

ZHENWEI LYU (吕振伟)

Boya fellow

📍 Kavli Institute for Astronomy and Astrophysics, Peking University,
5 Yiheyuan Road, Haidian District, Beijing, China 100871

✉ zwlyu@pku.edu.cn

🐙 [gwlyu.github.io](https://github.com/gwlyu)

🆔 [ORCID](#)

Fields of Interest

My current research focuses on gravitational wave (GW) astrophysics. The objective is to unravel physics buried within the data, including but not limited to:

- finite size effects of compact objects and dynamics of binaries
- any other potential detectable effects within Einstein's theory of gravity and beyond theories
- formation channels and merger rates of compact binaries (stellar mass and extreme mass ratio inspirals (EMRIs))
- implementations of GWs in cosmology: measuring Hubble parameter, constraints on dark matter and dark energy

Ongoing Projects

- Developing GW waveform model of compact objects with mass transfer effect included and their applications to binary evolution in astrophysics.
- Analyzing GW Data using normalising flow based neural networks.
- Studying GWs generated during superradiant instability with a spin-2 bosonic cloud around massive black holes.

Education

Kavli Institute for Astronomy and Astrophysics at Peking University	2022 – current
<i>Boya Fellow cooperated with Lijing Shao</i>	<i>Beijing, China</i>

University of Guelph and Perimeter Institute for Theoretical Physics	2018 – 2022
<i>Ph.D. supervised by Huan Yang, Physics</i>	<i>Guelph, ON, Canada</i>

Beijing Normal University	Sep. 2015 – Jun. 2018
<i>M.Sc supervised by Fan Zhang, Astronomy</i>	<i>Beijing, China</i>

Harbin Institute of Technology	Sep. 2011 – Jun. 2015
<i>B.Sc supervised by Ye Sun, Physics</i>	<i>Harbin, China</i>

Teaching Endeavours

Mathematical Physics

Fall semester 2020

- As a Teaching Assistant under the supervision of Prof. Huan Yang. My main responsibility was grading their assignments

Physics for Life Sciences

Five semesters in 2018 – 2021

- As a Teaching Assistant, my responsibilities were mainly conducting labs, grading quiz and labs, helping hours and invigilating exams.

Methods of Mathematical Physics

Two semesters in 2016 – 2017

- As a Teaching Assistant, I have helped more than 20 students finish their assignments, graded their work and invigilated exams every semester.

Publications and Presentations

- [1] **Zhenwei Lyu**, Nan Jiang, and Kent Yagi. “Constraints on Einstein-dilation-Gauss-Bonnet gravity from Black Hole-Neutron Star Gravitational Wave Events”. *Phys. Rev. D* 105 (6 Mar. 2022). DOI: [10.1103/PhysRevD.105.064001](https://doi.org/10.1103/PhysRevD.105.064001). arXiv: [2201.02543](https://arxiv.org/abs/2201.02543) [gr-qc].
- [2] **Zhenwei Lyu**, Michael LaHaye, Huan Yang, and Béatrice Bonga. *Probing Spin-Induced Quadrupole Moments in Precessing Compact Binaries*. 2023. arXiv: [2308.09032](https://arxiv.org/abs/2308.09032) [gr-qc].
- [3] Jun Zhang, **Zhenwei Lyu**, Junwu Huang, Matthew C. Johnson, Laura Sagunski, Mairi Sakellariadou, and Huan Yang. “First Constraints on Nuclear Coupling of Axionlike Particles from the Binary Neutron Star Gravitational Wave Event GW170817”. *Phys. Rev. Lett.* 127.16 (Oct. 2021). ISSN: 1079-7114. DOI: [10.1103/PhysRevLett.127.161101](https://doi.org/10.1103/PhysRevLett.127.161101). arXiv: [2105.13963](https://arxiv.org/abs/2105.13963) [hep-ph].
- [4] Zhen Pan, **Zhenwei Lyu**, Béatrice Bonga, Néstor Ortiz, and Huan Yang. “Probing Crust Meltdown in Inspiring Binary Neutron Stars”. *Phys. Rev. Lett.* 125.20 (Nov. 2020). DOI: [10.1103/PhysRevLett.125.201102](https://doi.org/10.1103/PhysRevLett.125.201102). arXiv: [2003.03330](https://arxiv.org/abs/2003.03330) [astro-ph.HE].
- [5] Xuefeng Feng, **Zhenwei Lyu**, and Huan Yang. “Black-hole perturbation theory with post-Newtonian theory: Towards hybrid waveforms for neutron-star binaries”. *Phys. Rev. D* 105 (10 May 2022). DOI: [10.1103/PhysRevD.105.104043](https://doi.org/10.1103/PhysRevD.105.104043). arXiv: [2104.11848](https://arxiv.org/abs/2104.11848) [gr-qc].
- [6] Zhen Pan, **Zhenwei Lyu**, and Huan Yang. “Wet extreme mass ratio inspirals may be more common for spaceborne gravitational wave detection”. *Phys. Rev. D* 104.6 (Sept. 2021). DOI: [10.1103/PhysRevD.104.063007](https://doi.org/10.1103/PhysRevD.104.063007). arXiv: [2104.01208](https://arxiv.org/abs/2104.01208) [astro-ph.HE].
- [7] Zhen Pan, **Zhenwei Lyu**, and Huan Yang. “Mass-gap extreme mass ratio inspirals”. *Phys. Rev. D* 105 (8 Apr. 2022). DOI: [10.1103/PhysRevD.105.083005](https://doi.org/10.1103/PhysRevD.105.083005). arXiv: [2112.10237](https://arxiv.org/abs/2112.10237) [astro-ph.HE].
- [8] Michael LaHaye, Huan Yang, Béatrice Bonga, and **Zhenwei Lyu**. “Efficient fully precessing gravitational waveforms for binaries with neutron stars”. *Phys. Rev. D* 108 (4 Aug. 2023). DOI: [10.1103/PhysRevD.108.043018](https://doi.org/10.1103/PhysRevD.108.043018). arXiv: [2212.04657](https://arxiv.org/abs/2212.04657) [gr-qc].
- [9] Ning Jiang, Huan Yang, Tinggui Wang, Jiazheng Zhu, **Zhenwei Lyu**, Liming Dou, Yibo Wang, Jianguo Wang, Zhen Pan, Hui Liu, Xinwen Shu, and Zhenya Zheng. *Tick-Tock: The Imminent Merger of a Supermassive Black Hole Binary*. 2022. arXiv: [2201.11633](https://arxiv.org/abs/2201.11633) [astro-ph.HE].

Presentations:

- Mini Workshop on Compact Objects and Gravitational Waves (KIAA, April 2023).
Title: “Probing spin-induced quadrupole moments in precessional compact binaries”
- The Postdoc Workshop on Gravitational Waves (KIAA, Oct. 2022), organized and attended.
Title: “Gravitational Wave Astrophysics, Cosmology and Fundamental Physics”
- Canadian Association of Physics(CAP) (2021). Title: “Constraints on Axions from GW170817”
- Canadian Student and Postdoc Conference on Gravity(CSPCG) (2021)
- Midwest Relativity Meeting (2020)

Membership, Honors and Awards

- Member of LIGO Scientific Collaboration at Perimeter Institute (from 2021)
- CSC Scholarship (2018-2022)
- Second Prize for Academic Scholarship (2017)
- Excellent Teaching Assistant of undergraduate (2017)
- First Prize for Academic Scholarship (2016)
- Excellent Student Cadre (2016)
- Excellent Teaching Assistant of undergraduate (2016)
- Honorable Mention of Mathematical Contest In Modeling (2013)
- The Star of Self-improvement of Chinese University students (2013)