising Committee
- **Infinity on a Gridshell** (meeting on hyperboloidal topics), 10th-13th July 2023, Niels Bohr Institute, University of Copenhagen, Denmark, <https://hyperboloid.al/event/copenhagen-23/>, part of the SOC
- **Virtual Infinity Workshop 2024**, 1st-2nd July 2024, online, organiser/part of the SOC

Event organization – helper to the local organising committee

- **The 10th Anniversary of the Discovery of Gravitational Waves**, 15th-17th September 2025, ParcBit, University of the Balearic Islands, Spain, <https://grg.uib.es/10thAnniversaryGW150914/>

Outreach activities and talks

- Organization of a stand about gravity at the “Fira de la Ciència 2025” at the University of the Balearic Islands, 8th - 10th May 2025
- Participation in outreach event European Night of the Researchers, 27th Sept 2024
- Outreach article *Exploring strong gravity with GRIT*, Richard Brito, Vitor Cardoso, Francisco Duque, Edgar Gasperín, David Hilditch, Guilherme Raposo, and Alex Vañó-Viñuales, in Revista Técnica 505 Edition, aeist (March 2023).
- Member of the jury in outreach event “Es Nostro Cel” <https://es-nostro-cel.com/> (November 2022 and May 2024).
- CENTRA answers outreach video 13: *What is escape velocity?* https://youtu.be/tM_7zIVS2hk (June 2022).
- Storytelling training by Christine Watkins organised by IOP, Cardiff, UK (Oct 2017)
- Invited guest to the Award Ceremony of the “Premio Princesa de Asturias 2017”, with Research Prize awarded to Weiss, Thorne, Barish and LIGO Scientific Collaboration, Oviedo, Spain (Oct 2017)
- Review of the book *Ripples in Spacetime* by Govert Schilling: *Welcome to a new era in astronomy*, Nature Astronomy 1, 647 (2017), DOI:10.1038/s41550-017-0240-z
- Invited talk at the **UKSEDS National Student Space Conference 2017**, 4-5 March 2017, University of Exeter, United Kingdom. Title: “LIGO and the discovery of gravitational waves”
- Appearance on the outreach video LIGO: past present and future by Physics World: <https://youtu.be/NUZBi2xQ9cE> (October 2017).
- Translation to Spanish of the gravitational wave related game “Black Hole Hunter”.
- Organization of a stand with the Black Hole Hunter game at the Einstein’s Legacy Meeting, 28-29 November 2015, Queen Mary University, London, United Kingdom.
- Organization of a stand about gravitational waves in the Street Alicante Science (StAS) fair, May 2012, Alicante, Spain.
- Organization of a stand with gravitational wave related games and posters in the Faculty of Science of the University of the Balearic Islands, Palma de Mallorca, Spain.
- Translation to Catalan of the gravitational wave related game “Space Time Quest”.
- Questions for the Graviquiz of the outreach webpage “La Sinfonía del Universo”.
- Writing of several press releases about science topics in the local newspapers.

Other activities

- Panelist at **Equality, diversity and inclusion in gravity** discussion round at meeting **At the Interface of Mathematical Relativity and Astrophysics (22w5025)**, BIRS, 24th - 29th April 2022, Banff, Alberta, Canada and online.

Funding

- **Senior postdoctoral contract**

01/03/2025 - 31/12/2025, with the University of the Balearic Islands

Application centre: Relativity and Gravitation Group, IAC3, University of the Balearic Islands

- **FCT postdoctoral contract** (DOI: 10.54499/DL57/2016/CP1384/CT0090)

01/03/2019 - 28/02/2025, with FCT (Fundação para a Ciência e a Tecnologia)

Application centre: GRIT, CENTRA, IST, University of Lisbon, Portugal

- **Contract as Postdoctoral Research Associate**

01/10/2015 - 01/03/2019, with Cardiff University

Application centre: Gravitational Physics Group, Cardiff University, United Kingdom

- **PhD grant: Formación del Profesorado Universitario (FPU)**

15/12/2011 - 30/09/2015, by the (Spanish) Ministry of Education

Application center: Universitat de les Illes Balears, Palma de Mallorca, Spain

- **Predoctoral contract in the MultiDark Project, Consolider-Ingenio 2010**

20/12/2010 - 14/12/2011, by the Instituto de Física Teórica IFT-UAM/CSIC, Madrid, Spain

Application center: Univ. Autónoma de Madrid, transferred to Univ. de les Illes Balears

- **Undergraduate students' collaborative research grant**

01/12/2009 - 31/06/2010, by the (Spanish) Ministry of Education

Application center: Universitat de les Illes Balears, Palma de Mallorca, Spain

- **Undergraduate students' exchange grant, Erasmus Programme**

01/09/2008 - 31/07/2009, by the European Commission

Application center: Friedrich-Schiller-Universität Jena, Germany

Membership of collaborations and scientific societies

- **Member of SPRG** (Sociedade Portuguesa de Relatividade e Gravitação) (April 2024 - present).
- **Founding member of the Hyperboloidal Research Network** (2023 - present).
- **Member of EuCAPT** (The European Consortium for Astroparticle Theory) (October 2022 - present).
- **Member of the Einstein Telescope Collaboration** (May 2022 - present).
- **Member of the LISA Consortium** (May 2022 - present).
- **Member of the LIGO Scientific Collaboration** (March 2010 - April 2019).
- Member of the **Spanish Royal Physics Society** (RSEF), Complutense University of Madrid, Spain (Sept 2005 - present).
- In COST Action CA16104's research network “**GWverse**”, member of Working Group 2, 2021.

Other merits

- **Invited professor** at Instituto Superior Técnico, University of Lisbon, Sept 2021 - Aug 2024.
- **Proposal evaluator** for RES (Red Española de Supercomputación – Spanish Supercomputing Network) since February 2024.
- **Guest editor for journal Springer Nature** for the collection *Hyperboloidal foliations in the era of gravitational-wave astronomy: from mathematical relativity to astrophysics*, 2024.
- **Reviewer for journal Universe (MDPI)** since August 2025.
- **Reviewer for journal Entropy (MDPI)** since April 2025.
- **Reviewer for journal Physical Review Letters (APS)** since February 2025.
- **Member of Classical and Quantum Gravity's Peer Review Advisory Panel** since October 2024
- **Reviewer for journal Physica Scripta (IOP)** since July 2024.
- **Reviewer for journal Physical Review D (APS)** since November 2022.
- **Reviewer for journal Classical and Quantum Gravity (IOP)** since October 2019.
- **Co-organiser** of the Infinity Virtual Seminar series since October 2023.
- **Seminar organiser** for CENTRA, IST, University of Lisbon, Sept 2021 - July 2023.
- **Seminar organiser** for the Gravitational Physics group at Cardiff University, Sept 2016 - June 2017.
- **Honorable mention** of the 2015 GWIC and Braccini Thesis Prizes
- **Degree Outstanding Award (“Premi Extraordinari de Llicenciatura”)** (January 2011)
- **High School Outstanding Award (“Premi Extraordinari de Batxillerat”)** (July 2005)
- **Physics Olympiad 2005:**
 - National Phase in Spain: Gold Medal (8th position)
 - Ibero-American Phase in Uruguay: Gold Medal (3rd position)
- **Chemistry Olympiad 2005:** National Phase in Spain: Gold Medal (9th position)

Skills

- **Languages:** Spanish (native), Catalan (native), German (advanced), English (advanced), French (advanced), Japanese (intermediate), Chinese (intermediate), Portuguese (intermediate) and Welsh (basic).

Obtained certifications:

- **Certificate in Advanced English by the University of Cambridge** (March 2007)
- **Certificate in German as a Foreign Language (“Zertifikat Deutsch als Fremdsprache”)** by the Goethe-Institut (January 1999)
- **Chinese Proficiency Test (HSK) 4 (Intermediate)** (汉语水平考试四级) (May 2015)
- **Japanese-Language Proficiency Test N3 (Intermediate)** (日本語能力試験N3) (December 2013)

- Foundation Level Certificate in Welsh Second Language: The Use of Welsh (Sylfaen) (June 2017)
- Official School of Languages of Palma de Mallorca (EOI):
 - * Certificate in the Advanced Level of: French (2010), English (2006) and German (2004)
 - * Certificate in the Intermediate Level of: Chinese (2015)
- Computing:
 - Operating systems: Linux, Mac, Windows.
 - Programming: Fortran, C/C++, Python, PETSc, ROOT, OpenMP, MPI.
 - Experience with other software: Mathematica, Matlab, LaTex, Microsoft Office (Excel, Word, PowerPoint), SVN, Git, Photoshop, AutoCAD.
 - User of supercomputing centers: SuperMUC (Munich).

Computing allocations

Computing time awarded at Barcelona Supercomputing Center for running on MareNostrum 5:

- Far-field infrastructure study for improving binary and strong field numerical relativity simulations, 1.5 M CPUh + 0.5GPUh, AECT-2025-2-0036

Publications

A full list is under <https://inspirehep.net/authors/1503116>: 24 articles + 2 proceedings + 1 editorial.

On the hyperboloidal initial value problem – conformal compactification approach (led by me):

1. **Alex Vañó-Viñuales**, Sascha Husa and David Hilditch. Spherical symmetry as a test case for unconstrained hyperboloidal evolution. *Class. Quant. Grav.*, 32(17):175010, 2015. DOI: 10.1088/0264-9381/32/17/175010. arXiv: 1412.3827 [gr-qc]
2. **Alex Vañó-Viñuales** and Sascha Husa. Unconstrained hyperboloidal evolution of black holes in spherical symmetry with GBSSN and Z4c. *J.Phys.Conf.Ser.*, 600(1):012061, 2015. DOI: 10.1088/1742-6596/600/1/012061. arXiv: 1412.4801 [gr-qc]
3. **Alex Vañó-Viñuales** and Sascha Husa. Free hyperboloidal evolution in spherical symmetry. In *Proceedings, 14th Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Astrophysics, and Relativistic Field Theories (MG14) (In 4 Volumes): Rome, Italy, July 12-18, 2015*, volume 2, pages 2025–2030, 2017. DOI: 10.1142/9789813226609_0220. arXiv: 1601.04079 [gr-qc]. URL: <https://inspirehep.net/record/1415732/files/arXiv:1601.04079.pdf>
4. **Alex Vañó-Viñuales** and Sascha Husa. Spherical symmetry as a test case for unconstrained hyperboloidal evolution II: gauge conditions. *Class. Quant. Grav.*, 35(4):045014, 2018. DOI: 10.1088/1361-6382/aaa4e2. arXiv: 1705.06298 [gr-qc]
5. **Alex Vañó-Viñuales**. Spherically symmetric black hole spacetimes on hyperboloidal slices. *Front. Appl. Math. Stat., Sec. Statistical and Computational Physics*, 9, 2023. DOI: 10.3389/fams.2023.1206017. arXiv: 2304.05384 [gr-qc]
6. **Alex Vañó-Viñuales**. Conformal diagrams for stationary and dynamical strong-field hyperboloidal slices. *Class. Quant. Grav.*, 41(10):105003, April 2024. DOI: 10.1088/1361-6382/ad3aca. arXiv: 2311.04972 [gr-qc]. URL: <https://dx.doi.org/10.1088/1361-6382/ad3aca>

7. **Alex Vañó-Viñuales** and Tiago Valente. Height-function-based 4D reference metrics for hyperboloidal evolution. *General Relativity and Gravitation*, 56(135), November 2024. doi: 10.1007/s10714-024-03323-8. arXiv: 2408.08952 [gr-qc]
8. João D. Álvares and **Alex Vañó-Viñuales**. Free hyperboloidal evolution of the Einstein-Maxwell-Klein-Gordon system. *Class. Quant. Grav.*, 42(15):155018, 2025. doi: 10.1088/1361-6382/adf0b9. arXiv: 2505.17176 [gr-qc]
9. **Alex Vañó-Viñuales**. Hyperboloidal neutron star and black hole initial data in spherical symmetry. *Class. Quant. Grav.*, 42(19):195001, 2025. doi: 10.1088/1361-6382/ae05e4. arXiv: 2506.05467 [gr-qc]
10. João D. Álvares and **Alex Vañó-Viñuales**. Charged Scalar Field at Future Null Infinity via Nonlinear Hyperboloidal Evolution. *Phys. Rev. D*, November 2025. doi: 10.1103/w94x-d6j8. arXiv: 2506.15311 [gr-qc]

On the hyperboloidal initial value problem – dual frame approach:

11. Edgar Gasperin, Shalabh Gautam, David Hilditch and **Alex Vañó-Viñuales**. The Hyperboloidal Numerical Evolution of a Good-Bad-Ugly Wave Equation. *Class. Quant. Grav.*, 37(3):035006, 2020. doi: 10.1088/1361-6382/ab5f21. arXiv: 1909.11749 [gr-qc]
12. Shalabh Gautam, **Alex Vañó-Viñuales**, David Hilditch and Sukanta Bose. Summation by Parts and Truncation Error Matching on Hyperboloidal Slices. *Phys. Rev. D*, 103(8):084045, 2021. doi: 10.1103/PhysRevD.103.084045. arXiv: 2101.05038 [gr-qc]
13. Christian Peterson, Shalabh Gautam, Inês Rainho, **Alex Vañó-Viñuales** and David Hilditch. 3D evolution of a semilinear wave model for the Einstein field equations on compactified hyperboloidal slices. *Phys. Rev. D*, 108(2):024067, 2023. doi: 10.1103/PhysRevD.108.024067. arXiv: 2303.16190 [gr-qc]
14. Christian Peterson, Shalabh Gautam, **Alex Vañó-Viñuales** and David Hilditch. Spherical Evolution of the Generalized Harmonic Gauge Formulation of General Relativity on Compactified Hyperboloidal Slices. *Phys. Rev. D*, 110:124033, 12, December 2024. doi: 10.1103/PhysRevD.110.124033. arXiv: 2409.02994 [gr-qc]. URL: <https://link.aps.org/doi/10.1103/PhysRevD.110.124033>

Other hyperboloidal-related works:

15. Flavio Rossetti and **Alex Vañó-Viñuales**. Hyperboloidal approach for linear and non-linear wave equations in FLRW spacetimes. *Gen. Rel. Grav.*, 57:79, 2025. doi: 10.1007/s10714-025-03409-x. arXiv: 2502.20520 [gr-qc]
16. Christian Peterson, Edgar Gasperín and **Alex Vañó-Viñuales**. Numerical evolutions of the linearised conformal Einstein field equations in the inversion-Minkowski spacetime. *Gen. Rel. Grav.*, 57(5):84, 2025. doi: 10.1007/s10714-025-03415-z. arXiv: 2503.08672 [gr-qc]
17. Pedro Duarte Baptista, **Alex Vañó-Viñuales** and Adrián del Río. A numerical approach to particle creation in accelerating toy models, June 2025. arXiv: 2506.18610 [gr-qc]

With the LIGO Scientific, Virgo and KAGRA Collaborations:

18. B. P. Abbott et al. Properties of the Binary Black Hole Merger GW150914. *Phys. Rev. Lett.*, 116(24):241102, 2016. doi: 10.1103/PhysRevLett.116.241102. arXiv: 1602.03840 [gr-qc]
19. B. P. Abbott et al. Directly comparing GW150914 with numerical solutions of Einstein's equations for binary black hole coalescence. *Phys. Rev. D*, 94(6):064035, 2016. doi: 10.1103/PhysRevD.94.064035. arXiv: 1606.01262 [gr-qc]

20. Thomas D. Abbott et al. Improved analysis of GW150914 using a fully spin-precessing waveform Model. *Phys. Rev.*, X6(4):041014, 2016. doi: 10.1103/PhysRevX.6.041014. arXiv: 1606.01210 [gr-qc]
21. Benjamin P. Abbott et al. Effects of waveform model systematics on the interpretation of GW150914. *Class. Quant. Grav.*, 34(10):104002, 2017. doi: 10.1088/1361-6382/aa6854. arXiv: 1611.07531 [gr-qc]

Waveform modelling and catalogues:

22. Eleanor Hamilton, Lionel London, Jonathan E. Thompson, Edward Fauchon-Jones, Mark Hannam, Chinmay Kalaghatgi, Sebastian Khan, Francesco Pannarale and **Alex Vañó-Viñuales**. Model of gravitational waves from precessing black-hole binaries through merger and ringdown. *Phys. Rev. D*, 104(12):124027, 2021. doi: 10.1103/PhysRevD.104.124027. arXiv: 2107.08876 [gr-qc]
23. Eleanor Hamilton, Edward Fauchon-Jones, Mark Hannam, Charlie Hoy, Chinmay Kalaghatgi, Lionel London, Jonathan E. Thompson, Dave Yeeles, Shrobona Ghosh, Sebastian Khan, Panagiota Kolitsidou and **Alex Vañó-Viñuales**. Catalog of precessing black-hole-binary numerical-relativity simulations. *Phys. Rev. D*, 109(4):044032, 2024. doi: 10.1103/PhysRevD.109.044032. arXiv: 2303.05419 [gr-qc]

Further numerical work:

24. Daniela D. Doneva, **Alex Vañó-Viñuales** and Stoytcho S. Yazadjiev. Dynamical descalarization with a jump during a black hole merger. *Phys. Rev. D*, 106(6):L061502, 2022. doi: 10.1103/PhysRevD.106.L061502. arXiv: 2204.05333 [gr-qc]
25. Flavio Rossetti and **Alex Vañó-Viñuales**. Decay of solutions of the wave equation in cosmological spacetimes – a numerical analysis. *Class. Quant. Grav.*, 40(17):175004, 2023. doi: 10.1088/1361-6382/ace7a6. arXiv: 2302.06666 [gr-qc]
26. Krinio Marouda, Daniela Cors, Hannes R. Rüter, **Alex Vañó-Viñuales** and David Hilditch. Twist and higher modes of a complex scalar field at the threshold of collapse, November 2025. arXiv: 2511.04649 [gr-qc]

Editorial for the *Topical Collection-Hyperboloidal Foliations in the Era of Gravitational-Wave Astronomy: From Mathematical Relativity to Astrophysics*:

27. David Hilditch, Rodrigo Panosso Macedo, **Alex Vañó-Viñuales** and Anil Zenginoğlu. Topical Collection-Hyperboloidal Foliations in the Era of Gravitational-Wave Astronomy: From Mathematical Relativity to Astrophysics. *Gen. Rel. Grav.*, 57:131, 2025. doi: 10.1007/s10714-025-03466-2. arXiv: 2509.10981 [gr-qc]

I am also an endorser of the LISA Waveform Working Group white paper:

- Niaesh Afshordi et al. Waveform Modelling for the Laser Interferometer Space Antenna, November 2023. arXiv: 2311.01300 [gr-qc]

References

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