

Marek Jan Szczepańczyk, PhD

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Gainesville, FL, USA

OBJECTIVES My research area is the newly-born Multimessenger Gravitational-Wave Astronomy. I am most interested in learning new Physics through detecting gravitational waves from unexpected or challenging astrophysical sources.

EDUCATION AND EMPLOYMENT

Oct 2018 - present: **Post-doctoral Associate**, University of Florida
Supervisor: prof. Sergey Klimenko

Jan 2014 - Aug 2018: **Ph.D. Astrophysics**, Embry-Riddle Aeronautical University
Thesis: *Multimessenger Astronomy with Gravitational Waves from Core-Collapse Supernovae*
Supervisor: prof. Michele Zanolin

Oct 2010 - Dec 2013: **M.Sc. Physics**, University of Warsaw, Poland
Thesis: *Continuous Gravitational Wave signals in the Mock Data Challenge in the Einstein Telescope*
Supervisor: prof. Marek Demiański

Oct 2007 - Oct 2010: **B.Sc. Physics**, University of Warsaw, Poland
Thesis: *Geometry of Special Theory of Relativity*
Supervisor: Andrzej Okołów PhD

AWARDS AND SCHOLARSHIPS

Individual

2018: Embry-Riddle Aeronautical University Outstanding Contribution Service Excellence Award

Feb - Aug 2018: LSC Fellow at LIGO Observatory in Hanford

Jan 2011 - Jan 2012: Erasmus scholarship at Vrije Universiteit Amsterdam and Nikhef

Mar 2011 - Jul 2011: Optical lever for Advanced VIRGO, supervisor prof. Jo van de Brand

Sep 2011 - Jan 2012: Branching ratio of the decay $K_s \rightarrow \mu_+ + \mu_-$, supervisor Dr Thomas Bauer

Sep - Dec 2009: Polish Academy of Sciences scholarship (Warsaw) *Scanning Electron Microscope Imaging*

Jul 2009: Polish Academy of Sciences scholarship (Warsaw) *MBE epitaxy and characterization of crystals*

Apr 2007: National Polish Physics Olympiad, finalist honor (6th place in Poland in experimental part)

May 2007: High School monetary award of Mr. Kuryłowicz for the best Physics student

Shared with LIGO for discovery of GW150914

2017 Princess of Asturias Award for Technical and Scientific Research

2017 Bruno Rossi Prize

2017 Einstein Medal

2017 UK RAS Group Achievement Award in Astronomy

2016 CBC Science Story of the Year

2017 & *2016* IOP Physics World Breakthrough of the Year

2017 & *2016* Science's Breakthrough of the Year

2016 Gruber Cosmology Prize

2016 Special Breakthrough Prize in Fundamental Physics

Shared with LIGO-Virgo for discovery of GW170817

2017 *Science's* Breakthrough of the Year

2017 IOP Physics World Breakthrough of the Year

AFFILIATIONS

Jan 2014 - present LIGO Scientific Collaboration, leadership positions:

Jun 2021 - present The co-chair of the LVK All-sky Short-duration Burst Working Group

Nov 2020 - present Liaison in the Operations Working Group (preparing future observations)

Mar 2016 - Jun 2019 The chair of the LVC Supernova Working Group

Oct 2015 - present American Physical Society

Oct 2021 - present SuperNova Early Warning System (SNEWS)

Jun 2022 - present Cosmic Explorer Consortium

PUBLICATIONS

Co-author of 159 (Nov 2022) LIGO-Virgo and LIGO-Virgo-KAGRA Scientific Collaborations papers (full list: [Spire](#), [google scholar](#)).

- Citations: 70587
- h-index: 81
- i10-index: 151

LIGO-Virgo and LIGO-Virgo-KAGRA Collaborations publications with my significant contribution (* paper lead, ** co-lead):

[10] B.P. Abbott et al. *First joint observation by the underground gravitational-wave detector, KAGRA, with GEO600* arXiv:2203.01270 [gr-qc] (2022)

[9] B.P. Abbott et al. *GWTC-3: Compact Binary Coalescences Observed by LIGO and Virgo During the Second Part of the Third Observing Run* arXiv:2111.03606 [gr-qc] (2021)

- [8] B.P. Abbott et al. *GWTC-2.1: Deep Extended Catalog of Compact Binary Coalescences Observed by LIGO and Virgo During the First Half of the Third Observing Run* arXiv:2108.01045 [gr-qc]
- [7] B.P. Abbott et al. *All-sky search for short gravitational-wave bursts in the third Advanced LIGO and Advanced Virgo run* arXiv:2107.03701 [gr-qc] (2021, accepted by PRD)
- [6] B.P. Abbott et al. *GWTC-2: Compact Binary Coalescences Observed by LIGO and Virgo During the First Half of the Third Observing Run* Phys. Rev. X 11, 021053 (2021)
- [5] B.P. Abbott et al. *GW190521: A Binary Black Hole Merger with a Total Mass of 150 M_{\odot}* Phys. Rev. Lett. 125, 101102 (2020)
- [4] B.P. Abbott et al. *Properties and Astrophysical Implications of the 150 M_{\odot} Binary Black Hole Merger GW190521* Astrophys. J. Lett. 900, L13 (2020)
- [3] B.P. Abbott et al. *Population Properties of Compact Objects from the Second LIGO-Virgo Gravitational-Wave Transient Catalog* arXiv: 2010.14533 (2020)
- [2] * B.P. Abbott et al. *Optically Triggered Search for Gravitational-Wave Bursts from Core-Collapse Supernovae in First and Second Observational Data of Advanced-Generation Laser Interferometer Detectors* Phys. Rev. D 101, 084002 (2020)
- [1] ** B.P. Abbott et al. *First targeted search for gravitational-wave bursts from core-collapse supernovae in data of first-generation laser interferometer detectors* Phys. Rev. D 94, 102001 (2016)

Short-author list (full list: Spires)

- [29] **M. J. Szczepańczyk**, et al. *An Optically Targeted Search for Gravitational Waves emitted by Core-Collapse Supernovae during the Third Observing Runs of Advanced LIGO and Advanced Virgo*, forthcoming (Feb 2023)
- [28] **M. J. Szczepańczyk**, F. Salemi, S. Bini, T. Mishra, G. Vedovato, V. Gayathri, I. Bartos, S. Bhaumik, M. Drago, O. Halim, C. Lazzaro, A. Miani, E. Milotti, G. A. Prodi, S. Tiwari, S. Klimenko, *All-sky search for gravitational-wave bursts in the third Advanced LIGO-Virgo run with coherent WaveBurst enhanced by Machine Learning*, arXiv:2210.01754 [gr-qc] (2022)
- [27] **M. J. Szczepańczyk**, M. Zanolin, *Gravitational Waves from a Core-Collapse Supernova: Perspectives with Detectors in the Late 2020s and Early 2030s*, Galaxies, 10(3), 70 (2022)
- [26] K. Gill, G. Hosseinzadeh, E. Berger, M. Zanolin, **M. J. Szczepańczyk**, *Constraining the Time of Gravitational Wave Emission from Core-Collapse Supernovae*, arXiv:2201.03609 [astro-ph.HE] (2022)
- [25] T. Mishra, B. O'Brien, **M. J. Szczepańczyk**, G. Vedovato, S. Bhaumik, V. Gayathri, G. Prodi, F. Salemi, E. Milotti, I. Bartos, S. Klimenko, *Search for binary black hole mergers in the third observing run of Advanced LIGO-Virgo using coherent WaveBurst enhanced with machine learning*, arXiv:2201.01495 [gr-qc] Phys. Rev. D 105, 083018 (2022)
- [24] J. A. Antelis, M. Cavaglia, T. Hansen, M. D. Morales, C. Moreno, S. Mukherjee, **M. J. Szczepańczyk**, M. Zanolin *Using supervised learning algorithms as a follow-up method in the search of gravitational waves from core-collapse supernovae* arXiv:2111.07219 [gr-qc] (submitted to PRD, 2021)

- [23] **M. J. Szczepańczyk**, J. A. Antelis, M. Benamin, M. Cavaglia, D. Gondok-Rosińska, T. Hansen, S. Klimenko, M. D. Morales, C. Moreno, S. Mukherjee, G. Nurbek, J. Powell, N. Sigh, S. Sitmukhambetov, P. Szewczyk, J. Westhouse, O. Valdez, G. Vedovato, Y. Zheng, M. Zanolin *Detecting and reconstructing gravitational waves from the next Galactic core-collapse supernova in the Advanced Detector Era* arXiv:2104.06462 [astro-ph.HE] Phys. Rev. D 104, 102002 (2021)
- [22] O. Halim, G. Vedovato, E. Milotti, G. A. Prodi, S. Bini, M. Drago, V. Gayathri, C. Lazzaro, D. Lopez, A. Miani, B. O'Brien, F. Salemi, **M. J. Szczepańczyk**, S. Tiwari, A. Virtuoso, S. Klimenko *The search of higher multipole radiation in gravitational waves from compact binary coalescences by a minimally-modelled pipeline* arXiv:2110.15820 [gr-qc] (2021)
- [21] W. Jia et al (**M. J. Szczepańczyk**) *Point Absorber Limits to Future Gravitational-Wave Detectors* arXiv:2109.08743 [physics.ins-det] (2021)
- [20] C. Richardson, M. Zanolin, H. Andresen, **M. J. Szczepańczyk**, K. Gill, A. Wongwathanarat *Modeling Core-Collapse Supernovae Gravitational-Wave Memory in Laser Interferometric Data* arXiv:2109.01582 [astro-ph.HE] (2021)
- [19] G. Vedovato, E. Milotti, G.A. Prodi, S. Bini, M. Drago, V. Gayathri, O. Halim, C. Lazzaro, D. Lopez, A. Miani, B. O'Brian, F. Salemi, **M. J. Szczepańczyk**, S. Tiwari, A. Virtuoso, S. Klimenko *Minimally-modeled search of higher multipole gravitational-wave radiation in compact binary coalescence* arXiv:2108.13384 [gr-qc] (2021)
- [18] B. O'Brien, **M. J. Szczepańczyk**, V. Gayathri, I. Bartos, G. Vedovato, G. Prodi, G. Mitselmakher, S. Klimenko *Detection of LIGO-Virgo binary black holes in the pair-instability mass gap* Phys. Rev. D 104, 082003 (2021)
- [17] T. Mishra, B. O'Brien, V. Gayathri, **M. J. Szczepańczyk**, S. Bhaumik, I. Bartos, S. Klimenko *Optimization of model independent gravitational wave search using machine learning* Phys. Rev. D 104, 023014 (2021)
- [16] D. Davis et al (**M. J. Szczepańczyk**) *LIGO Detector Characterization in the Second and Third Observing Runs* Class. Quantum Grav. 38 135014 (2021)
- [15] P. Nguyen et al (**M. J. Szczepańczyk**) *Environmental Noise in Advanced LIGO Detectors* Class. Quantum Grav. 38 145001 (2021)
- [14] A. F. Brooks et al (**M. J. Szczepańczyk**) *Point absorbers in Advanced LIGO* Applied Optics, vol. 60, issue 13, p. 4047 (2021)
- [13] R. Magee et al (**M. J. Szczepańczyk**) *First demonstration of early warning gravitational wave alerts* ApJL 910 L21 (2021)
- [12] **M. J. Szczepańczyk**, S. Klimenko, B. O'Brien, I. Bartos, V. Gayathri, G. Mitselmakher, G. Prodi, G. Vedovato, C. Lazzaro, E. Milotti, F. Salemi, M. Drago, and S. Tiwari, *Observing an intermediate mass black hole GW190521 with minimal assumptions* Phys. Rev. D 103, 082002, arXiv:2009.11336 [astro-ph.HE] (2021)
- [11] V. Gayathri, J. Healy, J. Lange, B. O'Brien, **M. J. Szczepańczyk**, I. Bartos, M. Campanelli, S. Klimenko, C. Lousto, and R. O'Shaughnessy. *Eccentricity estimate for black hole mergers with numerical relativity simulations* Nature Astronomy arXiv:2009.05461 [astro-ph.HE] (2020)
- [10] V. Gayathri, J. Healy, J. Lange, B. O'Brien, **M. J. Szczepańczyk**, I. Bartos, M. Campanelli, S. Klimenko, C. Lousto, and R. O'Shaughnessy, *Hubble Constant Measurement with GW190521 as an Eccentric Black Hole Merger* arXiv:2009.14247 [astro-ph.HE]

- [9] M. Drago, V. Gayathri, S. Klimentko, C. Lazzaro, E. Milotti, G. Mitselmakher, V. Necula, B. O'Brian, G. A. Prodi, F. Salemi, **M. J. Szczepańczyk**, S. Tiwari, V. Tiwari, G. Vedovato, and I. Yakushin, *Coherent WaveBurst, a pipeline for unmodeled gravitational-wave data analysis* SoftwareX 14, 2021, 100678, arXiv:2006.12604 [gr-qc]
- [8] A. Buikema et al (**M. J. Szczepańczyk**) *Sensitivity and performance of the advanced LIGO detectors in the third observing run* Phys. Rev. D 102, 062003 arXiv:2008.01301 [astro-ph.IM] (2020)
- [7] B. Becsy, P. Raffai, K. Gill, T. B. Littenberg, M. Millhouse, and **M. J. Szczepańczyk** *Interpreting gravitational-wave burst detections: constraining source properties without astrophysical models* Class. Quantum Grav. 37 105011, arXiv:2004.13729 [gr-qc] (2020)
- [6] M. Cavaglia, S. Gaudio, T. Hansen, K. Staats, **M. J. Szczepańczyk**, M. Zanolin *Improving the background of gravitational-wave searches for core collapse supernovae: A machine learning approach* Mach. Learn.: Sci. Technol. 1 015005, arXiv:2002.04591 [astro-ph.IM] (2020)
- [5] G. Vajente, Y. Huang, M. Isi, J. C. Driggers, J. S. Kissel, **M. J. Szczepańczyk**, and S. Vitale. *Machine-learning non-stationary noise out of gravitational wave detectors* Phys. Rev. D 101, 042003, arXiv:1911.09083 [gr-qc] (2020)
- [4] M. Tse et al (**M. J. Szczepańczyk**) *Quantum-enhanced advanced LIGO detectors in the era of gravitational-wave astronomy* Phys. Rev. Lett. 123, 231107 (2019)
- [3] K. Gill, W. Wang, O. Valdez, **M. J. Szczepańczyk**, M. Zanolin, S. Mukherjee, *Enhancing the Sensitivity of Searches for Gravitational Waves from Core-Collapse Supernovae with a Bayesian classification of candidate events* arXiv:1802.07255 [astro-ph.HE] (2018)
- [2] K. N. Yakunin, E. Endeve, A. Mezzacappa, **M. J. Szczepańczyk**, M. Zanolin, P. Marronetti, E. J. Lentz, S. W. Bruenn, W. R. Hix, O. E. B. Messer, J. M. Blondin, J. A. Harris, *Gravitational wave signals from multi-dimensional core-collapse supernova explosion simulations* arXiv:1710.08372 [astro-ph.HE] (2017)
- [1] J. Powell, **M. J. Szczepańczyk**, I. S. Heng, *Inferring the core-collapse supernova explosion mechanism with three-dimensional gravitational-wave simulations* arXiv:1709.00955 [astro-ph.HE] Phys. Rev. D 96, 123013 (2017)

White papers

- [6] 2020 – Multimessenger Astrophysics Science Analysis Group Final Report: [link](#)
- [5] 2019 – C. Fryer, E. Burns, P. Roming, S. Couch, **M. J. Szczepańczyk**, P. Slane, I. Tamborra, R. Trappitsch *Core-Collapse Supernovae and Multi-Messenger Astronomy* Bulletin of the AAS, 51(3)
- [4] 2019 – LIGO/Virgo Collaboration White Paper, (T1900541, lead of Section Op-2.6 and LT-2.6)
- [3] 2018 – LIGO/Virgo Collaboration White Paper (T1800058, lead of Section 2.5)
- [2] 2017 – LIGO/Virgo Collaboration White Paper, (T1700214, lead of Section 2.5)
- [1] 2016 – LIGO/Virgo Collaboration White Paper, (T1600115, lead of Section 3.17)

MENTORSHIP

Graduate students

2022 – Yanyan Zheng *An Optically Targeted Search for Gravitational Waves emitted by Core-Collapse Supernovae during the Third Observing Runs of Advanced LIGO and Advanced Virgo*, wins 2nd Scheerer Prize at the Missouri S&T (\$500).

2022 - present – Justin Javier Perez, *All-sky searches for gravitational waves* (together with prof. Sergey Klimenko)

2021 - 2022 – Matthew Reinhard, *Searches for gravitational-wave echos* (together with prof. Sergey Klimenko)

2019 - present – Tanmaya Mishra, *Searches for Binary Black Holes* (together with prof. Sergey Klimenko)

2018 - present – Brendan O'Brien, *Searches for Intermediate Mass Black-Holes* (together with prof. Sergey Klimenko)

Undergraduate students

2020 - 2021 – Henry Hill, under Undergraduate Research Scholar Program (co-mentor with prof. Sergey Klimenko)

2016 - 2018 – Travis Hansen, under NASA Space grant

2015 - 2017 – Sophia Schwalbe, under NASA Space grant (2021 Ph.D. in Applied Physics from U.S. Air Force Institute of Technology)

2015 - 2018 – Jasmine Gill (now Ph.D. candidate at the Harvard University; co-mentor with prof. Michele Zanolin)

SERVICE

Reviewer: NSF, MNRAS, MDPI

TEACHING

University of Florida

[11] 2020 Spring – Guest lecturer (PHY 4905 Modern Astrophysics)

[10] 2019 Fall – Teaching substitution (PHY 3221 Mechanics 1)

[9] 2019 Spring – Guest lecturer (PHY 3063 Enriched Modern Physics)

Embry-Riddle Aeronautical University

[7] 2017 Fall – Engineering Physics laboratory Instructor

[6] 2016 Spring – General Relativity, supplement Numerical Relativity lectures

[5] 2015 Spring – Tutor at Academic Advancement Center

[4] 2015 Spring – Undergraduate Physics exercise sessions, Instructor

[3] 2015 Spring – Engineering Physics laboratory, Instructor

[2] 2014 Fall – Engineering Physics laboratories, Teaching Assistant

[1] 2014 Spring – General Relativity, Teaching Assistant

INVITED TALKS

- [29] *Apr 2023* – Colloquium, Harvard (scheduled)
- [28] *Mar 2023* – Seminar, Nicolaus Copernicus Astronomical Center, Warsaw (scheduled)
- [27] *Feb 2023* – Seminar, University of Warsaw, Astronomical Observatory (scheduled)
- [26] *Feb 2023* – Seminar, Brownsville, Texas (scheduled)
- [25] *Dec 2022* – Seminar, University of Warsaw, Institute of Theoretical Physics (remotely, youtube)
- [24] *Dec 2022* – Supernovae in the Gravitational Wave Detection Era, Melbourne, Australia
- [23] *Dec 2021* – Topical conference emphasizing elementary particles, astrophysics, and cosmology, Miami, Florida (remotely)
- [22] *Nov 2021* – SESAPS21, Tallahassee, Florida
- [21] *Nov 2021* – XIII Mexican School on gravitation and mathematical physics (lectures, remotely)
- [20] *Oct 2021* – SNEWS Multi-Messenger Follow Up Task Group (remotely)
- [19] *May 2021* – Seminar, University of Wrocław, Poland (remotely)
- [18] *Dec 2019* – A topical conference on elementary particles, astrophysics, and cosmology, Fort Lauderdale, Florida
- [17] *Dec 2019* – Gravitational-Wave Workshop (lectures), Guadalajara, Mexico
- [16] *Oct 2019* – 4M_COCOS, Fukuoka, Japan
- [15] *Jan 2018* – GWASNe, Tokyo, Japan
- [14] *Dec 2017* – Seminar, Jagiellonian University, Kraków, Poland
- [13] *Dec 2017* – POLGRAW Virgo group, Warsaw, Poland
- [12] *Dec 2017* – Seminar, University of Wrocław, Poland
- [11] *Dec 2017* – Seminar, Garching, Germany
- [10] *Nov 2017* – Seminar, La Sapienza University, Rome, Italy
- [9] *Nov 2017* – Seminar, GSSI, L'Aquila, Italy
- [8] *Nov 2017* – Seminar, Albert Einstein Institute, Hannover, Germany
- [7] *Nov 2017* – Seminar, Prescott, USA
- [6] *Sep 2017* – Seminar, Brownsville, USA
- [5] *Aug 2017* – Colloquium, Chinese University of Hong Kong
- [4] *Dec 2016* – NRmGR, Valencia, Spain
- [3] *Sep 2016* – Seminar, Daytona Beach, USA
- [2] *Jun 2016* – Colloquium, Tsinghua University, Beijing, China
- [1] *Mar 2016* – Colloquium, CERN, Geneva, Switzerland (remotely)

MEETINGS
ORGANIZATION

- [4] *Mar 2017* – Scientific Organizing Committee, Workshop on Core Collapse Supernovae, their signatures in gravitational waves and their detection with ground-based laser interferometers (opening talk and panelist), Pasadena, USA
- [3] *Jan 2017* – Workshop on Gravitational Wave Core-Collapse Supernovae Science, Brownsville, USA (co-organizer)
- [2] *Jun 2016* – Workshop on Gravitational Wave Science with Core-Collapse Supernovae, Prescott, USA (co-organizer)
- [1] *Sep 2015* – Workshop on Gravitational Wave Science with Core-Collapse Supernovae, Prescott, USA (co-organizer)

OUTREACH AND
MEDIA

- [23] *Feb 2023* – Outreach talk at the Society of Catholic Scientists, Gainesville, Florida (scheduled)
- [22] *Sep 2022* – Outreach talk in a local High School (in Polish), Suwałki, Poland
- [21] *Sep 2022* – Featured during the National Postdoc Week: news.ufl.edu, phys.ufl.edu.
- [20] *Feb 2022* – *Explosive Universe*, invited presentation at the UF Physics Graduate Student and Postdoc Seminar
- [19] *Dec 2021* – LVK Third Gravitational-Wave Transient Catalog webinar, invited panelist ([youtube](https://www.youtube.com/watch?v=...))
- [18] *Jul 2021* – An interview with high-school students (in Polish, [link](https://www.youtube.com/watch?v=...))
- [17] *May 2021* – UF Virtual Postdoc Seminar Series talk
- [16] *Oct 2019* – Interview at the Narita airport, Japan (crunchyroll.org, 5:20-7:40)
- [15] *Aug 2019* – M. Szczepanczyk hosted in Gainesville a high school student from Poland, Mateusz Sulimowicz, who later became a finalist of the Polish national Physics Olympics for high school students (top 60 in Poland).
- [14] *Apr 2019* – UF postdoc seminar
- [13] *Mar 2019* – UF Physics open house outreach
- [12] *Jan 2019* – Interview in the regional radio station (radio.bialystok.pl in Polish), Suwałki, Poland
- [11] *Jan 2019* – Outreach talk at the University of Warsaw
- [10] *Jan 2019* – Outreach talk in a local High School (in Polish), Suwałki, Poland
- [9] *Dec 2018* – Outreach poster presentation to the local UF students
- [8] *Jan 2018* – Interview at the University of Warsaw radio (radiokampus.fm, in Polish)
- [7] *Oct 2017* – Phoenix Astronomy Club, Phoenix
- [6] *Feb 2017* – Navajo reservation, week-long school visits and STEM promotion
- [5] *Dec 2016* – Prescott Astronomy Club, Prescott, USA
- [4] *Feb 2016* – Navajo reservation, week-long school visits and STEM promotion

- [3] *Jan 2016* – Outreach talk for high school students (in Polish), Suwałki, Poland
- [2] *Mar 2013* – Outreach talk for high school students (in Polish), Suwałki, Poland
- [1] *Sep 2010* – Outreach talk at Science Festival talk series (in Polish), Sejny, Poland

REFERENCES

Professor Sergey Klimenko, University of Florida

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Professor Jo van de Brand, Nikhef, Amsterdam, Virgo Scientific Collaboration
spokeperson 2017-2020

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