Curriculum vitae

PERSONAL INFORMATION

Andrew L. Miller

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

University of Chinese Academy of Sciences (UCAS), Beijing, China

andrew-l-miller.github.io/

ORCID 0000-0002-4890-7627

APPOINTMENTS

Dec. 2025 – present

Associate professor

International Center for Theoretical Physics (ICTP) – Asia Pacific

University Chinese Academy of Sciences (UCAS), Beijing, China

Jan. 2023 – Dec. 2025

Postdoctoral Researcher

Nikhef - National Institute for Subatomic Physics, Netherlands

Joint with Utrecht University, Utrecht, Netherlands

Research: Worked on anomaly-detection and machine-learning methods to classify different types of glitches in GW detectors.

Responsibilities: Worked with two PhD students, one Masters student and one Bachelors student on their implementations of anomaly-detection methods and methods to constrain superradiance from vector boson clouds around rotating black holes

Jan. 2020 – Dec. 2022

FSR Postdoctoral Fellow

Université catholique de Louvain, Belgium

Centre for Cosmology, Particle Physics and Phenomenology (CP3)

Research: Developed methods to detect dark matter interacting with gravitational-wave detectors; vector boson clouds around black holes, a stochastic background, and primordial black holes.

Responsibilities: Built up a Virgo group, organized seminars, mentored students, diversity and outreach.

First Fellowship: In April 2021, awarded a fellowship from the Special Research Fund (FSR) to support research in any discipline; competitive: only 14 out of 74 applicants were awarded this fellowship

Second Fellowship: In May 2022, awarded the prestigious Chargé de Recherches postdoctoral fellowship from the Belgian National Fund for Scientific Research (FNRS) in Belgium; extremely competitive

Aug. 2015 – Aug. 2019

Graduate Student Fellow, Ph.D. student

University of Florida / **Università di Roma, La Sapienza**, US / Italy

Joint Ph.D between USA and Italy.

Advisers: Bernard Whiting and Pia Astone

First Fellowship: Awarded **Graduate Student Fellowship** from Aug. 2015 – Aug. 2019 to pursue any research direction at the University of Florida

Second Fellowship: Awarded from the **Institute of High Energy Physics and Astrophysics (IHEPA)** from Aug. – Nov. 2019 to finish my dissertation at the Institute for Cosmic Ray Research (ICRR) in Japan.

EDUCATION

Nov. 2016 – Nov. 2019

PhD in Physics

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

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

Aug. 2015 – Dec. 2016

Master’s of Science in Physics

University of Florida, Gainesville, FL, USA

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

The College of New Jersey, Ewing, NJ, USA

Honors Summa cum laude, Valedictorian of the Department of Physics

Scholarship Awarded a merit scholarship to attend this institution

GRANTS

6 November 2025 **Excellent Young Scientists Fund (Overseas)**

National Natural Science Foundation of China (NSFC)

Grant to attract researchers from any discipline. Extremely competitive.

FELLOWSHIPS

June 2022 **"Chargé de recherches" postdoctoral fellowship**

Fonds de la Recherche Scientifique (FNRS)

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

Jan. 2022 **Archival Research Fellowship**

European Space Agency

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

April 2021 **FSR incoming postdoctoral fellowship**

Special Research Fund (FSR)

2-year fellowship awarded at the Université catholique de Louvain to support research in any discipline. Only 14 out of 74 proposals selected.

August 2019 **IHEPA fellowship**

University of Florida

Semester-long fellowship awarded by IHEPA to pursue my PhD research at the Institute for Cosmic Ray Research in Japan

March 2015 **Graduate student fellowship**

University of Florida

4-year fellowship awarded to pursue research for my PhD in any discipline. Only awarded to 3 out of about 30 incoming PhD students

RESEARCH VISITS

3 – 14 November 2025 **Indian Institute of Astrophysics (IIA)**

Bengaluru, India

Research Collaborated on project about lensing of continuous gravitational waves by dark matter objects.

29 April – 2 May 2025 **IISER Kolkata and SNBNCBS**

Kolkata, India

Research Collaborated with Prof. Arunava Mukherjee, Prof. Archan S Majumdar and his students on developing gravitational-wave probes of neutron stars and dark energy

8 – 12 April 2025 **Birla Institute of Technology and Science (BITS), Pilani**

Goa, India

Research Collaborated with Prof. Prasanta Kumar Das and his students on developing gravitational-wave probes of neutron stars embedded in dark-matter clouds

30 Sept. – 4 Oct. 2024 **Universitat de les Illes Balears**

Palma de Mallorca, Spain

Research Collaborated with Prof. David Keitel and Prof. Alicia Sintes on searches for continuous gravitational waves from isolated neutron stars and neutron stars in binary systems

July – Aug. 2024 **ICTP – Asia Pacific (AP)**

Beijing, China

Research Developed ways to search for mini-extreme-mass-ratio inspirals systems with Prof. Huaike Guo

24 April –3 May 2024 **Indian Institute of Technology (IIT), Bombay**

Mumbai, India

12–16 Dec. 2023 **Inter-University Centre for Astronomy and Astrophysics (IUCAA)**

Pune, India

Research Invited to visit Prof. Debarati Chatterjee to consult on continuous gravitational-wave searches for dark matter and neutron stars

Sept. – Nov. 2023 **ICTP – AP**

Beijing, China

Research Worked on the synergy of dark-matter and gravitational-wave physics by developing methods to search for mini extreme-mass ratio inspirals systems with Prof. Huaike Guo

7 – 19 May 2023 **ICTP – South American Institute for Fundamental Research (SAIFR)**

São Paulo, Brasil

Oct. – Nov. 2022 **European Space Agency (ESA)**

Madrid, Spain

Research Analyzed LISA Pathfinder data to look for signatures of ultralight dark matter that could have directly interacted with the test masses when this mission flew

Fellowship In January 2022, awarded a fellowship from ESA to visit the European Space Astronomy Centre to collaborate with Luis Mendes on analyzing LISA Pathfinder data for ultralight dark matter

12 – 18 June 2022 **Los Alamos National Laboratory**

New Mexico, USA

Research Collaborated with Grant Meadors, Jonah Miller, Soumi De and others on ways to improve searches for boson clouds around black holes, use atom interferometry, and constrain the neutron star equation of state

Oct. 2021 – Nov. 2021 **AMALDI Research Center, Sapienza Università di Roma**

Rome, Italy

Research Collaborated on projects related to using machine learning to detect long-lived gravitational waves from young neutron stars with Prof. Pia Astone, Prof. Paola Leaci, and Cristiano Palomba

Oct. 2020 – Dec. 2020 **Sapienza Università di Roma**

Rome, Italy

Research Collaborated on projects related to direct dark matter detection with gravitational-wave interferometers, and to detecting boson clouds around black holes

Aug. 2019 – Nov. 2019 **Institute for Cosmic Ray Research (ICRR)**

Kashiwa, Japan

Research Collaborated with KAGRA members Prof. Hideyuki Tagoshi and Jishnu Suresh on developing an estimation of significance for continuous-wave and stochastic gravitational-wave searches, and on establishing an interactive data analysis tool for plotting KAGRA data.

Fellowship Awarded a fellowship to pursue this research by IHEPA at the University of Florida.

TEACHING EXPERIENCE

20–26 Aug. 2023 **Lecturer, Astrocamp**

Centro de Educação e Interpretação Ambiental (CEIA), Portugal (**LINK**).

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, targetting exceptionally bright high school students throughout Europe, the Middle East and the US

Aug. 2015 – Dec. 2016 **Teaching Assistant**

University of Florida, Gainesville, FL, USA

PHY2048: Physics with Calculus 1

Fall 2015, spring 2016 and fall 2016 semesters

Taught three classical mechanics labs or four mechanics problem solving sessions.

Aug. 2014 – May 2015 **Physics Tutor**

Department of Physics, The College of New Jersey, Ewing, NJ, USA

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

Aug. 2013 – May 2014 **Physics and Math Tutor**

Tutoring Center, The College of New Jersey, Ewing, NJ, USA

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

Aug. 2012 – May 2013 **Lab Assistant**

Department of Physics, The College of New Jersey, Ewing, NJ, USA

Set up and assisted with introductory classical mechanics and electrodynamics labs.

LEADERSHIP ROLES

Jan. 2023 – present **Project manager, paper writing team chair and analyst**

LIGO/Virgo/KAGRA collaborations

Collaboration paper on a direct search for dark-matter interactions with gravitational-wave interferometers using data from the first part LIGO/Virgo's fourth observing run.

Responsible for the scientific output and the publication of this analysis.

Jan. 2023 – present **Project manager, paper writing team chair and analyst**

LIGO/Virgo/KAGRA collaborations

Collaboration paper on a search for gravitational waves from inspiraling primordial black holes using data from the first part LIGO/Virgo's fourth observing run.

May 2023 – Feb 2024 **"Junior Colloquim" co-organizer**

Nikhef

Coordinate approximately bimonthly seminar series at Nikhef designed for PhD students to practice giving conference talks in a safe, supportive environment.

Feb 2021 – May 2022 **Project manager, paper writing team chair and lead analyst**

LIGO/Virgo/KAGRA collaborations

Collaboration paper on a search for dark photon dark matter using data from LIGO/Virgo's third observing run.

May 2020 – May 2022 **Project manager, paper writing team chair and analyst**

LIGO/Virgo/KAGRA collaborations

Collaboration paper on a search for gravitational waves from boson clouds around black holes using data from LIGO/Virgo's third observing run.

Nov. 2020 – Mar. 2021 **Virgo Early Career Scientists (VECS) seminar series co-organizer**

Virgo collaboration

Co-organized a virtual seminar series that promotes the work of early career scientists in the Virgo collaboration.

Aug. 2020 – May 2021 **Project manager and paper writing team co-chair**

LIGO/Virgo/KAGRA collaborations

Collaboration paper titled "Diving below the spin-down limit: Constraints on gravitational waves from the energetic young pulsar PSR J0537-6910."

Co-managed the writing of the paper and the presentation/interpretation of results. Responsible for the scientific output and the publication of this analysis.

March 2020 – Dec. 2022 **Departmental seminar series co-organizer**

Université catholique de Louvain

Coordinated weekly seminar series at Université catholique de Louvain by inviting prominent gravitational-wave physicists.

Jan. 2020 – Oct. 2020 **Paper writing team co-chair**

LIGO/Virgo collaborations

Collaboration paper on a search for gravitational waves from three millisecond pulsars and two very young pulsars.

Co-managed the writing of the paper and the presentation/interpretation of results

CONFERENCE ORGANIZING

Co-organizer, SOC

17–20 June 2024 Continuous gravitational waves and neutron stars (**LINK**).

Co-organizer, LOC

6–10 May 2024 Einstein Telescope Symposium (**LINK**).

Conference dedicated to encouraging interactions in the Netherlands between gravitational-wave physicists working on machine learning.

Main organizer, SOC and LOC

11–13 July 2023 Multi-Messenger Continuous Gravitational Waves (**LINK**).

First conference dedicated to detecting continuous gravitational waves from neutron stars and dark matter, and interacting with the astronomy community for this purpose

Invited speakers, organized all logistical aspects of the conference, and set up tutorials to enable newcomers to enter the field of gravitational-wave astronomy

Co-organizer

14–15 June 2023 Gravitational-wave retreat (**LINK**).

Event meant to foster connections different people on the instrumentation, theory and computational sides of gravitational-wave physics

Main organizer

18 Nov. 2022 Second Virgo LGBTQ+ STEM Day virtual conference (**LINK**).

Seminar organizer

20 Jan. 2021 "When the M meets the P" (**LINK**).

Annual event meant to foster connections between mathematicians and physicists at UCLouvain; arranged for a seminar on diversity at this event

Co-organizer

18 Nov. 2020 First Virgo LGBTQ+ STEM Day virtual conference (**LINK**).

Member of the Organizing staff

22–26 June 2025 European Astronomical Society (EAS) annual meeting, Cork, Ireland

19–21 Feb. 2019 First European Physical Society Conference on Gravitation, Rome, Italy.

20–31 Aug. 2018 International Astronomical Union (IAU) General Assembly, Vienna, Austria.
1–7 July 2018 Fifteenth Marcel Grossmann Meeting, Rome, Italy.

DIVERSITY EFFORTS

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

18 November 2022 **Co-organizer, Virgo LGBTQ+ STEM day**
Found speakers to discuss their research and experiences of LGBTQ+ advocacy in academia

7–11 November 2022 **Speaker,** The importance of LGBTQ+ STEM day
Presented at the Virgo week diversity session about why this event matters to both LGBTQ+ and non-LGBTQ+ scientists, and our plans for the event

15–18 November 2021 **Speaker,** Joining the Multi-messenger Diversity Network (MDN)
Presented at the November Virgo week, Cascina, Italy

19–22 April 2021 **Speaker,** Updating the Virgo non-discrimination and anti-harassment policy
Presented (by Kevin Turbang) online to the April Virgo week, Cascina, Italy

15–18 March 2021 **Co-author,** Mental health survey: Gauging mental health within LIGO/Virgo/KAGRA
Presented (by Kamiel Janssens) online to the LIGO/Virgo/KAGRA collaboration meeting, Milwaukee, WI, USA.

18 November 2020 **Co-organizer, Virgo LGBTQ+ STEM day**
Introduced purpose of LGBTQ+ in STEM day, facilated discussions, found speakers for event

6–9 July 2020 **Invited speaker,** Structural racism in academia
Invited presentation at the online July Virgo Week meeting, Cascina, Italy.

RESEARCH SUPERVISION

Feb. 2025–present Co-advising (with Prof. Odylio Aguiar) the Masters thesis of Divine Djanie at Instituto Nacional de Pesquisas Espaciais (INPE, National Institute for Space Research), Brazil
"Applying long short-term memory networks to continuous gravitational-wave searches for neutron stars"

Aug. 2023–March 2025 Directed (with Prof. Sarah Caudill) the Masters thesis of Charchit K. Sethi at Cologne University
"Pattern-recognition techniques to search for gravitational waves from inspiraling Dark-Dress primordial black holes".
Current: PhD student, UCAS.

Jan. 2023–March 2025 Helped with the Ph.D. thesis of Melissa Lopez at Utrecht University
"Exploring the Frontier of Transient Gravitational Wave Detection: Unleashing the Power of Machine Learning"
Current: Postdoc at UMass Darthmouth / Utrecht University (March 2025–present).

Jan. 2023–May 2025 Helped with the Ph.D. thesis of Stefano Schmidt at Utrecht University.
"**Searching for Precessing Black Hole Binaries in Gravitational-wave Data**"

April 2021–Oct. 2022 Co-advised (with Cristiano Palomba) Masters thesis of Vincenzo Rella at Sapienza Università.
"Search for ultra-light dark matter with gravitational-wave interferometers".
Current: PhD student at ICTP-SAIFR, (Oct. 2022 –present).

Jan. 2020–May 2024 Mentor during the Ph.D. thesis of Federico De Lillo at Université catholique de Louvain.
"Searching for stochastic GW backgrounds with LIGO and Virgo detectors"
Current: Postdoc at University of Antwerp (May 2024–present).

Jan. 2020–present Effective supervisor of the Ph.D. thesis of Antoine Depasse at Université catholique de Louvain.
"Searching for boson cloud signals in LIGO and Virgo data".

UNDERGRADUATE RESEARCH SUPERVISION

June – Aug. 2023 Lianys Feliciano, IREU student from City University of New York.
"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).

Jan.–July 2023 Sam Meije, Bachelors student at Utrecht University.
"Searching for transient GWs from vector boson clouds around rotating black holes".
Current: Science and Business Management Masters student.

Nov. 2021–May 2022 Arthur Rigaux, Bachelors student at UCLouvain.
"Deriving new constraints on boson clouds around black holes with recent LIGO data."
Current: Graduated with a Masters in Physics from UCLouvain.

Feb.–May 2021 Maxime Harvengt, Bachelors student at UCLouvain.
Current: Graduated with a Masters in Physics from UCLouvain.
"Continuous gravitational waves from isolated neutron stars".

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

May–Aug. 2018 Jessica Leviton, IREU student from University of Michigan, MI, USA.
"Inaccuracies in Correction Parameters and Long Duration Transient Source Recovery".
Current: Software engineer.

May–Aug. 2017 Avi Vajpeyi, IREU student from The College of Wooster, OH, USA.
"Enhancing Long Transient Power Spectra with Filters".
Current: Postdoctoral fellow at University of Auckland.

OUTREACH EFFORTS

26 November 2025 **Lead Author, Science Summary**
Searching for planetary-mass black holes from the early Universe
Summary for the public of an 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**

1 November 2025 **Lead Author, Science Summary**
Searching for elusive ultralight dark matter
Summary for the public of an 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**

24 July 2024 **Featured in the national Dutch press**
Article written about our PRL constraining the existence of planetary-mass black holes, **LINK**

17–19 April 2024 **Tutorial Contributor**
Gravitational-wave Open Data Workshop, Taiwan
I negotiated to have a tutorial given on continuous gravitational-wave science at this workshop aimed at educating undergraduate students about how the LIGO/Virgo collaborations conduct searches for long-lived signals, in contrast to the short-lived mergers of compact objects. Until this workshop, continuous-wave science had no representation to the public.

24 July 2023 **Featured in the American Physical Society press**
A news blurb circulated to journalists was written about our PRL probing the millisecond pulsar hypothesis to the GeV excess with gravitational waves, **LINK**

24 Mar. 2022 **Invited moderator of LIGO webinar**
Towards understanding neutron stars with continuous gravitational waves
I moderated this LIGO/Virgo/KAGRA webinar to promote continuous-wave searches from known sources; over 100 participants, **LINK**

24 Feb. 2022 **Invited speaker at LIGO webinar**

Searching for continuous gravitational waves from unknown sources

Webinar to promote continuous-wave searches; spoke about the search we performed for dark photon dark matter and primordial black hole binaries; over 75 participants, **LINK**

1 Dec. 2021 **Lead Author, Science Summary**

Observations constraining dark matter clouds around spinning black holes in our galaxy

Summary for the public of an LVK collaboration paper "All-sky search for gravitational wave emission from scalar boson clouds around spinning black holes in LIGO O3 data", **LINK**

27 May 2021 **Lead Author, Science Summary**

Ultralight dark matter eludes detection

Summary for the public of an LVK collaboration paper "Constraints on dark photon dark matter using data from LIGO's and Virgo's third observing run", **LINK**

20 Jan. 2021 **Speaker**

Continuous gravitational waves from neutron stars

Talk given to the Institute for Research and Mathematics at the annual "When the M meets the P" event that fosters collaborations between Mathematicians with Physicists at the Institute

31 Oct. 2020 **Co-author**

Halloween is Dark Matter Day!

Outreach article on how GWs can be used to probe the existence of dark matter, **LINK**

29 July 2020 **Lead Author, Science Summary**

No mountains yet on millisecond pulsars

Summary for the public about an LVK collaboration paper "Gravitational-wave constraints on the equatorial ellipticity of millisecond pulsars", **LINK**

June 2020 – Dec. 2022 **Website manager**

Managed virgo-gw.be and gravitatationalwaves.be, websites that highlight Belgium's contributions to Virgo and to gravitational-wave physics as a whole, respectively.

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

University of Florida International Research Experience for Undergraduates (IREU) program

Mentored undergraduates who travel to Europe or Australia to do research each summer.

3 May 2016 **Invited Speaker for outreach talk**

Gravitational waves: Theory, Detection, and Prospects given to The College of New Jersey.

22 May 2015 **Invited Speaker for outreach talk**

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

given to the Pascack Hills High School Research Symposium.

AWARDS

6 November 2025 **NSFC Excellent Young Scientists Fund (Overseas)**

National Natural Science Foundation (NSFC) grant to attract researchers from any discipline. Extremely competitive.

21 June 2022 **'Chargé de recherches" (postdoctoral) fellowship**

The Fonds de la Recherche Scientifique (FNRS)

National fellowship in Belgium to support research in any discipline. Extremely competitive.

February 2022 **Early Career Scientists (FECS) grants**

Support to attend the April 2022 APS meeting in New York and present my work on searching for boson clouds around spinning black holes

10 Jan. 2022 **ESA Archival Research Visitor Program Fellowship**

Support to visit the European Space Science Center and develop methods to search LISA Pathfinder data for ultralight dark photon dark matter

26 July – 20 August 2021 **Les Houches Summer School 2021: Dark Matter**

Admitted to this prestigious summer school in Les Houches, France.

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

14 June 2020 **Honorable Mention, GWIC-Braccini Thesis Prize**

Aug. – Dec. 2019 **IHEPA fellowship**

20 Oct. 2017 **2nd place, Early Career Scientists Presentations**
In the Multiwavelength Astronomy and Astrophysics Section at the Young Scientists Forum in Lviv, Ukraine.

17–20 Oct. 2017 **Travel grant recipient**
Awarded a €100 travel grant to attend the Young Scientists Forum in Lviv, Ukraine

3–12 July 2017 **Travel grant recipient**
Awarded a €900 grant to attend International School of Physics "Enrico Fermi" - Varenna, Lake Como, Italy Course on: Gravitational Waves and Cosmology

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

22 May 2015 **Leadership and services award**
Awarded to the most active leader for their services to The College of New Jersey physics department.

15 April 2015 **Honor societies inductee**
Sigma Pi Sigma, Phi Beta Kappa, and Phi Kappa Phi

11-14 April 2015 **Travel grant recipient**
Awarded $500 to present at the April APS meeting, Baltimore, MD, USA

SKILLS

Excellent communicator, independent and collaborative researcher, experienced data analyst with expertise in machine learning, signal processing, statistics, Matlab, and Python

SERVICE WORK

May. 2022 – present **Member**, Speakers committee for the Virgo Scientific Collaboration

Sept. 2022 – present **Career Mentoring Fellow**, American Physical Society

Jan.–Dec. 2022 **Member**, Continuous-wave first detection readiness committee for LIGO/Virgo/KAGRA

16–19 May 2022 **Session Chair**, Pharos conference on multi-messenger physics of neutron stars

Jan. 2020–Sept. 2024 **Member**, Virgo Diversity, Equity and Inclusion Committee

Jan. 2020–Jan. 2023 **Referee** for Physical Review D, Letters and Astrophysical Journal

Feb. 2019–present **Reviewer** within the LIGO/Virgo/KAGRA collaboration for analyses that search for isolated neutron stars, gravitational-wave lensing, and electromagnetic counterparts

INVITED TALKS [19]

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

26–30 Aug. 2025 Constraints on ultralight dark mater using data from the first part of the LIGO/Virgo/KAGRA 4th observing run
Presented by Huaike Guo on behalf of A.L.M. to XIX International Conference on Topics in Astroparticle and Underground Physics (**TAUP2025**), Xichang, Sichuan Province, China

14–25 July 2025 What LISA data analysis can learn from continuous gravitational-wave searches in LVK data
Presented to Enabling Future Gravitational Wave Astrophysics in the Milli-Hertz Regime, **MI-APbP - Munich Institute for Astro-, Particle and BioPhysics**, Garching, Germany

13–15 Feb. 2025	Shedding light on dark matter with gravitational waves Presented to the International Conference on Frontiers of High Energy Physics (ICFHEP), IIT Bhilai, Bhilai, India
16–19 Dec. 2024	Novel probes of dark matter with gravitational waves Presented to the 4th Beijing dark matter conference (BNU dark matter conference), China
18–22 Nov. 2024	Exotic Continuous waves and their detectability Co-presented to the Discovering Continuous GW with Nuclear, Astro and Particle Physics, **Institute of Nuclear Theory (INT), University of Washington**, Seattle, WA, USA
4–8 Nov. 2024	Gravitational-wave restrictions on dark matter Presented to the **XV Latin American Symposium on High Energy Physics (SILAFAE)**, Cinvestav, Mexico City, Mexico
3–6 Sept. 2024	Ultralight dark matter detection with gravitational-wave interferometers Co-presented to the 2nd General Meeting of COST Action COSMIC WISPers, Istinye University, Istanbul, Türkiye
19–21 July 2024	Gravitational-wave interferometers as particle physics laboratories: directly probing dark matter Presented to the International Workshop on New Opportunities for Particle Physics 2024, Institute of High Energy Physics, Chinese Academy of Sciences, Beijing, China
7–11 July 2024	Dark matter and continuous gravitational waves Presented to the Continuous Gravitational Waves School, **Kavli Institute for Astronomy and Astrophysics, Peking University**, Beijing, China
10–13 Oct. 2023	Novel probes of dark matter with continuous gravitational waves Presented online to the **42nd International Symposium on Physics in Collision (PIC 2023)**, Arica, Chile
18–25 March 2023	O3 Lessons – Continuous-wave sources Presented to the **57th Rencontres de Moriond, Gravitation session**, La Thuile, Italy
13-14 Jan. 2022	Determining the existence of primordial black holes and ultralight dark matter using gravitational-wave detectors Presented online to the Mini-workshop on Theory for High Energy Physics, Hong Kong University of Science and Technology, Kowloon, Hong Kong
27-29 Sept. 2021	Dark photon dark matter searches using LIGO/Virgo data Presented to the virtual Workshop on Very Light Dark Matter 2021, University of Tokyo, Tokyo, Japan
6-9 Sept. 2021	Dark Photon Dark Matter searches in LIGO/Virgo's third observing run Presented to the virtual LIGO/Virgo/KAGRA collaboration meeting in a panel discussion on dark matter searches with gravitational-wave detectors, IJCLab, Orsay, France
11–25 July 2021	How to detect continuous gravitational waves from isolated neutron stars Presented to the workshop "Exploring Extreme Matter in the Era of Multimessenger Astronomy: from the Cosmos to Quarks", **Aspen Center of Physics**, Aspen, CO, USA
22 June 2020	Continuous gravitational waves as probes of neutron stars and dark matter in the detection era Presented online to the Belgian High Energy Physics annual meeting, Belgium.
25–29 March 2019	Characterizing machine learning's capabilities to detect long duration transient gravitational-wave signals from isolated neutron stars Presented to the Congrès des doctorants (conference of Ph.D. students), Paris, France.
27–31 Jan. 2019	Searching for a remnant of GW170817 Presented to the 1st Punjab University International Conference on Gravitation and Cosmology, Lahore, Pakistan.

INVITED SEMINARS [43]

4 November 2025	Shedding light on dark matter with gravitational waves Presented to the IIA, Bengaluru, India

3 November 2025	Multi-messenger astronomy with continuous gravitational waves Presented to the **IIA**, Bengaluru, India
30 June 2025	Looking for imprints of dark matter in gravitational waves Presented to the University of Birmingham, Birmingham, UK
29 May 2025	Shedding light on dark matter with gravitational waves Presented to the Instituto de Astronomía Universidad Nacional Autónoma de México (**IA-UNAM**), Mexico City, Mexico
17 April 2025	Multi-messenger astronomy with continuous gravitational waves Presented to **IIT Bombay**, Mumbai, India
12 April 2025	Continuous gravitational waves: Probing neutron stars and primordial black holes Presented to BITS Pilani, Goa, India
20 Mar. 2025	Looking for imprints of dark matter in gravitational waves Presented to the Malaviya National Institute of Technology (MNIT), Jaipur, India
21 Jan. 2025	Exploring the dark sector with gravitational waves Presented to the Network for Neutrinos, Nuclear Astrophysics, and Symmetries (N3AS), **University of Berkeley**, Berkeley, California, USA
18 Dec. 2024	Long-lived sources of gravitational waves Presented to the International Centre for Theoretical Sciences, TATA Institute for Fundamental Research (**ICTS-TIFR**), Bengaluru, India
15 Nov. 2024	Probes of dark matter with gravitational-wave detectors Presented to the Centro Internacional de Física Fundamental (CIFFU), Benemérita Universidad Autónoma de Puebla, Puebla, Mexico
1 October 2024	Long-lived sources of gravitational waves Presented to the Universitat de les Illes Balears, Palma de Mallorca, Spain
16 May 2024	Directly detecting dark matter with gravitational-wave interferometers Presented to the **European Space Agency (ESA)**, European Space Astronomy Centre (ESAC), Villafranca del Castillo, Spain
25 April 2024	Using gravitational waves to search for dark matter Presented to **IIT Bombay**, Mumbai, India
10 April 2024	Long-lived sources of gravitational waves from mini-EMRIs, PBHs and BNSs Presented to Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, São Paulo, Brasil
9 April 2024	Continuous waves: long-lived sources of gravitational waves from EMRIs, PBHs and BNSs Presented to **INPE – Instituto Nacional de Pesquisas Espaciais**, São José dos Campos, São Paulo, Brasil
27 March 2024	Long-lived sources of gravitational waves Presented to the University of Massachusetts-Dartmouth, North Dartmouth, MA, USA
1 March 2024	Probes of ultralight dark matter and primordial black holes with gravitational-wave detectors Presented to the Instituto de Física, **Universidade de São Paulo (USP)**, São Paulo, Brasil
26 February 2024	Future first detections of black holes, dark matter and neutron stars with continuous gravitational waves Presented remotely to the IIT, Bombay, Mumbai, India
24 January 2024	Future first detections of black holes, dark matter and neutron stars with continuous gravitational waves Presented to the université catholique de Louvain, Louvain-la-Neuve, Belgium
13 December 2023	Continuous gravitational waves: an overview Presented to **IUCAA**, Pune, India
24 November 2023	Directly detecting dark matter and neutron stars with gravitational waves Presented to the Astronomy Department at **Tsinghua University**, Beijing, China

10 November 2023	Persistent gravitational-wave sources as probes of neutron-star and dark-matter physics Presented to the Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences (HIAS, UCAS), Hangzhou, China
17 October 2023	Exploring dark-matter candidates with continuous gravitational waves Presented to **Peking University**, Beijing, China
11 October 2023	Continuous gravitational-wave probes of neutron stars and dark matter Presented to ICTP-AP, Beijing, China
30 Jun 2023	Inspiraling primordial black hole binaries as continuous gravitational-wave sources Presented to Univeristà di Roma, La Sapienza, Rome, Italy
28 June 2023	Continuous gravitational-wave searches for neutron stars and dark matter Presented to the Cittadella Universitaria di Monserrato, Cagliari, Italy
25 May 2023	Continuous gravitational-wave probes of neutron stars and dark matter Presented to The Center for Research and Advanced Studies (Centro de Investigación y de Estudios Avanzados, Unidad Mérida), Mérida, Yucatan, Mexico
8–19 May 2023	Probing neutron stars and dark matter with continuous gravitational waves Presented to **ICTP-SAIFR**, São Paulo, Brasil
21 Feb. 2023	Probing dark matter, black holes and neutron stars with gravitational-wave detectors Presented to the IIT Bombay, Mumbai, India
24 Jan. 2023	Detecting gravitational waves and dark matter using LIGO/Virgo/KAGRA Presented to the Instituto de Astronomía Universidad Nacional Autónoma de México (**IA-UNAM**), Mexico City, Mexico
10 Nov. 2022	Probes of dark matter with gravitational-wave detectors Presented to the Central European Institute for Cosmology and Fundamental Physics (CEICO) within the Institute of Physics of the Czech Academy of Sciences, Prague, Czech Republic
16 June 2022	Ultralight dark-matter searches with gravitational-wave detectors Presented to **Los Alamos National Lab**, Los Alamos, New Mexico, USA
4 Feb. 2022	Probing different types of dark matter with gravitational-wave detectors Presented online to Nikhef, Amsterdam, Netherlands
1 Feb. 2022	Constraining the existence of very light primordial black holes using results from continuous gravitational-wave searches Presented online to the **Max Planck Institut f. Gravitationsphysik (AEI Hannover)**, Hannover, Germany
18 Nov. 2021	Using gravitational-wave interferometers to directly detect dark matter Presented to the AMALDI Research Center at the Sapienza University of Rome, Rome, Italy
12 Nov. 2021	Direct detection of dark matter with gravitational-wave interferometers Presented to **Laboratoire d'Annecy De Physique Des Particules (LAAP)**, Annecy, France
21 June 2021	Continuous gravitational waves as probes of neutron stars and dark matter Presented online to Institut d'Astrophysique de Paris, GReCO seminar series, Paris, France.
26 Oct. 2020	Detecting dark matter with gravitational-wave detectors Presented to the Sapienza Università di Roma, Rome, Italy.
8 Oct. 2020	Using continuous gravitational waves to detect neutron stars, black holes, and dark matter Presented online to the University of Liège, Liège, Belgium.
27 Feb. 2020	Adapting gravitational-wave searches to detect dark photon dark matter Presented to the University of Maastricht, Maastricht, Netherlands.
20 Feb. 2020	Transient continuous-wave searches using machine learning and the Hough Transform Presented to the University of Liège, Liège, Belgium.
9 Jan. 2020	Using machine learning and the Hough Transform to detect gravitational waves from isolated neutron stars Presented to the Université catholique de Louvain, Louvain-la-Neuve, Belgium.

14 June 2018	Results of a Search for a Post-merger Remnant of Binary Neutron Merger GW170817 Presented to the University of Oslo, Institute of Theoretical Astrophysics, Oslo, Norway.

CONFERENCE TALKS [50]

22 – 26 June 2025	Probing the galactic center GeV excess with gravitational waves Presented to the European Astronomical Society (EAS) annual meeting, Cork, Ireland
19 – 22 May 2025	Searching for gravitational waves from inspiraling planetary-mass primordial black holes in LIGO O3 data Presented to the New Horizons in Primordial Black Hole Physics (NEHOP '25), Brussels, Belgium
17 – 20 June 2024	Searching for inspiraling planetary-mass primordial black holes in LIGO O3a data Presented to the Continuous gravitational waves and neutron stars workshop, Max Planck Institute for Gravitational Physics, Hannover, Germany
6 – 10 May 2024	Localizing binary neutron star inspirals using continuous-wave methods in Einstein Telescope Presented to the XIV Einstein Telescope Symposium, Maastricht, Netherlands
6 – 9 Dec. 2023	Novel probes of dark matter with continuous gravitational waves Presented to the 10th International Conference on Gravitation and Cosmology (ICGC), Institute of Technology (IIT) Guwahati, India
11 – 14 Sep. 2023	Update on searching for long-lived binary neutron star inspirals in 3G GW detectors Presented remotely to the September LVK Collaboration meeting, Toyama, Japan
28 Aug – 1 Sep 2023	Probing neutron stars, (primordial) black holes and dark matter with continuous waves Presented to Gravitational Waves meet Amplitudes in Southern Hemisphere, São Paulo, Brasil
19–21 June 2023	Gravitational-wave probes of planetary-mass primordial black holes Presented to New Horizons in Primordial Black Hole Physics, Napoli, Italy
3–5 May 2023	Continuous gravitational-wave probes of dark matter Presented to the International Conference on Dark Matter and Stars (ICDMS), Lisboa, Portugal
24–28 April 2023	Gravitational-wave constraints on the pulsar explanation of the Galactic-Center GeV excess Presented to the Galactic Center Workshop, Granada, Spain
15–18 April 2023	Constraining asteroid-mass primordial black hole abundance using continuous waves Presented to the April American Physical Society (APS) meeting, Minneapolis, MN, USA
14–17 March 2023	Searching for long-lived binary neutron star inspirals in third-generation GW detectors Presented to the LIGO/Virgo/KAGRA March Collaboration meeting, Northwestern University, Evanston, Illinois, USA
7–11 November 2022	Can continuous waves tell us about the galactic-center GeV excess? Presented to the November Virgo Week, Cascina, Italy
22–26 August 2022	Ultralight dark-matter searches with gravitational-wave detectors Presented to the 25th annual International Conference on Particle Physics and Cosmology (COSMO'22) in Rio de Janeiro, Brasil
27 June–1 July	Searching for gravitational waves from mini-EMRIs in LIGO/Virgo Presented to the European Astronomical Society annual meeting, Valencia, Spain
16–19 May 2022	Reaching below the GW spin-down limit for "Big Glitcher" PSR J0537-6910 Presented as an e-poster to the Pharos conference: The multi-messenger physics and astrophysics of neutron stars, La Sapienza, Rome, Italy
21 Apr. 2022	Continuous gravitational waves as multi-messenger probes in third-generation gravitational-wave detectors Presented to the 12th CosPa Meeting: Multi-Messenger Sources and Observations, Louvain-la-Neuve, Belgium
9 – 12 Apr. 2022	Results of an all-sky search for boson clouds around spinning black holes using LIGO O3 data Presented to the American Physical Society April meeting, New York, New York, USA

15 – 18 Nov. 2021	Continuous gravitational-wave constraints on planetary- and asteroid-mass primordial black holes using O3a data
	Presented to the November Virgo Week meeting, Cascina, Italy
2 Nov. 2021	Direct constraints on planetary and asteroid-mass primordial black holes from continuous gravitational- wave searches
	Presented to the Belgian Gravitational-Wave Meeting, Brussels, Belgium
30 Aug. – 3 Sept. 2021	Continuous gravitational waves as probes of primordial black holes
	Presented to the Global meeting of the GWVerse COST action, Lisbon, Portugal
9 Aug. 2021	Gravitational-wave probes of dark matter
	Presented to the Les Houches summer school as a “gong talk”, Les Houches, France
26–30 July 2021	Searching for dark photon dark matter in the third observing run of LIGO/Virgo
	Presented online to the European Physical Society Conference on High Energy Physics (EPS-HEP).
19–23 July 2021	Searching for dark photon dark matter in the third observing run of LIGO/Virgo
	Presented online to the 14th Edoardo Amaldi Conference on Gravitational Waves, Melbourne, Australia.
17–18 June 2021	Constraints on dark photon dark matter using data from LIGO’s and Virgo’s third observing run
	Presented online to the 9th annual Belgian-Dutch Gravitational-Wave Meeting, Amsterdam, Netherlands.
27 Oct. 2020	Search for dark photons with continuous-wave methods
	Presented online to the Belgian Gravitational-Wave Meeting, Brussels, Belgium.
14–17 Sept. 2020	Detecting gravitational waves from planetary mass primordial black hole inspirals using the Generalized Frequency-Hough Transform
	Presented online to the fall 2020 LIGO/Virgo/KAGRA collaboration meeting.
2–6 Dec. 2019	First search for a remnant of GW170817 using convolutional neural networks
	Presented to the TeV Particle Astrophysics conference (TeVPA 2019), Sydney, Australia.
14–17 Oct. 2019	First search for a remnant of GW170817 using convolutional neural networks
	Presented to the Gravitational-Wave Physics and Astronomy Workshop (GWPAW), Tokyo, Japan.
18–21 June 2019	Using machine learning to detect gravitational waves from isolated neutron stars
	Presented to the 10th Young Researcher Meeting (YRM), Rome, Italy.
18–21 March 2019	Long-duration transient search on O3 data using machine learning and the Generalized Frequency-Hough
	Presented to the LIGO-Virgo March Meeting, Lake Geneva, WI, USA, 18–21 March 2019.
8–12 Oct. 2018	A method to search for a remnant of GW170817 with the Frequency-Hough
	Presented to the 3rd HEL.A.S. summer school and DAAD school “neutron stars and gravitational waves”, Thessaloniki, Greece.
4–7 Sep. 2018	Update on Frequency-Hough post-merger search
	Presented to the LIGO-Virgo September Meeting, Maastricht, Netherlands.
12–21 July 2018	Searching for a remnant of GW170817
	Presented to the ISAPP-Baikal Summer School “Exploring the Universe through multiple messengers”, Bol’shie Koty, Russia.
16–20 April 2018	Searches for signals from unknown or poorly known sources
	Presented (by Alicia Sintes) to the Astro-Solids, Dense Matter, and Gravitational Waves workshop, Seattle, WA, USA.
16–18 April 2018	Update on post-merger remnant search using the Frequency-Hough
	Presented to the April Virgo Week meeting, Cascina, Italy.
19–22 March 2018	Frequency-Hough post-merger search update
	Presented to the LIGO-Virgo March Meeting, Sonoma, USA.

19–23 Feb. 2018	Search for a remnant of GW170817 using the Hough transform Presented to the YKIS2018a symposium: General Relativity – The Next Generation, Kyoto, Japan.
3–8 Dec. 2017	Post-merger remnant search for long gravitational-wave transients Presented to the 29th International Texas Symposium on Relativistic Astrophysics, Cape Town, South Africa.
29 Nov. – 1 Dec. 2017	Search for very long transient GW signals from the post-merger remnant of a binary neutron star merger Presented (by Cristiano Palomba) to: GW170817 - Italian contributions to the dawn of the multi-messenger astronomy, Gran Sasso Science Institute (GSSI), L'Aquila, Italy.
6–8 Nov. 2017	Post-merger remnant search for long GW transients Presented to the Nov. Virgo Week meeting, Cascina, Italy
17–20 Oct. 2017	Using Filtering to Find Long Duration Gravitational Waves from Neutron Stars Presented to the 2017 IEEE International Young Scientists Forum on Applied Physics and Engineering, Lviv, Ukraine.
13–14 Oct. 2017	Study of a method to detect r-mode signals in white noise Presented (by Avi Vajpeyi) to the Ohio-Region Section of the American Physical Society (OS/APS) Fall Meeting, Miami University, Oxford, Ohio.
28 Aug. – 1 Sep. 2017	Analyzing a machine learning algorithm to detect gravitational waves from r-modes Presented to the LIGO-Virgo Sep. Meeting, Geneva, Switzerland.
15–17 May 2017	Developing a machine learning-based method to detect long gravitational-wave transients Presented to the May Virgo Week meeting, Cascina, Italy.
21–26 June 2015	How beaming of gravitational radiation from gamma ray bursts impacts gravitational-wave detection Presented to the 11th Edoardo Amaldi Conference on Gravitational Waves, Gwangju, South Korea.
11–14 April 2015	An analysis of the Frequency-Hough method for an all-sky search for continuous waves Presented to the American Physical Society April Meeting, Baltimore, MD, USA.
9–13 Dec. 2013	How much do diurnal land-sea circulations contribute to coastal wind power? Presented to the American Geophysical Union (AGU) Fall Meeting, San Francisco, CA.
3–6 Oct. 2013	Contribution of the diurnal sea breeze to wind power potential at Crystal Cove Presented to the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference, San Antonio, TX, USA.
3–7 Dec. 2012	Nanoscale ice measured through in-situ ellipsometry and ESEM Presented to the AGU Fall Meeting, San Francisco, CA, USA.
3–7 Dec. 2012	Environmental scanning electron microscopy of ice crystal nucleation and growth: investigating the formation of a shadow behind nucleating ice crystals Presented (by Marco Amaral) to the AGU Fall Meeting, San Francisco, CA, USA.

OTHER WORKSHOPS ATTENDED

2 – 6 June 2025	Scientific Machine Learning for Gravitational Wave Astronomy, Institute for Computational and Experimental Research in Mathematics (**ICERM**), Brown University, Providence, RI, USA
26 July – 20 Aug. 2021	**Les Houches** Summer School 2021: Dark Matter, Les Houches, France.
11–25 July 2021	Exploring Extreme Matter in the Era of Multimessenger Astronomy: from the Cosmos to Quarks. **Aspen Center for Physics**, Aspen, CO, USA.
15–19 July 2019	Physical and Mathematical Aspects of General Relativity, Domodossola, Italy.
21–23 May 2019	The International School on Gravity from Earth to Space, Urbino, Italy.
8–12 April 2019	Third ASTERICS-OBELICS International School on Computing for Astrophysics and Astroparticle Physics, Annecy, France.
12–14 Nov. 2018	Fundamental Physics with LISA, Arcetri, Florence, Italy.

5–7 Nov. 2018	Third LISA Consortium meeting, Marseilles, France.
3–12 July 2017	International School of Physics, GWs and Cosmology, Varenna, Lake Como, Italy.

References

- **Nancy Aggarwal** – Collaborator, Assistant Professor of physics, University of California, Davis (UC Davis) nqaggarwal@ucdavis.edu, +1 321 122 3232
- **Sébastien Clesse** – Collaborator; Professor of physics, Université libre de Bruxelles (ULB). sebastien.clesse@ulb.be, +32 2 650 5446
- **David Keitel** – LIGO Continuous-wave working-group chair; Professor of physics, Universitat de les Illes Balears. david.keitel@uib.es, +34 971 259786
- **Keith Riles** – Collaborator; Professor of physics, University of Michigan. kriles@umich.edu, +1 734 764 4652
- **Yue Zhao** – Collaborator; Professor of physics, Hong Kong University of Science and Technology (HKUST). zhaoyue@ust.hk, +852 (852) 23587980

RESEARCH TRACK RECORD

Continuous gravitational waves from isolated neutron stars (2014–2016)

I began my career in gravitational-wave physics by determining the detection efficiency of an all-sky search method (the Frequency-Hough) for quasi-monochromatic, quasi-infinite duration gravitational waves from asymmetrically rotating neutron stars. I also studied various follow-up techniques to cluster the billions of candidates we obtain in all-sky searches, and participated in a mock data challenge that compared different methods that search for isolated neutron stars.

Collaborators: Sinead Walsh, Pia Astone, Bernard Whiting, Cristiano 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 that searches for intermediate duration ($\mathcal{O}(\mathrm{hours} - \mathrm{days})$) gravitational waves from newborn neutron stars. This method is a generalization of the Frequency-Hough transform that tries to find power-law signals, and was one of four that contributed to the first-ever search for a long-lived remnant of the binary neutron star merger GW170817.

Collaborators: Alicia Sintes, David Keitel, Lilli Sun, Sharan Banagiri, and Miguel Oliver

Location: Sapienza University of Rome/ University of Florida; remote collaborations

Transient continuous gravitational waves from newborn neutron stars (2020–2021)

I have recently managed searches for continuous gravitational waves from known pulsars using data from LIGO/Virgo's third observing run, and specifically, from J0537-6910, one of the most actively glitching pulsars known.

Collaborators: Matt Pitkin, Simone Mastrogiovanni, Wynn Ho

Location: Catholic University of Louvain; remote collaborations

Machine learning: transient continuous waves (2018–2019)

I used artificial and convolutional neural networks to detect transient continuous gravitational waves from newborn neutron stars. This method performed equally as well as the Generalized Frequency-Hough transform, and was computationally cheaper. It was also able to detect signals that deviate slightly from a power-law model, which was a major limitation of Generalized Frequency-Hough transform. We searched again for a remnant of GW170817, and provided a framework for assessing the sensitivity and usability of machine learning methods in gravitational-wave physics. I also worked studying the sensitivity of artificial neural networks and support vector machines towards r-mode gravitational-wave signals. We showed that we could see transient signals as far as a few megaparsecs away.

Collaborators: Pia Astone, Cristiano Palomba, Bernard Whiting, Antonis Mytidis

Location: Sapienza University of Rome/ University of Florida

Machine learning: EMBright (2018–2019)

I was also involved in the development and review of a nearest-neighbor method, called EMBright, that aims to classify components of binary mergers, and their remnants, as having a neutron star or not. This method is able to quickly output a classification on the basis of parameters returned by binary merger searches that can aid astronomers in deciding whether to follow-up particular neutron star or neutron star/black hole mergers.

Collaborators: Deep Chatterjee, Shaon Ghosh, Patrick R. Brady, Shasvath J. Kapadia, Samaya Nissanke, and Francesco Pannarale.

Location: Sapienza University of Rome/ University of Florida; remote collaborations

Stochastic gravitational-wave backgrounds (2020–2023)

I have become involved in the stochastic gravitational-wave group within the LIGO/Virgo/KAGRA collaborations. I was an analyst in the search for an anisotropic gravitational-wave background using data from LIGO/Virgo/KAGRA's third observing run. I am also involved in efforts to detect an intermittent background of black hole mergers, to develop a robust, modular infrastructure for stochastic gravitational-wave data analysis for isotropic backgrounds, and to apply these techniques to search for a background of gravitational waves from isolated neutron stars. I am mentoring a PhD student in these projects.

Collaborators: Shivaraj Kandhasamy Jishnu Suresh, Federico De Lillo

Location: Catholic University of Louvain; remote collaborations.

Machine learning for continuous gravitational waves (2021–2023)

I am involved in a project that aims to apply machine learning to continuous gravitational-wave data analysis. We are applying convolutional neural networks to estimate the sky location of a neutron star, which has so far been successful in Gaussian noise. We are testing the network on non-Gaussian artifacts (lines, glitches, combs, etc.) to see if it can distinguish those from a continuous wave and subsequently estimate the sky location of the neutron star. We are performing this analysis after taking two Fourier transforms of the strain data, which localizes in a lot fewer bins in this domain compared to the frequency domain.

Collaborators: Takahiro S Yamamoto, Takahiro Tanaka, Magdalena Sieniawska

Location: Catholic University of Louvain; remote collaborations, 2021

Dark matter: dark photons (2020–present)

During my postdoctoral fellowship, I have shifted my field slightly to dark matter detection via gravitational-wave interferometers. I have led the first-ever LIGO, Virgo and KAGRA search for a candidate of dark mater, the dark photon, that could directly couple to the protons and neutrons in the interferometers. Additionally, I have developed an end-to-end pipeline to detect this signal, which closely resembles both continuous gravitational waves and noise disturbances. I am

now working to distinguish among different types of dark matter interactions with gravitational-wave detectors.

Collaborators: Yue Zhao, Keith Riles, Huaike Guo.

Location: Catholic University of Louvain, remote collaborations

Dark matter: boson clouds around black holes (2018–present)

I was involved in the development of a method that searches for gravitational waves from depleting scalar boson clouds around black holes. Our group also set direct constraints on black hole/boson mass combinations using the results of all-sky searches in LIGO/Virgo's second observing run. I have managed a search for scalar boson clouds using data from LIGO/Virgo's third observing run.

Collaborators: Paola Leaci, Cristiano Palomba, Lilli Sun, Sabrina D'Antonio

Location: Sapienza University of Rome/ Catholic University of Louvain; remote collaborations

Dark matter: boson clouds around black holes (2020–present)

I have been mentoring a PhD student working to detect vector boson clouds that could form around black holes in binary systems, such as Cygnus x-1. Vector boson clouds could emit gravitational waves that are much stronger, but also much shorter, than those of scalar bosons. Furthermore, the search for a black hole in a binary system is much more computationally heavy than that of an isolated system. We are working on developing a computationally cheap method to probe this exotic source of gravitational waves.

Collaborators: Paola Leaci, Cristiano Palomba, Magdalena Sieniawska, Antoine Depasse

Location: Sapienza University of Rome/ Catholic University of Louvain; remote collaborations, 2018-present.

Dark matter: planetary-mass primordial black holes (2020–present)

I have applied the Generalized Frequency-Hough transform to look for inspiraling planetary-mass primordial black holes. The signals that come from these inspirals resemble those of transient continuous gravitational waves (both have frequency evolutions that follow power laws). Based on the sensitivity of this method, and of current and future detectors, we projected constraints on the fraction of dark matter that primordial black holes could compose. Our method can investigate an interesting mass region for primordial black holes, and can be complementary to methods already developed to search for binary mergers.

Collaborators: Sébastien Clesse, Nancy Aggarwal, Huaike Guo, Kuver Sinha

Location: Catholic University of Louvain; remote collaborations

Probing the GeV excess with continuous waves (2022–present)

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. Now, I am working to develop a more optimal method to search specifically the galactic center for millisecond pulsars in binary systems, where we expect many to lie, as well as to evaluate the computational cost of performing such a directed search for neutron stars in binaries by finely resolving the sky patch in the galactic center.

Collaborators: Yue Zhao

Location: Nikhef / Utrecht University.

Detecting binary neutron star inspirals in 3G detectors (2022–present)

I am a member of the Einstein Telescope consortium and am working on computationally efficient methods to search for binary neutron star inspirals and sub-solar mass primordial black holes by leveraging the low-frequency sensitivity of this future instrument. By doing so, I am getting involved in early warning efforts to ensure that astronomers will have ample time to potentially see a neutron star/neutron star merger.

Collaborators: Neha Singh, Cristiano Palomba

Location: Nikhef / Utrecht University.

Machine learning for glitch identification and mitigation (2022–present)

I am involved in various projects to use particular statistics, such as the fractal dimension, to identify different types of glitches in the detectors, and distinguish them from astrophysical signals, using machine learning (generative adversarial networks and autoencoders). With these techniques, we have been able to reveal potentially new glitch classes, and are working to determine which auxiliary channels in the detector are responsible for observed glitches.

Collaborators: Sarah Caudill, Melissa Lopez, Stefano Schmidt and others

Location: Nikhef / Utrecht University.

ACADEMIC PAPERS, ETC.

Notes about authorship conventions:

Most of my research has been conducted within the LIGO/Virgo/KAGRA collaborations, and I am a co-author on many papers as a result. The standard practice in these collaborations is to list all active members as authors, strictly alphabetically in most cases, to represent the contributions that all of us have made to the assembly, testing, infrastructure, operation, data analysis and internal review for the experiments and results. I only list the collaboration papers below to which I have actively contributed, either through analysis, management, writing or review.

Please find at this **LINK** official recognition of my achievements within the LIGO, Virgo and KAGRA collaborations.

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 conceptualize this work and contributed to developing the method, based on the Hough Transform, to search for these signals.

Select 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: (Mar. 2025). 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.