

ZHENWEI LYU (吕振伟)

Boya fellow

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Fields of Interest

My current research focuses on gravitational wave physics. The objective is to unravel physics buried within the data, covering various aspects:

- Tests of general relativity: consistency tests, modified theories of gravity.
- Physics of compact objects, such as neutron stars, black holes.
- Cosmology: formation channels and rates, Hubble parameter, standard sirens, and more.
- Multi-messenger astronomy.

Work Experience

Boya Fellow cooperated with Lijing Shao

Kavli Institute for Astronomy and Astrophysics at Peking University

Oct. 2022 – Present

Beijing, China

Education

Ph.D. in physics supervised by Huan Yang

University of Guelph and Perimeter Institute for Theoretical Physics

Sept. 2018 – Oct. 2022

Ontario, Canada

M.Sc in astrophysics supervised by Fan Zhang

Beijing Normal University

Sept. 2015 – July 2018

Beijing, China

B.Sc in physics

Harbin Institute of Technology

Sept. 2011 – July 2015

Harbin, China

Teaching and Mentoring

Teaching Assistant:

Mathematical Physics

Fall semester 2020

- My primary responsibility involved grading assignments.

Physics for Life Sciences

Five semesters in 2018 – 2021

- My duties included conducting labs, grading quizzes and labs, hosting help sessions, and supervising exams.

Methods of Mathematical Physics

Two semesters in 2016 – 2017

- I assisted students in completing assignments, graded their work, and supervised exams.

Mentoring:

- Hanlin Song, a third-year Ph.D. student, analyzing gravitational waves using neural networks.
- Hongyi Zhang, an undergraduate student, exploring potential degeneracies within the embedded effects of gravitational waves.

Publications

- [1] **Zhenwei Lyu**, Michael LaHaye, Huan Yang, and Béatrice Bonga. *Probing Spin-Induced Quadrupole Moments in Precessing Compact Binaries* (). 2023. arXiv: [2308.09032 \[gr-qc\]](#).
- [2] **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](#). arXiv: [2201.02543 \[gr-qc\]](#).
- [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](#). arXiv: [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](#). arXiv: [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](#). arXiv: [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](#). arXiv: [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](#). arXiv: [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](#). arXiv: [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 \[astro-ph.HE\]](#).

Technical Skills

- **Gravitational Wave Data Analysis:** waveform modeling, Bayesian inference, model selection, Fisher matrix analysis.
- **Languages/Coding:** C, Python, Mathematica, Shell script. Good at LALSimulation, PyCBC, bilby, dynesty, and so on.
- **Frameworks/Technologies:** Ubuntu and CentOS operating system, GitHub, WordPress