Andrew L. **Miller**

Assistant Professor · Gravitational waves · Dark matter

International Center for Theoretical Physics, Asia Pacific (ICTP-AP)

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Appointments

ICTP–AP / University of Chinese Academy of Sciences (UCAS) *Beijing, China*

Assistant Professor *Dec. 2025 – present*

- Building a research group focusing on gravitational-wave probes of dark matter
- Supervising two PhD students and three postdocs

Nikhef – National Institute for Subatomic Physics *Amsterdam, Netherlands*

Postdoctoral Researcher (joint with Utrecht University) *Jan. 2023 – Dec. 2025*

- Worked on anomaly-detection and machine-learning methods to classify different types of glitches in GW detectors.
- Worked with two PhD students, one Masters student and one Bachelors student on implementations of anomaly-detection methods and methods to constrain superradiance from vector boson clouds around rotating black holes.

CP3 – Centre for Cosmology, Particle Physics and Phenomenology *Louvain-la-Neuve, Belgium*

FSR Postdoctoral Fellow at Université catholique de Louvain (UCLouvain) *Jan. 2020 – Dec. 2022*

- Developed methods to detect dark matter interacting with gravitational-wave detectors; boson clouds; stochastic backgrounds; primordial black holes.
- Built up a Virgo group; organized seminars; mentored students; diversity and outreach.
- **FSR incoming postdoctoral fellowship** (Apr. 2021): 14/74 proposals selected.
- **FNRS Chargé de Recherches** (May 2022): prestigious national fellowship (declined).

University of Florida / Sapienza Università di Roma *Gainesville, FL, USA / Rome, Italy*

Graduate Student Fellow, Ph.D. student (Joint Ph.D.) *Aug. 2015 – Aug. 2019*

- Advisers: Bernard Whiting and Pia Astone.
- Graduate Student Fellowship (Aug. 2015 – Aug. 2019): pursue any research direction at UF.
- IHEPA Fellowship (Aug. – Nov. 2019): finish dissertation at ICRR, Japan.

Education

University of Florida / Sapienza Università di Roma *Gainesville, FL, USA / Rome, Italy*

PhD in Physics *Nov. 2016 – Nov. 2019*

- Thesis: Using machine learning and the Hough Transform to search for gravitational waves due to r-mode emission by isolated neutron stars.
- Grade: Summa cum laude ("Ottimo con lode").
- Supervisors: Pia Astone and Bernard Whiting.

University of Florida *Gainesville, FL, USA*

Master's of Science in Physics *Aug. 2015 – Dec. 2016*

The College of New Jersey *Ewing, NJ, USA*

Bachelor's of Science in Physics *Aug. 2011 – May 2015*

- Honors: Summa cum laude; Valedictorian of the Department of Physics.
- Merit scholarship recipient.

Grants

National Natural Science Foundation of China (NSFC)

Excellent Young Scientists Fund (Overseas) *6 Nov. 2025*

- Grant to attract researchers from any discipline. Extremely competitive.

Fellowships

Fonds de la Recherche Scientifique (FNRS)

"Chargé de recherches" postdoctoral fellowship *June 2022*

- 3-year fellowship awarded by the national science funding agency in Belgium. Extremely competitive. (Declined)

European Space Agency

Archival Research Fellowship *Jan. 2022*

- Awarded for two one-month visits to ESAC to support archival research of LISA Pathfinder data in Madrid, Spain. Very competitive.

Special Research Fund (FSR)
FSR incoming postdoctoral fellowship — *April 2021*
- 2-year fellowship awarded at the Université catholique de Louvain to support research in any discipline.
- Only 14 out of 74 proposals selected.

University of Florida
IHEPA fellowship — *Aug. 2019*
- Semester-long fellowship awarded by IHEPA to pursue PhD research at the Institute for Cosmic Ray Research (ICRR), Japan.

University of Florida
Graduate student fellowship — *March 2015*
- 4-year fellowship awarded to pursue PhD research in any discipline.
- Only 3 out of approximately 30 incoming PhD students selected.

Research Visits

Indian Institute of Astrophysics (IIA) — *Bengaluru, India*
Collaborated on a project about lensing of continuous gravitational waves by dark matter objects — *3 – 14 Nov. 2025*

IISER Kolkata and SNBNCBS — *Kolkata, India*
Developed gravitational-wave probes of neutron stars and dark energy — *29 Apr. – 2 May 2025*

Birla Institute of Technology and Science (BITS), Pilani — *Goa, India*
Developed gravitational-wave probes of neutron stars embedded in dark-matter clouds — *8 – 12 Apr. 2025*

Universitat de les Illes Balears — *Palma de Mallorca, Spain*
Worked on searches for continuous gravitational waves from isolated neutron stars and neutron stars in binaries — *30 Sept. – 4 Oct. 2024*

ICTP – AP — *Beijing, China*
Developed methods to search for mini extreme-mass-ratio inspiral systems — *July – Aug. 2024*

Indian Institute of Technology (IIT), Bombay — *Mumbai, India*
Collaborations on gravitational-wave probes of neutron stars — *24 Apr. – 3 May 2024*

Inter-University Centre for Astronomy and Astrophysics (IUCAA) — *Pune, India*
Consulted on continuous gravitational-wave searches for dark matter and neutron stars — *12 – 16 Dec. 2023*

ICTP – AP — *Beijing, China*
Developed methods to search for mini extreme-mass-ratio inspiral systems — *Sept. – Nov. 2023*

ICTP – South American Institute for Fundamental Research (SAIFR) — *São Paulo, Brazil*
Collaborations on dark-matter and gravitational-wave physics — *7 – 19 May 2023*

European Space Agency (ESA) — *Madrid, Spain*
Search for ultralight dark matter using LISA Pathfinder data — *Oct. – Nov. 2022*

Los Alamos National Laboratory — *New Mexico, USA*
Collaborations on boson clouds, atom interferometry, and neutron-star equation-of-state constraints — *12 – 18 June 2022*

AMALDI Research Center, Sapienza Università di Roma — *Rome, Italy*
Machine-learning methods for long-lived gravitational waves from young neutron stars — *Oct. – Nov. 2021*

Sapienza Università di Roma *Rome, Italy*
Direct dark-matter detection with gravitational-wave interferometers and boson-cloud searches *Oct. – Dec. 2020*

Institute for Cosmic Ray Research (ICRR) *Kashiwa, Japan*
Continuous-wave and stochastic-search methodology; KAGRA data visualization *Aug. – Nov. 2019*

Teaching Experience

Centro de Educação e Interpretação Ambiental (CEIA) *Portugal*
Lecturer, Astrocamp *20–26 Aug. 2023*

- Course title: *Gravitational-wave astrophysics: a new window into the universe*.
- Invited one-week lecture series consisting of 15 hours of lectures, 9 hours of practical/exercise classes, and 4 hours of written exams.
- Target audience: exceptionally strong high school students from Europe, the Middle East, and the United States.
- **Astrocamp website**.

University of Florida *Gainesville, FL, USA*
Teaching Assistant *Aug. 2015 – Dec. 2016*

- Course: PHY2048 — Physics with Calculus I.
- Taught during Fall 2015, Spring 2016, and Fall 2016 semesters.
- Led three classical mechanics laboratory sections or four mechanics problem-solving sessions.

Department of Physics, The College of New Jersey *Ewing, NJ, USA*
Physics Tutor *Aug. 2014 – May 2015*

- Tutored classical mechanics, electrodynamics, modern physics, and mathematical physics.

Tutoring Center, The College of New Jersey *Ewing, NJ, USA*
Physics and Math Tutor *Aug. 2013 – May 2014*

- Tutored introductory classical mechanics, electrodynamics, modern physics, mathematical physics, calculus, linear algebra, and differential equations.

Department of Physics, The College of New Jersey *Ewing, NJ, USA*
Lab Assistant *Aug. 2012 – May 2013*

- Set up and assisted with introductory classical mechanics and electrodynamics laboratory courses.

Leadership Roles

Project Manager, Paper Writing Team Chair / Co-chair, Lead Analyst
LIGO/Virgo/KAGRA collaborations *Jan. 2020 – present*

- Led and co-led multiple LVK collaboration papers as project manager, writing-team chair or co-chair, and analyst.
- O4 data: Direct search for dark-matter interactions with gravitational-wave interferometers (Jan. 2023 – present).
- O4 data: Search for gravitational waves from inspiraling primordial black holes (Jan. 2023 – present).
- O3 data: Search for dark photon dark matter (Feb. 2021 – May 2022).
- O3 data: Search for gravitational waves from boson clouds around black holes (May 2020 – May 2022).
- O3 data: "Diving below the spin-down limit: Constraints on gravitational waves from the energetic young pulsar PSR J0537–6910" (Aug. 2020 – May 2021).
- O3 data: Search for gravitational waves from three millisecond pulsars and two very young pulsars (Jan. 2020 – Oct. 2020).
- Responsible for scientific strategy, analysis coordination, result interpretation, and publication delivery.

"Junior Colloquium" Co-organizer *Amsterdam, Netherlands*
Nikhef *May 2023 – Feb. 2024*

- Coordinated an approximately bimonthly seminar series designed for PhD students to practice conference-style presentations.

Virgo Early Career Scientists (VECS) Seminar Series Co-organizer
Virgo Collaboration *Nov. 2020 – Mar. 2021*

- Co-organized a virtual seminar series promoting the research of early-career scientists within the Virgo collaboration.

Departmental Seminar Series Co-organizer *Louvain-la-Neuve, Belgium*
Université catholique de Louvain *Mar. 2020 – Dec. 2022*

- Coordinated a weekly departmental seminar series by inviting leading researchers in gravitational-wave physics.

Conference Organizing

Continuous Gravitational Waves and Neutron Stars (Link)
Co-organizer, SOC *17–20 June 2024*

Einstein Telescope Symposium (Link)
Co-organizer, LOC *6–10 May 2024*

Multi-Messenger Continuous Gravitational Waves (Link)
Main organizer, SOC and LOC *11–13 July 2023*

- First conference dedicated to detecting continuous gravitational waves from neutron stars and dark matter and fostering interaction with the astronomy community.
- Invited speakers; organized logistics; set up tutorials for newcomers to gravitational-wave astronomy.

Gravitational-wave retreat (Link)
Co-organizer *14–15 June 2023*

- Event fostering connections across instrumentation, theory, and computational GW physics.

Second Virgo LGBTQ+ STEM Day (Link)
Main organizer *18 Nov. 2022*

"When the M meets the P" (Link.)
Seminar organizer *20 Jan. 2021*

- Annual event fostering connections between mathematicians and physicists at UCLouvain; arranged a seminar on diversity.

First Virgo LGBTQ+ STEM Day (Link)
Co-organizer *18 Nov. 2020*

European Astronomical Society (EAS) Annual Meeting *Cork, Ireland*
Member of the organizing staff *22–26 June 2025*

First European Physical Society Conference on Gravitation *Rome, Italy*
Member of the organizing staff *19–21 Feb. 2019*

International Astronomical Union (IAU) General Assembly *Vienna, Austria*
Member of the organizing staff *20–31 Aug. 2018*

Fifteenth Marcel Grossmann Meeting *Rome, Italy*
Member of the organizing staff *1–7 July 2018*

Diversity Efforts

Astronomy Society of Ireland Committee
Diversity, Equity and Inclusion Officer *1 Oct. 2025 – present*

LIGO/Virgo/KAGRA collaborations
Diversity Group Member, Speaker, and Event Co-organizer *Nov. 2020 – Nov. 2022*

- Co-organized Virgo LGBTQ+ STEM Day events (2020, 2022), including identifying and inviting speakers, introducing the purpose of the event, and facilitating discussions.
- Speaker at Virgo Week diversity sessions on the importance of LGBTQ+ STEM Day and its relevance to both LGBTQ+ and non-LGBTQ+ scientists.
- Speaker on updates to the Virgo non-discrimination and anti-harassment policy (presentation delivered by Kevin Turbang).
- Co-author of the LVK mental health survey "Gauging mental health within LIGO/Virgo/KAGRA," with results presented at the LVK collaboration meeting (presentation delivered by Kamiel Janssens).

Multi-messenger Diversity Network
Speaker, Multi-messenger Diversity Network (MDN) *15–18 Nov. 2021*

- Presented at the November Virgo Week meeting in Cascina, Italy on joining and engaging with the MDN.

Virgo Scientific Collaboration
Invited Speaker, Structural Racism in Academia *6–9 July 2020*
- Invited presentation at the July Virgo Week online meeting addressing structural racism in academia.

Research Supervision

PhD Supervision

Université catholique de Louvain
Antoine Depasse *Jan. 2020 – present*
- **“Searching for boson cloud signals in LIGO and Virgo data.”**
- Role: Effective supervisor.

Université catholique de Louvain
Federico De Lillo *Jan. 2020 – May 2024*
- **“Searching for stochastic GW backgrounds with LIGO and Virgo detectors.”**
- Role: PhD mentor.
- **Current:** Postdoctoral researcher at the University of Antwerp (May 2024 – present).

Utrecht University
Melissa Lopez *Jan. 2023 – Mar. 2025*
- **“Exploring the Frontier of Transient Gravitational Wave Detection: Unleashing the Power of Machine Learning.”**
- Role: PhD thesis contributor.
- **Current:** Postdoctoral researcher at UMass Dartmouth / Utrecht University (Mar. 2025 – present).

Utrecht University
Stefano Schmidt *Jan. 2023 – May 2025*
- **“Searching for Precessing Black Hole Binaries in Gravitational-wave Data.”**
- Role: PhD thesis contributor.

MSc Supervision

INPE, Brazil
Divine Djanie *Feb. 2025 – present*
- **“Applying long short-term memory networks to continuous gravitational-wave searches for neutron stars.”**
- Co-advised with Prof. Odylio Aguiar.

University of Cologne
Charchit K. Sethi *Aug. 2023 – Mar. 2025*
- **“Pattern-recognition techniques to search for gravitational waves from inspiraling Dark-Dress primordial black holes.”**
- Co-advised with Prof. Sarah Caudill.
- **Current:** PhD student at UCAS.

Sapienza Università di Roma
Vincenzo Rella *Apr. 2021 – Oct. 2022*
- **“Search for ultra-light dark matter with gravitational-wave interferometers.”**
- Co-advised with Cristiano Palomba.
- **Current:** PhD student at ICTP–SAIFR (Oct. 2022 – present).

Undergraduate Research Supervision

City University of New York (IREU student)
Lianys Feliciano *June – Aug. 2023*
- **“Separating overlapping gravitational-wave signals from long-lived binary neutron star inspirals in Einstein Telescope using the Hough Transform.”**
- **Current:** PhD student at Rutgers University (Aug. 2024 – present).

Utrecht University
Sam Meije *Jan. – July 2023*
- **“Searching for transient gravitational waves from vector boson clouds around rotating black holes.”**
- **Current:** MSc student in Science and Business Management.

Université catholique de Louvain
Arthur Rigaux *Nov. 2021 – May 2022*
- **"Deriving new constraints on boson clouds around black holes with recent LIGO data."**
- **Current:** Graduated with an MSc in Physics from UCLouvain.

Université catholique de Louvain
Maxime Harvengt *Feb. – May 2021*
- **"Continuous gravitational waves from isolated neutron stars."**
- **Current:** Graduated with an MSc in Physics from UCLouvain.

California State University, Fullerton (IREU student)
Teresita Ramirez *May – Aug. 2019*
- **"Parameter estimation of power-law gravitational-wave signals using machine learning."**
- **Current:** PhD student (NSF Graduate Research Fellow) at Northwestern University (Aug. 2021 – present).

University of Michigan (IREU student)
Jessica Leviton *May – Aug. 2018*
- **"Inaccuracies in Correction Parameters and Long Duration Transient Source Recovery."**
- **Current:** Software engineer.

The College of Wooster (IREU student)
Avi Vajpeyi *May – Aug. 2017*
- **"Enhancing Long Transient Power Spectra with Filters."**
- **Current:** Postdoctoral fellow at the University of Auckland.

Outreach Efforts

Public Science Summaries (LVK)

Searching for planetary-mass black holes from the early Universe
Lead Author *26 Nov. 2025*
- Public-facing summary of the LVK collaboration paper "Search for planetary-mass ultra-compact binaries using data from the first part of the LIGO–Virgo–KAGRA fourth observing run."
- **Link**

Searching for elusive ultralight dark matter
Lead Author *1 Nov. 2025*
- Public-facing summary of the LVK collaboration paper "Direct multi-model dark-matter search with gravitational-wave interferometers using data from the first part of the fourth LIGO–Virgo–KAGRA observing run."
- **Link**

Observations constraining dark matter clouds around spinning black holes in our galaxy
Lead Author *1 Dec. 2021*
- Public-facing summary of the LVK collaboration paper "All-sky search for gravitational-wave emission from scalar boson clouds around spinning black holes in LIGO O3 data."
- **Link**

Ultralight dark matter eludes detection
Lead Author *27 May 2021*
- Public-facing summary of the LVK collaboration paper "Constraints on dark photon dark matter using data from LIGO's and Virgo's third observing run."
- **Link**

No mountains yet on millisecond pulsars
Lead Author *29 July 2020*
- Public-facing summary of the LVK collaboration paper "Gravitational-wave constraints on the equatorial ellipticity of millisecond pulsars."
- **Link**

Media Coverage

Nikhef
Featured in National Dutch Press *24 July 2024*
- Article highlighting our *Physical Review Letters* result constraining the existence of planetary-mass black holes.
- **Link**

American Physical Society

Featured in APS Press — *24 July 2023*

- APS press release circulated to journalists on our PRL probing the millisecond-pulsar hypothesis for the GeV excess with gravitational waves.
- **Link**

Public Webinars and Workshops

LIGO/Virgo/KAGRA Public Webinar

Invited Moderator — *24 Mar. 2022*

- *Towards understanding neutron stars with continuous gravitational waves*.
- Moderated a public webinar promoting CW searches from known sources (>100 participants).
- **Link**

LIGO/Virgo/KAGRA Public Webinar

Invited Speaker — *24 Feb. 2022*

- *Searching for continuous gravitational waves from unknown sources*.
- Public webinar on CW searches including dark photon dark matter and PBH binaries (>75 participants).
- **Link**

Gravitational-wave Open Data Workshop, Taiwan

Tutorial Contributor — *17–19 Apr. 2024*

- Negotiated and delivered the first public tutorial on continuous gravitational-wave science at this workshop, aimed at undergraduate audiences.

Outreach Articles and Talks

Halloween is Dark Matter Day!

Co-author — *31 Oct. 2020*

- Outreach article on probing dark matter with gravitational waves.
- **Link**

When the M Meets the P (IRMP)

Invited Speaker — *20 Jan. 2021*

- *Continuous gravitational waves from neutron stars*.

The College of New Jersey

Invited Outreach Speaker — *3 May 2016*

- *Gravitational waves: Theory, Detection, and Prospects*.

Pascack Hills High School Research Symposium

Invited Outreach Speaker — *22 May 2015*

- *An overview of gravitational-wave physics: experiments and data analysis techniques*.

Web and Program Management

Virgo / Belgian GW Outreach

Website Manager — *June 2020 – Dec. 2022*

- Managed `virgo-gw.be` and `gravitationalwaves.be`, highlighting Belgium's contributions to Virgo and gravitational-wave physics.

University of Florida IREU Program

Graduate Student Mentor — *Nov. 2016 – Aug. 2019*

- Mentored undergraduate researchers conducting summer research in Europe and Australia.

Awards

Major Grants and Fellowships

National Natural Science Foundation of China

NSFC Excellent Young Scientists Fund (Overseas) — *6 Nov. 2025*

- Highly competitive national grant to attract outstanding researchers from any discipline.

Fonds de la Recherche Scientifique (FNRS), Belgium

"Chargé de recherches" Postdoctoral Fellowship — *21 June 2022*

- Prestigious national fellowship supporting independent postdoctoral research across all disciplines.

European Space Agency
ESA Archival Research Visitor Program Fellowship *10 Jan. 2022*
- Support for research visits to the European Space Science Center to develop methods for searching LISA Pathfinder data for ultralight dark photon dark matter.

University of Florida
IHEPA Fellowship *Aug. – Dec. 2019*
- Competitive fellowship supporting international research activities during PhD studies.

Competitive Schools and Workshops

Les Houches School of Physics, France
Les Houches Summer School 2021: Dark Matter *26 July – 20 Aug. 2021*
- Selected to attend this prestigious international summer school focused on dark matter physics.

Aspen Center for Physics
NSF–Simons Foundation Grant *11 – 28 July 2021*
- Support to attend the workshop "Exploring Extreme Matter in the Era of Multimessenger Astronomy: from the Cosmos to Quarks," Aspen, CO, USA.

Prizes and Honors

Gravitational Wave International Committee
Honorable Mention, GWIC–Braccini Thesis Prize *14 June 2020*

Young Scientists Forum, Lviv, Ukraine
2$^{\text{nd}}$ Place, Early Career Scientists Presentations *20 Oct. 2017*
- Awarded in the Multiwavelength Astronomy and Astrophysics Section.

The College of New Jersey
Fink–Moses–Pregger Physics Award *22 May 2015*
- Awarded for the highest grade point average in the Physics Department.

The College of New Jersey
Leadership and Service Award *22 May 2015*
- Awarded for outstanding leadership and service to the Physics Department.

Sigma Pi Sigma, Phi Beta Kappa, Phi Kappa Phi
Honor Societies Inductee *15 Apr. 2015*

Travel and Conference Grants

APS April Meeting
Early Career Scientists (FECS) Grant *Feb. 2022*
- Support to attend the APS April Meeting in New York and present work on searches for boson clouds around spinning black holes.

Young Scientists Forum, Lviv, Ukraine
Travel Grant Recipient *17 – 20 Oct. 2017*
- Awarded a €100 travel grant.

International School of Physics "Enrico Fermi," Varenna, Italy
Travel Grant Recipient *3 – 12 July 2017*
- Awarded a €900 travel grant to attend the course "Gravitational Waves and Cosmology."

APS April Meeting, Baltimore, MD, USA
Travel Grant Recipient *11 – 14 Apr. 2015*
- Awarded $500 to present research at the APS April Meeting.

Service Work

Collaboration Service

Member, Speakers Committee
Designed a system for distribution of conference talk invitations to ensure equitable representation of early career scientists
May 2022 – present

Member, Continuous-Wave First Detection Readiness Committee
Served to outline the necessary criteria for detection from physics and detector characterization point of views
Jan. – Dec. 2022

Member, Diversity, Equity and Inclusion Committee
Organized events to promote DEI in physics
Jan. 2020 – Sept. 2024

Internal Reviewer
Reviewed analyses on isolated neutron stars, gravitational-wave lensing, and electromagnetic counterparts.
Feb. 2019 – present

Professional Service

Career Mentoring Fellow
American Physical Society (APS)
Sept. 2022 – present

Session Chair
Pharos Conference on Multi-Messenger Physics of Neutron Stars.
16 – 19 May 2022

Peer Review

Referee
Physical Review D, Physical Review Letters, The Astrophysical Journal
Jan. 2020 – Jan. 2023

Invited Talks [20]

Phenikaa International Symposium on Gravitational Waves, Phenikaa University
Hanoi, Vietnam
Dark matter at kHz gravitational-wave frequencies
14 – 15 Jan. 2026

The Future of Gravitational-Wave Astronomy, ICTS Bengaluru
Bengaluru, India
Prospects of dark-matter probes using gravitational-wave observations
27 – 31 Oct. 2025

XIX International Conference on Topics in Astroparticle and Underground Physics (TAUP 2025)
Xichang, China
Constraints on ultralight dark matter using data from the first part of the LIGO/Virgo/KAGRA fourth observing run (Presented by Huaike Guo on behalf of A. L. Miller)
26 – 30 Aug. 2025

Enabling Future Gravitational Wave Astrophysics in the Milli-Hertz Regime, MIAPbP
Garching, Germany
What LISA data analysis can learn from continuous gravitational-wave searches in LVK data
14 – 25 July 2025

International Conference on Frontiers of High Energy Physics (ICFHEP), IIT Bhilai
Bhilai, India
Shedding light on dark matter with gravitational waves
13 – 15 Feb. 2025

4th Beijing Dark Matter Conference (BNU Dark Matter Conference)
China
Novel probes of dark matter with gravitational waves
16 – 19 Dec. 2024

Discovering Continuous GWs with Nuclear, Astro and Particle Physics, Institute of Nuclear Theory (INT)
Seattle, WA, USA (Co-presented with Cristiano Palombo)
Exotic continuous waves and their detectability
18 – 22 Nov. 2024

XV Latin American Symposium on High Energy Physics (SILAFAE) — *Mexico City, Mexico*
Gravitational-wave restrictions on dark matter — *4 – 8 Nov. 2024*

2nd General Meeting of COST Action COSMIC WISPers — *Istanbul, Türkiye*
Ultralight dark matter detection with gravitational-wave interferometers — *3 – 6 Sept. 2024*

International Workshop on New Opportunities for Particle Physics 2024, IHEP, CAS — *Beijing, China*
Gravitational-wave interferometers as particle physics laboratories: directly probing dark matter — *19 – 21 July 2024*

Continuous Gravitational Waves School, Kavli Institute for Astronomy and Astrophysics, Peking University — *Beijing, China*
Dark matter and continuous gravitational waves — *7 – 11 July 2024*

42nd International Symposium on Physics in Collision (PIC 2023) — *Arica, Chile (online)*
Novel probes of dark matter with continuous gravitational waves — *10 – 13 Oct. 2023*

57th Rencontres de Moriond, Gravitation Session — *La Thuile, Italy*
O3 lessons: continuous-wave sources — *18 – 25 Mar. 2023*

Mini-workshop on Theory for High Energy Physics, HKUST — *Kowloon, Hong Kong*
Determining the existence of primordial black holes and ultralight dark matter using gravitational-wave detectors — *13 – 14 Jan. 2022*

Workshop on Very Light Dark Matter 2021, University of Tokyo — *Tokyo, Japan (online)*
Dark photon dark matter searches using LIGO/Virgo data — *27 – 29 Sept. 2021*

LIGO/Virgo/KAGRA Collaboration Meeting — *IJCLab, Orsay, France (online)*
Dark photon dark matter searches in LIGO/Virgo's third observing run — *6 – 9 Sept. 2021*

Exploring Extreme Matter in the Era of Multimessenger Astronomy, Aspen Center of Physics — *Aspen, CO, USA*
How to detect continuous gravitational waves from isolated neutron stars — *11 – 25 July 2021*

Belgian High Energy Physics Annual Meeting — *Belgium (online)*
Continuous gravitational waves as probes of neutron stars and dark matter in the detection era — *22 June 2020*

Congrès des Doctorants — *Paris, France*
Characterizing machine learning's capabilities to detect long-duration transient gravitational-wave signals from isolated neutron stars — *25 – 29 Mar. 2019*

1st Punjab University International Conference on Gravitation and Cosmology — *Lahore, Pakistan*
Searching for a remnant of GW170817 — *27 – 31 Jan. 2019*

Invited Seminars [44]

Phenikaa University — *Hanoi, Vietnam*
Multi-messenger astronomy with continuous gravitational waves and dark matter — *22 Jan. 2026*

Indian Institute of Astrophysics (IIA) — *Bengaluru, India*
Shedding light on dark matter with gravitational waves — *4 Nov. 2025*

Indian Institute of Astrophysics (IIA) *Bengaluru, India*
Multi-messenger astronomy with continuous gravitational waves *3 Nov. 2025*

University of Birmingham *Birmingham, UK*
Looking for imprints of dark matter in gravitational waves *30 June 2025*

Instituto de Astronomía, Universidad Nacional Autónoma de México (IA–UNAM) *Mexico City, Mexico*
Shedding light on dark matter with gravitational waves *29 May 2025*

Indian Institute of Technology Bombay *Mumbai, India*
Multi-messenger astronomy with continuous gravitational waves *17 Apr. 2025*

BITS Pilani *Goa, India*
Continuous gravitational waves: probing neutron stars and primordial black holes *12 Apr. 2025*

Malaviya National Institute of Technology (MNIT) *Jaipur, India*
Looking for imprints of dark matter in gravitational waves *20 Mar. 2025*

Network for Neutrinos, Nuclear Astrophysics, and Symmetries (N3AS), University of California Berkeley *Berkeley, CA, USA*
Exploring the dark sector with gravitational waves *21 Jan. 2025*

International Centre for Theoretical Sciences, TIFR (ICTS–TIFR) *Bengaluru, India*
Long-lived sources of gravitational waves *18 Dec. 2024*

Centro Internacional de Física Fundamental (CIFFU), BUAP *Puebla, Mexico*
Probes of dark matter with gravitational-wave detectors *15 Nov. 2024*

Universitat de les Illes Balears *Palma de Mallorca, Spain*
Long-lived sources of gravitational waves *1 Oct. 2024*

European Space Agency, ESAC *Villafranca del Castillo, Spain*
Directly detecting dark matter with gravitational-wave interferometers *16 May 2024*

Indian Institute of Technology Bombay *Mumbai, India*
Using gravitational waves to search for dark matter *25 Apr. 2024*

Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo *São Paulo, Brazil*
Long-lived sources of gravitational waves from mini-EMRIs, PBHs and BNSs *10 Apr. 2024*

Instituto Nacional de Pesquisas Espaciais (INPE) *São José dos Campos, Brazil*
Continuous waves: long-lived sources of gravitational waves from EMRIs, PBHs and BNSs *9 Apr. 2024*

University of Massachusetts Dartmouth *North Dartmouth, MA, USA*
Long-lived sources of gravitational waves *27 Mar. 2024*

Instituto de Física, Universidade de São Paulo *São Paulo, Brazil*
Probes of ultralight dark matter and primordial black holes with gravitational-wave detectors *1 Mar. 2024*

Indian Institute of Technology Bombay (remote) *Mumbai, India*
Future first detections of black holes, dark matter and neutron stars with continuous gravitational waves *26 Feb. 2024*

Université catholique de Louvain — *Louvain-la-Neuve, Belgium*
Future first detections of black holes, dark matter and neutron stars with continuous gravitational waves — *24 Jan. 2024*

Inter-University Centre for Astronomy and Astrophysics (IUCAA) — *Pune, India*
Continuous gravitational waves: an overview — *13 Dec. 2023*

Tsinghua University — *Beijing, China*
Directly detecting dark matter and neutron stars with gravitational waves — *24 Nov. 2023*

Hangzhou Institute for Advanced Study, UCAS — *Hangzhou, China*
Persistent gravitational-wave sources as probes of neutron-star and dark-matter physics — *10 Nov. 2023*

Peking University — *Beijing, China*
Exploring dark-matter candidates with continuous gravitational waves — *17 Oct. 2023*

ICTP–Asia Pacific — *Beijing, China*
Continuous gravitational-wave probes of neutron stars and dark matter — *11 Oct. 2023*

Sapienza Università di Roma — *Rome, Italy*
Inspiraling primordial black hole binaries as continuous gravitational-wave sources — *30 June 2023*

Cittadella Universitaria di Monserrato — *Cagliari, Italy*
Continuous gravitational-wave searches for neutron stars and dark matter — *28 June 2023*

CINVESTAV, Unidad Mérida — *Mérida, Yucatán, Mexico*
Continuous gravitational-wave probes of neutron stars and dark matter — *25 May 2023*

ICTP–SAIFR — *São Paulo, Brazil*
Probing neutron stars and dark matter with continuous gravitational waves — *8 – 19 May 2023*

Indian Institute of Technology Bombay — *Mumbai, India*
Probing dark matter, black holes and neutron stars with gravitational-wave detectors — *21 Feb. 2023*

Instituto de Astronomía, Universidad Nacional Autónoma de México (IA–UNAM) — *Mexico City, Mexico*
Detecting gravitational waves and dark matter using LIGO/Virgo/KAGRA — *24 Jan. 2023*

Central European Institute for Cosmology and Fundamental Physics (CEICO), Czech Academy of Sciences — *Prague, Czech Republic*
Probes of dark matter with gravitational-wave detectors — *10 Nov. 2022*

Los Alamos National Laboratory — *Los Alamos, NM, USA*
Ultralight dark-matter searches with gravitational-wave detectors — *16 June 2022*

Nikhef (online) — *Amsterdam, Netherlands*
Probing different types of dark matter with gravitational-wave detectors — *4 Feb. 2022*

Max Planck Institute for Gravitational Physics (AEI Hannover, online) — *Hannover, Germany*
Constraining the existence of very light primordial black holes using continuous gravitational-wave searches — *1 Feb. 2022*

AMALDI Research Center, Sapienza Università di Roma — *Rome, Italy*
Using gravitational-wave interferometers to directly detect dark matter — *18 Nov. 2021*

Laboratoire d'Annecy de Physique des Particules (LAPP) — *Annecy, France*
Direct detection of dark matter with gravitational-wave interferometers — *12 Nov. 2021*

Institut d'Astrophysique de Paris, GReCO Seminar Series (online) — *Paris, France*
Continuous gravitational waves as probes of neutron stars and dark matter — *21 June 2021*

Sapienza Università di Roma — *Rome, Italy*
Detecting dark matter with gravitational-wave detectors — *26 Oct. 2020*

University of Liège (online) — *Liège, Belgium*
Using continuous gravitational waves to detect neutron stars, black holes, and dark matter — *8 Oct. 2020*

University of Maastricht — *Maastricht, Netherlands*
Adapting gravitational-wave searches to detect dark photon dark matter — *27 Feb. 2020*

University of Liège — *Liège, Belgium*
Transient continuous-wave searches using machine learning and the Hough Transform — *20 Feb. 2020*

Université catholique de Louvain — *Louvain-la-Neuve, Belgium*
Using machine learning and the Hough Transform to detect gravitational waves from isolated neutron stars — *9 Jan. 2020*

University of Oslo, Institute of Theoretical Astrophysics — *Oslo, Norway*
Results of a search for a post-merger remnant of binary neutron star merger GW170817 — *14 June 2018*

Conference Talks [50]

European Astronomical Society (EAS) Annual Meeting — *Cork, Ireland*
Probing the galactic center GeV excess with gravitational waves — *22 – 26 June 2025*

New Horizons in Primordial Black Hole Physics (NEHOP 2025) — *Brussels, Belgium*
Searching for gravitational waves from inspiraling planetary-mass primordial black holes in LIGO O3 data — *19 – 22 May 2025*

Continuous Gravitational Waves and Neutron Stars Workshop, MPI for Gravitational Physics — *Hannover, Germany*
Searching for inspiraling planetary-mass primordial black holes in LIGO O3a data — *17 – 20 June 2024*

XIV Einstein Telescope Symposium — *Maastricht, Netherlands*
Localizing binary neutron star inspirals using continuous-wave methods in Einstein Telescope — *6 – 10 May 2024*

10th International Conference on Gravitation and Cosmology (ICGC) — *IIT Guwahati, India*
Novel probes of dark matter with continuous gravitational waves — *6 – 9 Dec. 2023*

September LIGO/Virgo/KAGRA Collaboration Meeting (remote) — *Toyama, Japan*
Update on searching for long-lived binary neutron star inspirals in 3G gravitational-wave detectors — *11 – 14 Sept. 2023*

Gravitational Waves meet Amplitudes in the Southern Hemisphere — *São Paulo, Brazil*
Probing neutron stars, primordial black holes and dark matter with continuous waves — *28 Aug. – 1 Sept. 2023*

New Horizons in Primordial Black Hole Physics *Napoli, Italy*
Gravitational-wave probes of planetary-mass primordial black holes *19 – 21 June 2023*

International Conference on Dark Matter and Stars (ICDMS) *Lisbon, Portugal*
Continuous gravitational-wave probes of dark matter *3 – 5 May 2023*

Galactic Center Workshop *Granada, Spain*
Gravitational-wave constraints on the pulsar explanation of the Galactic Center GeV excess *24 – 28 Apr. 2023*

APS April Meeting *Minneapolis, MN, USA*
Constraining asteroid-mass primordial black hole abundance using continuous waves *15 – 18 Apr. 2023*

LIGO/Virgo/KAGRA March Collaboration Meeting *Evanston, IL, USA*
Searching for long-lived binary neutron star inspirals in third-generation gravitational-wave detectors *14 – 17 Mar. 2023*

November Virgo Week *Cascina, Italy*
Can continuous waves tell us about the Galactic Center GeV excess? *7 – 11 Nov. 2022*

25th International Conference on Particle Physics and Cosmology (COSMO 2022) *Rio de Janeiro, Brazil*
Ultralight dark-matter searches with gravitational-wave detectors *22 – 26 Aug. 2022*

European Astronomical Society Annual Meeting *Valencia, Spain*
Searching for gravitational waves from mini-EMRIs in LIGO/Virgo *27 June – 1 July 2022*

Pharos: Multi-messenger Physics and Astrophysics of Neutron Stars (e-poster) *Rome, Italy*
Reaching below the gravitational-wave spin-down limit for “Big Glitcher” PSR J0537–6910 *16 – 19 May 2022*

12th COSPAR/CosPa Meeting: Multi-Messenger Sources and Observations *Louvain-la-Neuve, Belgium*
Continuous gravitational waves as multi-messenger probes in third-generation detectors *21 Apr. 2022*

APS April Meeting *New York, NY, USA*
Results of an all-sky search for boson clouds around spinning black holes using LIGO O3 data *9 – 12 Apr. 2022*

November Virgo Week *Cascina, Italy*
Continuous gravitational-wave constraints on planetary- and asteroid-mass primordial black holes using O3a data *15 – 18 Nov. 2021*

Belgian Gravitational-Wave Meeting *Brussels, Belgium*
Direct constraints on planetary- and asteroid-mass primordial black holes from continuous-wave searches *2 Nov. 2021*

GWVerse COST Action Global Meeting *Lisbon, Portugal*
Continuous gravitational waves as probes of primordial black holes *30 Aug. – 3 Sept. 2021*

Les Houches Summer School (gong talk) *Les Houches, France*
Gravitational-wave probes of dark matter *9 Aug. 2021*

EPS–HEP Conference (online)
Searching for dark photon dark matter in the third observing run of LIGO/Virgo *26 – 30 July 2021*

14th Edoardo Amaldi Conference on Gravitational Waves (online) *Melbourne, Australia*
Searching for dark photon dark matter in the third observing run of LIGO/Virgo *19 – 23 July 2021*

Belgian–Dutch Gravitational-Wave Meeting (online) *Amsterdam, Netherlands*
Constraints on dark photon dark matter using LIGO and Virgo O3 data *17 – 18 June 2021*

Belgian Gravitational-Wave Meeting (online) *Brussels, Belgium*
Search for dark photons with continuous-wave methods *27 Oct. 2020*

Fall LIGO/Virgo/KAGRA Collaboration Meeting (online)
Detecting gravitational waves from planetary-mass primordial black hole inspirals using the Generalized Frequency-Hough Transform *14 – 17 Sept. 2020*

TeV Particle Astrophysics Conference (TeVPA 2019) *Sydney, Australia*
First search for a remnant of GW170817 using convolutional neural networks *2 – 6 Dec. 2019*

Gravitational-Wave Physics and Astronomy Workshop (GWPAW) *Tokyo, Japan*
First search for a remnant of GW170817 using convolutional neural networks *14 – 17 Oct. 2019*

10th Young Researcher Meeting *Rome, Italy*
Using machine learning to detect gravitational waves from isolated neutron stars *18 – 21 June 2019*

LIGO–Virgo March Meeting *Lake Geneva, WI, USA*
Long-duration transient searches on O3 data using machine learning and the Generalized Frequency-Hough *18 – 21 Mar. 2019*

HEL.A.S./DAAD Summer School: Neutron Stars and Gravitational Waves *Thessaloniki, Greece*
A method to search for a remnant of GW170817 with the Frequency-Hough *8 – 12 Oct. 2018*

LIGO–Virgo September Meeting *Maastricht, Netherlands*
Update on Frequency-Hough post-merger searches *4 – 7 Sept. 2018*

ISAPP–Baikal Summer School: Exploring the Universe through Multiple Messengers *Bol'shie Koty, Russia*
Searching for a remnant of GW170817 *12 – 21 July 2018*

Astro-Solids, Dense Matter and Gravitational Waves Workshop *Seattle, WA, USA*
Searches for signals from unknown or poorly known sources (Presented by Alicia Sintes) *16 – 20 Apr. 2018*

April Virgo Week *Cascina, Italy*
Update on post-merger remnant searches using the Frequency-Hough *16 – 18 Apr. 2018*

LIGO–Virgo March Meeting *Sonoma, CA, USA*
Frequency-Hough post-merger search update *19 – 22 Mar. 2018*

YKIS2018a Symposium: General Relativity — The Next Generation *Kyoto, Japan*
Search for a remnant of GW170817 using the Hough Transform *19 – 23 Feb. 2018*

29th Texas Symposium on Relativistic Astrophysics *Cape Town, South Africa*
Post-merger remnant search for long gravitational-wave transients *3 – 8 Dec. 2017*

GW170817: Italian Contributions to the Dawn of Multi-Messenger Astronomy *L'Aquila, Italy*
Search for very long transient gravitational-wave signals from the post-merger remnant of a binary neutron star merger (Presented by Cristiano Palomba) *29 Nov. – 1 Dec. 2017*

November Virgo Week *Cascina, Italy*
Post-merger remnant searches for long gravitational-wave transients *6 – 8 Nov. 2017*

IEEE International Young Scientists Forum on Applied Physics and Engineering *Lviv, Ukraine*
Using filtering to find long-duration gravitational waves from neutron stars *17 – 20 Oct. 2017*

Ohio Section of the American Physical Society Fall Meeting *Oxford, OH, USA*
Study of a method to detect r-mode signals in white noise (Presented by Avi Vajpeyi) *13 – 14 Oct. 2017*

LIGO–Virgo September Meeting *Geneva, Switzerland*
Analyzing a machine-learning algorithm to detect gravitational waves from r-modes *28 Aug. – 1 Sept. 2017*

May Virgo Week *Cascina, Italy*
Developing a machine-learning-based method to detect long gravitational-wave transients *15 – 17 May 2017*

11th Edoardo Amaldi Conference on Gravitational Waves *Gwangju, South Korea*
How beaming of gravitational radiation from gamma-ray bursts impacts gravitational-wave detection *21 – 26 June 2015*

APS April Meeting *Baltimore, MD, USA*
An analysis of the Frequency-Hough method for an all-sky search for continuous waves *11 – 14 Apr. 2015*

AGU Fall Meeting *San Francisco, CA, USA*
How much do diurnal land–sea circulations contribute to coastal wind power? *9 – 13 Dec. 2013*

SACNAS National Conference *San Antonio, TX, USA*
Contribution of the diurnal sea breeze to wind power potential at Crystal Cove *3 – 6 Oct. 2013*

AGU Fall Meeting *San Francisco, CA, USA*
Nanoscale ice measured through in-situ ellipsometry and ESEM *3 – 7 Dec. 2012*

AGU Fall Meeting *San Francisco, CA, USA*
Environmental scanning electron microscopy of ice crystal nucleation and growth (Presented by Marco Amaral) *3 – 7 Dec. 2012*

Other Workshops

Institute for Computational and Experimental Research in Mathematics (ICERM), Brown University *Providence, RI, USA*
Scientific Machine Learning for Gravitational-Wave Astronomy *2 – 6 June 2025*

Les Houches *Les Houches, France*
Summer School 2021: Dark Matter *26 July – 20 Aug. 2021*

Aspen Center for Physics *Aspen, CO, USA*
Exploring Extreme Matter in the Era of Multimessenger Astronomy: From the Cosmos to Quarks *11 – 25 July 2021*

DomoSchool *Domodossola, Italy*
Physical and Mathematical Aspects of General Relativity *15 – 19 July 2019*

University of Urbino “Carlo Bo” *Urbino, Italy*
International School on Gravity from Earth to Space *21 – 23 May 2019*

LAPP - Laboratoire d'Annecy de Physique des Particules *Annecy, France*
Third ASTERICS–OBELICS International School on Computing for Astrophysics and Astroparticle Physics *8 – 12 Apr. 2019*

LISA Working group meeting *Arcetri Observatory, Florence, Italy*
Fundamental Physics with LISA *12 – 14 Nov. 2018*

LISA Consortium *Marseille, France*
Third LISA Consortium Meeting *5 – 7 Nov. 2018*

International School of Physics "Enrico Fermi" *Varenna, Lake Como, Italy*
Gravitational Waves and Cosmology *3 – 12 July 2017*

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Research Track

Continuous gravitational waves from isolated neutron stars

2014 – 2016

I began my career in gravitational-wave physics by studying the detection efficiency of the Frequency–Hough method for all-sky searches targeting quasi-monochromatic, long-duration signals from asymmetrically rotating neutron stars. I investigated follow-up and clustering techniques to manage billions of candidates produced in such searches and participated in a mock data challenge comparing methods for isolated neutron-star searches.
Collaborators: S. Walsh, P. Astone, B. Whiting, C. Palomba.

Location: Sapienza University of Rome; University of Florida.

Transient continuous gravitational waves from newborn neutron stars

2017 – 2018

I developed one of the first methods to search for intermediate-duration ($\mathcal{O}(\mathrm{hours}-\mathrm{days})$) gravitational waves from newborn neutron stars. The method generalized the Frequency–Hough transform to detect power-law frequency evolution and contributed to the first-ever search for a long-lived remnant of the binary neutron star merger GW170817.
Collaborators: A. Sintes, D. Keitel, L. Sun, S. Banagiri, M. Oliver.

Location: Sapienza University of Rome; University of Florida; remote.

Continuous gravitational waves from known pulsars

2020 – 2021

I managed searches for continuous gravitational waves from known pulsars using LIGO/Virgo O3 data, focusing on PSR J0537–6910, one of the most actively glitching pulsars known. This work pushed searches below the canonical spin-down limit.
Collaborators: M. Pitkin, S. Mastrogiovanni, W. Ho.

Location: Université catholique de Louvain; remote.

Machine learning for transient continuous waves

2018 – 2019

I applied artificial and convolutional neural networks to detect transient continuous gravitational waves from newborn neutron stars. These methods matched the sensitivity of the Generalized Frequency–Hough transform while being computationally cheaper and more robust to deviations from ideal power-law evolution. This framework enabled a renewed search for a GW170817 remnant and established sensitivity benchmarks for machine-learning approaches.
Collaborators: P. Astone, C. Palomba, B. Whiting, A. Mytidis.

Location: Sapienza University of Rome; University of Florida.

Machine learning for merger classification (EMBright)

2018 – 2019

I contributed to the development and review of EMBright, a nearest-neighbor classifier designed to rapidly identify whether compact binary mergers involve neutron stars. The method aids electromagnetic follow-up decisions by classifying merger remnants using parameters inferred from gravitational-wave searches.
Collaborators: D. Chatterjee, S. Ghosh, P. R. Brady, S. J. Kapadia, S. Nissanke, F. Pannarale.

Location: Sapienza University of Rome; University of Florida; remote.

Stochastic gravitational-wave backgrounds

2020 – 2023

I contributed to stochastic-background searches within the LIGO/Virgo/KAGRA collaborations, including anisotropic background analyses using O3 data. I also worked on intermittent backgrounds from compact binaries, modular infrastructures for isotropic searches, and stochastic signals from isolated neutron stars, while mentoring a PhD student in this area.
Collaborators: S. Kandhasamy, J. Suresh, F. De Lillo.

Location: Université catholique de Louvain; remote.

Machine learning for continuous gravitational waves

2021 – 2023

I applied convolutional neural networks to continuous-wave data to estimate neutron-star sky locations. After demonstrating success in Gaussian noise, I extended the analysis to realistic non-Gaussian artifacts. The approach exploits a double-Fourier-transform representation that significantly reduces parameter-space dimensionality.
Collaborators: T. S. Yamamoto, T. Tanaka, M. Sieniawska.

Location: Université catholique de Louvain; remote.

Dark matter searches: dark photons

2020 – present

I led the first LIGO/Virgo/KAGRA search for dark photon dark matter, a candidate that could directly couple to baryonic matter in interferometers. I developed an end-to-end detection pipeline for signals resembling both continuous waves and instrumental artifacts and continue to work on distinguishing different dark-matter interaction models.
Collaborators: Y. Zhao, K. Riles, H. Guo.

Location: Université catholique de Louvain; remote.

Dark matter searches: scalar boson clouds around black holes

2018 – present

I contributed to methods targeting gravitational waves from depleting scalar boson clouds around black holes and helped set constraints using LIGO/Virgo O2 and O3 data. I managed an O3 search that placed direct limits on boson and black-hole mass combinations.
Collaborators: P. Leaci, C. Palomba, L. Sun, S. D'Antonio.

Location: Sapienza University of Rome; Université catholique de Louvain; remote.

Dark matter searches: vector boson clouds in binaries

2020 – present

I mentor a PhD student developing methods to detect vector boson clouds around black holes in binary systems, where signals are stronger but shorter-lived and computationally challenging. We are designing efficient strategies to probe this unexplored dark-matter regime.
Collaborators: P. Leaci, C. Palomba, M. Sieniawska, A. Depasse.

Location: Sapienza University of Rome; Université catholique de Louvain; remote.

Dark matter searches: planetary-mass primordial black holes

2020 – present

I applied the Generalized Frequency–Hough transform to search for inspiraling planetary-mass primordial black holes. Using current and future detector sensitivities, we derived constraints on the fraction of dark matter composed of such objects, probing a mass range complementary to merger searches.

Collaborators: S. Clesse, N. Aggarwal, H. Guo, K. Sinha.

Location: Université catholique de Louvain; remote.

Probing the Galactic Center GeV excess with continuous waves

2022 – present

I used null results from all-sky continuous-wave searches to constrain millisecond pulsar populations at the Galactic Center, ruling out portions of parameter space proposed to explain the GeV excess. I am now developing targeted searches for pulsars in binaries and assessing their computational feasibility.

Collaborators: Y. Zhao.

Location: Nikhef; Utrecht University.

Binary neutron star inspirals in third-generation detectors

2022 – present

As a member of the Einstein Telescope consortium, I develop computationally efficient methods to detect binary neutron star inspirals and sub-solar-mass primordial black holes by exploiting low-frequency sensitivity, contributing to early-warning strategies for multimessenger astronomy.

Collaborators: N. Singh, C. Palomba.

Location: Nikhef; Utrecht University.

Machine learning for glitch identification and mitigation

2022 – present

I apply machine-learning techniques, including autoencoders and generative adversarial networks, to identify and classify detector glitches using statistics such as fractal dimension. This work has revealed potential new glitch classes and links to instrumental auxiliary channels.

Collaborators: S. Caudill, M. Lopez, S. Schmidt, and others.

Location: Nikhef; Utrecht University.

Publications

Authorship conventions.

Most of my research has been conducted within the LIGO/Virgo/KAGRA (LVK) collaborations, where the standard authorship practice is to list all active members alphabetically. This convention reflects the collective contributions to detector construction, commissioning, operation, data analysis, and internal review. I therefore list below only those collaboration papers to which I have made an active contribution, including analysis development, project management, writing, or internal review.

Official recognition of my contributions within the LIGO, Virgo, and KAGRA collaborations is available **here**.

Preprints (6)

[1] Zi-Xuan Wang, Xing-Yu Chen, Ju Chen, Gong Cheng, Huai-Ke Guo, and Andrew L. Miller. “Methods for Detecting Gravitational Waves from mini-Extreme-Mass-Ratio Inspirals II: A Spectral-Leakage-Aware Framework”. In: (Dec. 2025). arXiv: `2512.21739 [gr-qc]`.

I helped to guide the work and consulted on particular continuous-wave methods that were previously used in searches.

[2] Zi-Xuan Wang, Gong Cheng, Ju Chen, Huai-Ke Guo, and Andrew L. Miller. “Methods for Detecting Gravitational Waves from mini-Extreme-Mass-Ratio Inspirals I: Statistics Based on Time-Frequency Signal Tracks”. In: (Dec. 2025). arXiv: `2512.21738 [gr-qc]`.

I helped to guide the work and consulted on particular continuous-wave methods that were previously used in searches.

[3] Andrew L. Miller and Lorenzo Pierini. “BinaryGFH-v2: Improved method to search for gravitational waves from sub-solar-mass, ultra-compact binaries using the Generalized Frequency-Hough Transform”. In: (Dec. 2025). arXiv: 2512.10539 [gr-qc].

I developed an improved method to search for gravitational waves binary primordial black holes with masses between $[10^{-2}, 10^{-1}]M_{\odot}$, bridging the gap in the mass parameter space between conventional searches that target systems with masses below and above this range.

[4] A. G. Abac et al. “Search for planetary-mass ultra-compact binaries using data from the first part of the LIGO–Virgo–KAGRA fourth observing run”. In: (Nov. 2025). arXiv: 2511.19911 [gr-qc].

I lead the first LVK-wide search for gravitational waves from planetary-mass ultra-compact binaries using LIGO O4a data. I am the journal point of contact for this paper, and I lead the analysis used in this paper, which collectively placed the first stringent upper limits on planetary-mass primordial black holes.

[5] A. G. Abac et al. “Direct multi-model dark-matter search with gravitational-wave interferometers using data from the first part of the fourth LIGO-Virgo-KAGRA observing run”. In: (Oct. 2025). arXiv: 2510.27022 [astro-ph.CO].

I lead the first search for multiple kinds of dark matter – ultralight scalar, vector and tensor bosons interacting with the interferometers – using LIGO O4a data. I am the journal point of contact for this paper, I reviewed one of the analyses used in the paper, and I lead another analysis used, which all collectively placed the best upper limits to-date on the coupling strengths of scalar, vector and tensor dark matter.

[6] A. G. Abac et al. “Directed searches for gravitational waves from ultralight vector boson clouds around merger remnant and galactic black holes during the first part of the fourth LIGO-Virgo-KAGRA observing run”. In: (Sept. 2025). arXiv: 2509.07352 [gr-qc].

I reviewed one of the analysis methods employed to search for vector boson clouds from remnants of detected binary black hole mergers. I was also instrumental in developing the second analysis in this paper that targeted vector boson clouds around Cygnus X-1, and was one of the effective supervisors for the PhD student who led the search using that method.

[7] A. G. Abac et al. “The Science of the Einstein Telescope”. In: (Mar. 2025). arXiv: 2503.12263 [gr-qc].

I am involved in applications of continuous-wave techniques to future Einstein Telescope data.

[8] Huai-Ke Guo and Andrew L. Miller. “Searching for Mini Extreme Mass Ratio Inspirals with Gravitational-Wave Detectors”. In: (May 2022). arXiv: 2205.10359 [astro-ph.IM].

I calculated the expected distance reach as a function of mass ratio to gravitational waves emitted by hypothetical binary systems composed of one ordinary object and one exotic compact object with a much smaller mass than its companion orbiting around the heavier object. I also helped to conceputalize this work and contributed to developing the method, based on the Hough Transform, to search for these signals.

Selected Publications (47)

[1] Andrew L. Miller and Federico De Lillo. “Searching for continuous gravitational waves from highly deformed compact objects with DECIGO”. In: *Phys. Rev. D* 112.4 (2025), p. 042001. arXiv: 2503.03748 [gr-qc].

I determined the extent to which continuous gravitational waves from highly deformed compact objects would be detectable by DECIGO, a future space-based gravitational-wave detector. I also studied the feasibility of doing all-sky search searches in DECIGO data, showing that they are computationally inexpensive. We also studied the stochastic gravitational-wave background arising from these sources.

[2] Dana Jones, Nils Siemonsen, Ling Sun, William E. East, Andrew L. Miller, Karl Wette, and Ornella J. Piccinni. "Methodology for constraining ultralight vector bosons with gravitational wave searches targeting merger remnant black holes". In: *Phys. Rev. D* 111.6 (2025), p. 063028. arXiv: `2412.00320 [gr-qc]`.

I contributed to discussions about the development of the methodology to place constraints on vector boson clouds systems from the remannts of black hole mergers, and reviewed the code for this work.

[3] Andrew L. Miller. "Prospects for detecting asteroid-mass primordial black holes in extreme-mass-ratio inspirals with continuous gravitational waves". In: *Phys. Rev. D* 112.10 (2025), p. 103027. arXiv: `2410.01348 [gr-qc]`.

I considered the ability of methods that search for long-lived gravitational waves to constrain the abundance of asteroid-mass primordial black holes in current and future detectors.

[4] Ish Gupta et al. "Characterizing Gravitational Wave Detector Networks: From $A^\sharp$ to Cosmic Explorer". In: *Class. Quant. Grav.* 41.24 (Nov. 2024), p. 245001. arXiv: `2307.10421 [gr-qc]`.

This is a report with the details of the calculations to support the white paper [1]. Here, I computed the horizon distance reach to rotating black holes with dark matter clouds emitting gravitational waves through anniliation.

[5] Andrew L. Miller, Nancy Aggarwal, et al. "Method to search for inspiraling planetary-mass ultra-compact binaries using the generalized frequency-Hough transform in LIGO O3a data". In: *Phys. Rev. D* 110.8 (Oct. 2024), p. 082004. arXiv: `2407.17052 [astro-ph.IM]`.

I designed a method to search for planetary-mass primordial black hole inspirals and a procedure to set upper limits using LIGO O3a data.

[6] A. G. Abac et al. "Ultralight vector dark matter search using data from the KAGRA O3GK run". In: *Phys. Rev. D* 110.4 (2024), p. 042001. arXiv: `2403.03004 [astro-ph.CO]`.

I was a reviewer for one of the searches performed for ultralight vector dark matter in different channels in KAGRA data.

[7] Andrew L. Miller, Nancy Aggarwal, et al. "Gravitational Wave Constraints on Planetary-Mass Primordial Black Holes Using LIGO O3a Data". In: *Phys. Rev. Lett.* 133.11 (Sept. 2024), p. 111401. arXiv: `2402.19468 [gr-qc]`.

I ran the first-ever search for planetary-mass primordial black holes and placed stringent constraints on the fraction of dark matter that primordial black holes could compose.

[8] Sulagna Bhattacharya, Andrew L. Miller, and Anupam Ray. "Continuous gravitational waves: A new window to look for heavy nonannihilating dark matter". In: *Phys. Rev. D* 110.4 (Aug. 2024), p. 043006. arXiv: `2403.13886 [hep-ph]`.

I contributed to the intellectual design of this project, and also to calculating the expected formation rate densities of sun-like planets detectable by future space-based gravitational-wave detectors that could transmute into black holes.

[9] Andrew L. Miller, Neha Singh, and Cristiano Palomba. "Enabling multimessenger astronomy with continuous gravitational waves: Early warning and sky localization of binary neutron stars in the Einstein Telescope". In: *Phys. Rev. D* 109.4 (Feb. 2024), p. 043021. arXiv: `2309.15808 [astro-ph.IM]`.

I designed a method to search for binary neutron star inspirals in third-generation detectors that is computationally efficient and robust against noise disturbances, that can also warn astronomers of imminent mergers.

[10] Paloma Laguarta et al. "Detection of anomalies amongst LIGO's glitch populations with autoencoders". In: *Class. Quant. Grav.* 41.5 (Feb. 2024), p. 055004. arXiv: 2310.03453 [astro-ph.IM].

I contributed to the ideas behind the machine learning techniques employed in this work , and the use of the fractal dimension as a statistic to encode information about various auxiliary channels to find the origin of glitches .

[11] Andrew L. Miller and Yue Zhao. "Probing the Pulsar Explanation of the Galactic-Center GeV Excess Using Continuous Gravitational-Wave Searches". In: *Phys. Rev. Lett.* 131.8 (Sept. 2023), p. 081401. arXiv: 2301.10239 [astro-ph.HE].

I used null results from an all-sky search for gravitational waves from deformed neutron stars to constrain the existence of millisecond pulsars at the galactic center that could explain the observed GeV excess. For the first time, GW searches were used to rule out certain model parameters that predict the number of millisecond pulsars needed to explain the GeV excess.

[12] Marica Branchesi et al. "Science with the Einstein Telescope: a comparison of different designs". In: *JCAP* 07 (July 2023), p. 068. arXiv: 2303.15923 [gr-qc].

I compared the impact of different possible designs of Einstein Telescope on the detection of post-merger gravitational waves from isolated neutron stars, and determined that two 2 L-shaped interferometers provided better sensitivity than a single triangle interferometer.

[13] Andrew L. Miller and Luis Mendes. "First search for ultralight dark matter with a space-based gravitational-wave antenna: LISA Pathfinder". In: *Phys. Rev. D* 107.6 (Mar. 2023), p. 063015. arXiv: 2301.08736 [gr-qc].

I ran a search on LISA pathfinder data, taken from March 2016 - May 2017, to look for any signatures of dark matter that could have coupled to the instrument. I set the first-ever upper limits on this coupling from a space-based GW antenna that was a precursor to LISA.

[14] Federico De Lillo, Jishnu Suresh, Antoine Depasse, Magdalena Sieniawska, Andrew L. Miller, and Giacomo Bruno. "Probing ensemble properties of vortex-avalanche pulsar glitches with a stochastic gravitational-wave background search". In: *Phys. Rev. D* 107.10 (Mar. 2023), p. 102001. arXiv: 2211.16857 [gr-qc].

I provided insight into neutron star glitches, and helped to design the scope of the project to constrain the glitch sizes and rates.

[15] Magdalena Sieniawska, David Ian Jones, and Andrew Lawrence Miller. "Measuring neutron star distances and properties with gravitational-wave parallax". In: *Mon. Not. Roy. Astron. Soc.* 521.2 (Feb. 2023), pp. 1924–1930. arXiv: 2212.07506 [astro-ph.HE].

I calculated the sky resolution necessary to resolve the GW parallax effect, and determined how sensitive our methods need to be to obtain that resolution.

[16] Robert Caldwell et al. "Detection of early-universe gravitational-wave signatures and fundamental physics". In: *Gen. Rel. Grav.* 54.12 (Nov. 2022), p. 156. arXiv: 2203.07972 [gr-qc].

I contributed to this white paper by describing different types of dark matter that could interact with GW detectors.

[17] Takahiro S. Yamamoto, Andrew L. Miller, Magdalena Sieniawska, and Takahiro Tanaka. "Assessing the impact of non-Gaussian noise on convolutional neural networks that search for continuous gravitational

waves”. In: *Phys. Rev. D* 106.2 (July 2022), p. 024025. arXiv: 2206.00882 [gr-qc].

I provided insight into the non-Guassian nature of the noise in LIGO/Virgo, and expertise in how all-sky searches for neutron stars are performed in practice and convolutional neural networks.

[18] Andrew L. Miller, Francesca Badaracco, and Cristiano Palomba. “Distinguishing between dark-matter interactions with gravitational-wave detectors”. In: *Phys. Rev. D* 105.10 (May 2022), p. 103035. arXiv: 2204.03814 [astro-ph.IM].

I showed that the Wiener filter can follow-up candidate dark-matter signals interacting with gravitational-wave detectors, confirming or rejecting thems. Also, I demonstrated the effectiveness of this method to distinguish between scalar and vector dark-matter interaction signals.

[19] Federico De Lillo, Jishnu Suresh, and Andrew L. Miller. “Stochastic gravitational-wave background searches and constraints on neutron-star ellipticity”. In: *Monthly Notices of the Royal Astronomical Society* 513.1 (Apr. 2022), pp. 1105–1114. arXiv: 2203.03536 [gr-qc].

I contributed here by determining the frequency distribution of galactic neutron stars to use, and by advising the first author, a PhD student, on how to conduct the search, interpret the results, and write the paper.

[20] R. Abbott et al. “Search for gravitational waves from Scorpius X-1 with a hidden Markov model in O3 LIGO data”. In: *Phys. Rev. D* 106.6 (2022), p. 062002. arXiv: 2201.10104 [gr-qc].

I reviewed the analysis method, codes, the paper and results for this search for gravitational waves from Sco X-1, and helped interpret the upper limits on gravitational-wave strain.

[21] R. Abbott et al. “All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO and Advanced Virgo O3 data”. In: *Phys. Rev. D* 106.10 (2022), p. 102008. arXiv: 2201.00697 [gr-qc].

I placed constraints on the rates and abundance of planetary- and asteroid-mass primordial black hole binaries using upper limits obtained from these all-sky searches.

[22] R. Abbott et al. “All-sky search for gravitational wave emission from scalar boson clouds around spinning black holes in LIGO O3 data”. In: *Phys. Rev. D* 105 (10 May 2022), p. 102001. arXiv: 2111.15507 [astro-ph.HE].

I led the first all-sky LIGO/Virgo/KAGRA search for gravitational waves from boson clouds around black holes. I coordinated the scientific analyses, managed the paper writing, handled the release of data, and wrote a science summary suitable for the public.

[23] Andrew L. Miller, Nancy Aggarwal, Sébastien Clesse, and Federico De Lillo. “Constraints on planetary and asteroid-mass primordial black holes from continuous gravitational-wave searches”. In: *Phys. Rev. D* 105.6 (2022), p. 062008. arXiv: 2110.06188 [gr-qc].

I used upper limits from a continuous-wave search to put constraints on the rates and abundance of planetary- and asteroid- mass primordial black hole binary systems slowly inspiraling due to the emission of gravitational waves.

[24] R. Abbott et al. “Constraints on dark photon dark matter using data from LIGOs and Virgo’s third observing run”. In: *Phys. Rev. D* 105.6 (2022), p. 063030. arXiv: 2105.13085 [astro-ph.CO].

I led this LIGO/Virgo/KAGRA search for dark photon dark matter. I ran one of the two searches, coordinated the scientific analyses, managed the paper writing, handled the internal review of methods, and wrote a science summary suitable for the public.

[25] Iuri La Rosa, Pia Astone, Sabrina D'Antonio, Sergio Frasca, Paola Leaci, Andrew Lawrence Miller, Cristiano Palomba, Ornella Juliana Piccinni, Lorenzo Pierini, and Tania Regimbau. "Continuous Gravitational-Wave Data Analysis with General Purpose Computing on Graphic Processing Units". In: *Universe* 7.7 (2021), p. 218.

I contributed in discussions about understanding conceptually the Hough Transform, as well as how GPUs could be applied to the Generalized Frequency Hough Transform, which is a method that I developed to search for rapidly spinning down neutron stars.

[26] R. Abbott et al. "Search for anisotropic gravitational-wave backgrounds using data from Advanced LIGO and Advanced Virgo's first three observing runs". In: *Phys. Rev. D* 104.2 (2021), p. 022005. arXiv: `2103.08520 [gr-qc]`.

I co-ran the broadband radiometer analysis for this paper, which involved producing skymaps summed over all frequencies, analyzing outliers who had high signal-to-noise ratios, and producing upper limits.

[27] Andrew L. Miller, Sébastien Clesse, Federico De Lillo, Giacomo Bruno, Antoine Depasse, and Andres Tanasijczuk. "Probing planetary-mass primordial black holes with continuous gravitational waves". In: *Phys. Dark Univ.* 32 (2021), p. 100836. arXiv: `2012.12983 [astro-ph.HE]`.

I developed a method to detect primordial black hole inspirals with masses less than $10^{-3}M_{\odot}$ using the Hough Transform. I showed that advanced and future gravitational-wave detectors will be able to place physical constraints on the fraction of dark matter that primordial black holes could compose.

[28] R. Abbott et al. "Diving below the Spin-down Limit: Constraints on Gravitational Waves from the Energetic Young Pulsar PSR J0537-6910". In: *Astrophys. J. Lett.* 913 (2021), p. L27. arXiv: `2012.12926 [astro-ph.HE]`.

I managed the scientific analysis, led the writing of the paper, and contributed to discussions regarding the upper limits produced in this paper.

[29] Andrew L. Miller et al. "Probing new light gauge bosons with gravitational-wave interferometers using an adapted semi-coherent method". In: *Phys. Rev. D* 103.10 (2021), p. 103002. arXiv: `2010.01925 [astro-ph.IM]`.

I developed a method to directly detect vector bosons that may interact with baryons in gravitational-wave interferometers by judiciously varying the Fast Fourier Transform length to match the expected frequency spread of the dark matter signal.

[30] R. Abbott et al. "Gravitational-wave Constraints on the Equatorial Ellipticity of Millisecond Pulsars". In: *Astrophys. J. Lett.* 902.1 (2020), p. L21. arXiv: `2007.14251 [astro-ph.HE]`.

I managed the writing of this paper, and coordinated with astronomers and gravitational-wave physicists to ensure that the emphermides for the analyses were available.

[31] G. Intini, P. Leaci, P. Astone, S.D.' Antonio, S. Frasca, I. La Rosa, A. Miller, C. Palomba, and O. Piccinni. "A Doppler-modulation based veto to discard false continuous gravitational-wave candidates". In: *Class. Quant. Grav.* 37.22 (2020), p. 225007.

I contributed to many discussions of these vetoes that were meant to reduce the number of candidates that an all-sky search for neutron stars returned that followed a particular pattern in the sky.

[32] I. M. Romero-Shaw et al. "Bayesian inference for compact binary coalescences with bilby: validation and application to the first LIGO-Virgo gravitational-wave transient catalogue". In: *Mon. Not. Roy. Astron. Soc.* 499.3 (2020), pp. 3295–3319. arXiv: `2006.00714 [astro-ph.IM]`.

I contributed to discussions about the paper.

[33] Deep Chatterjee, Shaon Ghosh, Patrick R. Brady, Shasvath J. Kapadia, Andrew L. Miller, Samaya Nissanke, and Francesco Pannarale. "A Machine Learning Based Source Property Inference for Compact Binary Mergers". In: *Astrophys. J.* 896.1 (2020), p. 54. arXiv: 1911.00116 [astro-ph.IM].

I was an internal reviewer within LIGO for the pipeline described in this work, and contributed by suggesting many tests of the nearest neighbor machine learning algorithm that were then placed in the paper.

[34] Ornella J. Piccinni, P. Astone, S. D'Antonio, S. Frasca, G. Intini, I. La Rosa, P. Leaci, S. Mastrogiovanni, A. Miller, and C. Palomba. "Directed search for continuous gravitational-wave signals from the Galactic Center in the Advanced LIGO second observing run". In: *Phys. Rev. D* 101.8 (2020), p. 082004. arXiv: 1910.05097 [gr-qc].

I had done tests with the methodology used in this paper in the follow-up of the search for GW170817, and also read and gave comments on the paper.

[35] Cristiano Palomba et al. "Direct constraints on ultra-light boson mass from searches for continuous gravitational waves". In: *Phys. Rev. Lett.* 123 (2019), p. 171101. arXiv: 1909.08854 [astro-ph.HE].

I contributed to discussions regarding how to best map the upper limits from the second observing run to constraints on boson/black hole mass pairs.

[36] Andrew L. Miller et al. "How effective is machine learning to detect long transient gravitational waves from neutron stars in a real search?" In: *Phys. Rev. D* 100.6 (2019), p. 062005. arXiv: 1909.02262 [astro-ph.IM].

I used a convolutional neural network to search for transient gravitational waves, signals lasting of $\mathcal{O}$(hours-days) from a remnant of the first-detected binary neutron star merger GW170817, and characterized the use and sensitivity of this machine learning method in gravitational-wave searches.

[37] A. Singhal et al. "A resampling algorithm to detect continuous gravitational-wave signals from neutron stars in binary systems". In: *Class. Quant. Grav.* 36.20 (2019), p. 205015.

I contributed to discussions about how to perform sensitivity studies to test the resampling algorithm.

[38] Miquel Oliver, David Keitel, Andrew L. Miller, Hector Estelles, and Alicia M. Sintes. "Matched-filter study and energy budget suggest no detectable gravitational-wave 'extended emission' from GW170817". In: *Mon. Not. Roy. Astron. Soc.* 485 (2019), pp. 843–850. arXiv: 1812.06724 [astro-ph.HE].

I contributed to discussions about how to respond to the claim of "extended emission" to GW170817, and ran an independent analysis that also showed that no signal could have been detected.

[39] Antonis Mytidis, Athanasios Aris Panagopoulos, Orestis P. Panagopoulos, Andrew L. Miller, and Bernard Whiting. "Sensitivity study using machine learning algorithms on simulated r-mode gravitational wave signals from newborn neutron stars". In: *Phys. Rev. D* 99.2 (2019), p. 024024. arXiv: 1508.02064 [astro-ph.IM].

I finalized the paper by producing the figures demonstrating the sensitivty of the machine learning algorithm, and dealt with the round of referee comments that had been put off for years.

[40] B.P. Abbott et al. "Search for gravitational waves from a long-lived remnant of the binary neutron star merger GW170817". In: *Astrophys. J.* 875.2 (2019), p. 160. arXiv: 1810.02581 [gr-qc].

I ran the Generalized Frequency-Hough algorithm to search for a long-lived remnant of GW170817. This was one of four analyses in the paper, and I also contributed to writing the sections regarding the description and results of my analysis.

[41] S. D'Antonio et al. "Semicoherent analysis method to search for continuous gravitational waves emitted by ultralight boson clouds around spinning black holes". In: *Phys. Rev. D* 98.10 (2018), p. 103017. arXiv: 1809.07202 [gr-qc].

I tested this method on simulated boson cloud signals, and later adapted it to detect dark photon dark matter signals.

[42] S. Mastrogiovanni et al. "Phase decomposition of the template metric for continuous gravitational-wave searches". In: *Phys. Rev. D* 98.10 (2018), p. 102003. arXiv: 1808.01532 [gr-qc].

I contributed to discussions about the paper.

[43] Andrew L. Miller et al. "Method to search for long duration gravitational wave transients from isolated neutron stars using the generalized frequency-Hough transform". In: *Phys. Rev. D* 98.10 (2018), p. 102004. arXiv: 1810.09784 [astro-ph.IM].

I developed a method to search for long-lived gravitational-wave signals from remnants of neutron star mergers or supernovae explosions that follow power-law frequency evolutions.

[44] O.J. Piccinni, P. Astone, S. D'Antonio, S. Frasca, G. Intini, P. Leaci, S. Mastrogiovanni, A. Miller, C. Palomba, and A. Singhal. "A new data analysis framework for the search of continuous gravitational wave signals". In: *Class. Quant. Grav.* 36.1 (2019), p. 015008. arXiv: 1811.04730 [gr-qc].

I tested the data structures that were designed in this paper in a search for a long-lived remnant of GW170817. I also contributed to discussions about the benefits and feasibility of this approach.

[45] S. Mastrogiovanni, P. Astone, S. D'Antonio, S. Frasca, G. Intini, P. Leaci, A. Miller, C. Palomba, O.J. Piccinni, and A. Singhal. "An improved algorithm for narrow-band searches of continuous gravitational waves". In: *Class. Quant. Grav.* 34.13 (2017), p. 135007. arXiv: 1703.03493 [gr-qc].

I contributed to discussions about the paper.

[46] Sinead Walsh et al. "Comparison of methods for the detection of gravitational waves from unknown neutron stars". In: *Phys. Rev. D* 94.12 (2016), p. 124010. arXiv: 1606.00660 [gr-qc].

I quantified the sensitivity of the Frequency-Hough method to simulated neutron star signals in gravitational-wave data.

[47] NB Magee, A Miller, M Amaral, and A Cumiskey. "Mesoscopic surface roughness of ice crystals pervasive across a wide range of ice crystal conditions." In: *Atmospheric Chemistry & Physics* 14.22 (2014).

I designed a diffusion chamber to hold ice crystals that we studied, and also took images of ice crystals with a scanning electron microscope at Princeton.

Conference Proceedings (4)

[1] Quynh Lan Nguyen and Andrew L. Miller. "Dark Matter and its Effect on Gravitational Wave Signals". In: *PoS* EPS-HEP2023 (Mar. 2024), p. 132.

I contributed to the this conference proceedings by describing the kinds of dark-matter searches that could be performed using data from LIGO, Virgo and KAGRA.

[2] Charchit Kumar Sethi, Andrew L. Miller, and Sarah Caudill. "Pattern-recognition techniques to search for gravitational waves from inspiraling, dark-dressed primordial black holes". In: *59th Rencontres de Moriond*

on Gravitation. May 2025. arXiv: `2505.05546 [gr-qc]`.

I am the co-supervisor of this student's thesis, and I designed the project on which these proceedings were based.

[3] Andrew L. Miller. "Recent results from continuous gravitational wave searches using data from LIGO, Virgo, and KAGRA's third observing run". In: *57th Rencontres de Moriond on Gravitation*. May 2023. arXiv: `2305.15185 [gr-qc]`.

I wrote a conference proceedings as a contribution to the 2023 Gravitation session of the 57th Rencontres de Moriond for an invited talk in which I gave an overview of the state-of-the-art continuous gravitational-wave searches in LIGO/Virgo/KAGRA's third observing run.

[4] Andrew L. Miller and Thulsi Wickramasinghe. "How beaming of gravitational waves compares to the beaming of electromagnetic waves: impacts to gravitational wave detection". In: *J. Phys. Conf. Ser.* 716.1 (2016). Ed. by Hyung Mok Lee and John Oh, p. 012006. arXiv: `1609.09832 [astro-ph.HE]`.

I determined how beaming of gravitational waves would affect the detection of gravitational waves, and compared this to the beaming of electromagnetic waves.

Reviews (3)

[1] Andrew L. Miller. "Gravitational wave probes of particle dark matter: a review". In: *International Journal of Modern Physics D* 35.01 (Jan. 2026), p. 2530005. arXiv: `2503.02607 [astro-ph.HE]`.

This was an invited review article on gravitatoinal-wave probes of particle dark matter by the International Journal of Modern Physics D.

[2] Andrew L. Miller. "Gravitational waves from sub-solar mass primordial black holes". In: *Primordial Black Holes*. Ed. by Christian Byrnes, Gabriele Franciolini, Tomohiro Harada, Paolo Pani, and Misao Sasaki. Springer Nature Singapore, May 2025, pp. 467–494. arXiv: `2404.11601 [gr-qc]`.

This was an invited review for a book titled "Primordial Black Holes" about different ways to probe the existence of primordial black holes with gravitational waves.

[3] A. Addazi et al. "Quantum gravity phenomenology at the dawn of the multi-messenger era: A review". In: *Prog. Part. Nucl. Phys.* 125 (2022), p. 103948. arXiv: `2111.05659 [hep-ph]`.

I wrote a section in this white paper on searches for quasi-monochromatic, long-lasting gravitational-wave signals from neutron stars, primordial black hole binaries, and boson clouds around black holes.

Physics Reports (5)

[1] Matthew Evans et al. "Cosmic Explorer: A Submission to the NSF MPSAC ngGW Subcommittee". In: (June 2023). arXiv: `2306.13745 [astro-ph.IM]`.

In this white paper, I computed the distance to which we could detect gravitational waves from ultralight scalar boson clouds around rotating black holes in Cosmic Explorer.

[2] Rana X. Adhikari et al. "Report of the Topical Group on Cosmic Probes of Fundamental Physics for for Snowmass 2021". In: (Sept. 2022). arXiv: `2209.11726 [hep-ph]`.

I contributed to multiple discussions regarding the detection of dark matter with gravitational-wave interferometers.

[3] Richard Brito, Sukanya Chakrabarti, Sebastien Clesse, Cora Dvorkin, Juan Garcia-Bellido, Joel Meyers, Ken K. Y. Ng, Andrew L. Miller, Sarah Shandera, and Ling Sun. "Snowmass2021 Cosmic Frontier White Paper: Probing dark matter with small-scale astrophysical observations". In: (Mar. 2022). arXiv: `2203.15954 [hep-ph]`.

I contributed to this white paper by writing a section on how we can probe dark matter via its interactions with gravitational-wave detectors, as well as generally how to probe dark matter via astrophysical observations of small-scale structure.

[4] Andrew L. Miller et al. "Using gravitational-wave interferometers as particle detectors to directly probe the existence of dark matter". In: *Letter of Intent for Snowmass 2021* (Aug. 2020).

I led the writing of this letter of intent that was aimed at arguing that Snowmass should support efforts to directly search for ultralight dark matter with interacting directly with gravitational-wave detectors.

[5] Ling Sun, Cristiano Palomba, and Andrew L. Miller. "Snowmass2021-Letter of Interest Search for gravitational waves from ultralight boson clouds around black holes". In: *Letter of Intent for Snowmass 2021* (Aug. 2020).

I was involved in discussions for what kind of arguments we wanted to make at the Snowmass meeting to support efforts to search for boson clouds around black holes.