Yong Gao — Curriculum Vitae

Contact Information

0.27, Albert Einstein Institute
Am Mühlenberg 1, Golm
Potsdam 14476, Germany

email: yong.gao@aei.mpg.de
personal webpage: gravyong.github.io
telephone: (86)13811809693

Education

Postdoctoral researcher, Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam, Germany **September 2023-Present**

Ph.D., Physics, Peking University, Beijing, China **August 2018-2023**

Thesis Advisor: Prof. Lijing Shao

Thesis Title: *Study of neutron-star structures and spin precession in the era of multimessenger astrophysics*

B.S., Physics, Dalian University of Technology, Dalian, Liaoning Province, China **July 2018**

Degree conferred with honor

Senior Dissertation Advisors: Prof. Renxin Xu and Prof. Chong Li

Dissertation Title: *The electron distributions of strangelets in the Thomas-Fermi model*

Research Interests

Understanding composition and state of matter inside neutron stars (NSs). Modelling gravitational waves (GWs) from NSs: tidal/spin effects in binary NS and NS-black hole systems, global non-radial oscillations of NSs, mountains on NSs. Studying dynamics and observational consequences of free/forced precession of NSs. Numerical simulations of compact binary mergers involving NSs.

Testing strong-field gravity. Modelling GW waveform from compact binaries and oscillating compact objects beyond general relativity. Constructing timing model and testing gravity with pulsar timing. Studying the structures of rotating, tidally-deformed, and oscillating NSs in alternative theories of gravity. Numerical simulations of compact binary mergers in alternative theories of gravity.

Honors and Awards

Principal Scholarship, Peking University **2022-2023**

Tung Scholarship, Peking University **2021–2022**

Merit Student, Peking University **2021–2022**

The Second Prize for Oral Presentation, Physics Five Universities **April 2021**

Vela Prize for Oral Presentation, FAST/Future Pulsar Symposium 9 **August 2020**

National Scholarship, Peking University **2019–2020**

Excellent Teaching Assistant Award, Peking University **2019–2020**

Principal Scholarship, Peking University **2018–2019**

Learning Excellence Award (First Prize), Dalian University of Technology **2015–2016**

Teaching Experience

Lecturer, Max Planck Institute for Gravitational Physics

Jürgen Ehlers Spring School: Introduction to the Fundamentals of Neutron Stars **Spring 2025**

Teaching Assistant, Peking University

Electrodynamics (B) , **Excellent Teaching Assistant Award** **Fall 2022**

General Physics I, *incl. Mechanics & Electromagnetism **Fall 2021**

Theoretical Mechanics (A), **Excellent Teaching Assistant Award** **Fall 2019**

Co-advised Students

Ph.D. Student, Peking University

Hongbo Li, co-advised with Prof. Lijing Shao and Prof. Renxin Xu **2021–2023**
Oscillations of neutron stars and gravitational-wave asteroseismology

Undergraduate Students, Peking University

Haoyang Qi, co-advised with Prof. Lijing Shao **2021-2022**
Constraints on ultralight dark matter with pulsar timing

Huimei Wang, co-advised with Prof. Lijing Shao **2020-2021**
Undergraduate Dissertation: The structure of neutron stars with anisotropic pressure

Jingyuan Deng, co-advised with Prof. Lijing Shao **2020-2021**
Undergraduate Dissertation: Forced precession of neutron stars

Zexin Hu, co-advised with Prof. Lijing Shao **2020-2021**
Scalarized neutron stars in massive scalar-tensor gravity

Computer Skills

Proficient in Mathematica, Julia, Fortran, Python. Experience in C, Bash, and HPC.
Markup languages: LaTeX, Markdown.

Code development— Most contributions can be found at https://github.com/GravYong.

Professional Activities, Outreach, and Service

KAGRA Collaboration

Member of KAGRA Future Strategy Committee (FSC) **2021–2023**

Chair of conference session/group meeting

KAGRA Future Working Group 1st Open Meeting (*online*) **November 2021**

Chair of the Kiaagravity group meeting **2020-2021**

Journal referee

Classical and Quantum Gravity (CQG) **2021-Present**

Research in Astronomy and Astrophysics (RAA) **2021-Present**

Science China Physics, Mechanics & Astronomy (SCPMA) **2021-Present**

Submitted Publications

27. M. Z. Han, **Y. Gao**, K. Kiuchi and M. Shibata, *Dependence of post-merger properties on the thermal heating efficiency in neutron star mergers*, submitted to Phys. Rev. D [arXiv:2504.08514]
26. **Y. Gao**, K. Hayashi, K. Kiuchi, A. T. L. Lam, H. J. Kuan and M. Shibata, *Convective stability analysis of massive neutron stars formed in binary mergers*, submitted to Phys. Rev. D [arXiv:2501.19053]

Refereed Publications

25. A. T. L. Lam, **Y. Gao**, H. J. Kuan, M. Shibata, K. Van Aelst and K. Kiuchi, *Accessing universal relations of binary neutron star waveforms in massive scalar-tensor theory*, Phys. Rev. Lett. **134**, 15, 151402 [arXiv:2410.00137]
24. Z. Wang, **Y. Gao**, D. Liang, J. Zhao and L. Shao, *Vetting quark-star models with gravitational waves in the hierarchical Bayesian framework*, JCAP **11**, 038 [arXiv:2409.11103]
23. Y. Liu, H. B. Li, **Y. Gao**, L. Shao, Z. Hu, Effects from dark matter halos on X-ray pulsar pulse profiles, Phys. Rev. D **110**, 083018 [arXiv:2408.04425]
22. S. C. Chen, **Y. Gao**, E. P. Zhou, R.-X. Xu, *Free energy of anisotropic strangeon stars*, Res. Astron. Astrophys. **24**, 025005 [arXiv:2305.19687].
21. E. P. Zhou, **Y. Gao**, Y. R. Zhou, X. Y. Lai, L. Shao, W. Y. Wang, S.-L. Xiong, R.-X. Xu, S. X. Yi, H. Yue, Z. Zhang, *The precursor of GRB211211A: a tide-induced giant quake?*, Res. Astron. Astrophys. **24**, 025019 [arXiv:2305.19687]
20. G. Yim, **Y. Gao**, Y. Kang, L. Shao and R. Xu, *Continuous gravitational waves from trapped magnetar ejecta and the connection to glitches and antiglitches*, Mon. Not. Roy. Astron. Soc. **527**, 2, 2379-2392 [arXiv:2308.01588]
19. C. Zhang, **Y. Gao**, C. J. Xia, R. Xu, *Rescaling strange-cluster stars and its implications on gravitational-wave echoes*, Phys. Rev. D **108**, 6, 063002 [arXiv:2305.13323]
18. Y. Kang, C. Liu, J. P. Zhu, **Y. Gao**, L. Shao, B. Zhang, H. Sun, Y. H. I. Yin and B. B. Zhang, *Prospects for detecting neutron star–white dwarf mergers with decihertz gravitational-wave observatories*, Mon. Not. Roy. Astron. Soc. **528**, 3, 5309-5322 [arXiv:2309.16991]
17. **Y. Gao**, L. Shao, Jan Steinhoff, *A tight universal relation between the shape eccentricity and the moment of inertia for rotating neutron stars*, Astrophys. J. **954**, 1, 16 [arXiv:2303.14130]
16. H. Liu, **Y. Gao**, Z. Li, A. Dohi, W. Wang, G. Lv and R. Xu, *EOS-dependent millihertz quasi-periodic oscillation in low-mass X-ray binary*, Mon. Not. Roy. Astron. Soc. **525**, 2, 2054-2068 [arXiv:2308.05288]
15. H.-B. Li, **Y. Gao**, L. Shao, R.-X. Xu, *The g-mode of neutron stars in Pseudo-Newtonian gravity*, Phys. Rev. D 108 **6**, 064005 [arXiv:2302.03856].
14. G. Desvignes, P. Weltevrede, **Y. Gao**, D. I. Jones, M. Kramer, M. Caleb, R. Karuppusamy, L. Levin, K. Liu, A. G. Lyne, L. Shao, B. Stappers, *A freely precessing magnetar following an X-ray outburst*, Nature Astron. **8**, 617-627.
13. **Y. Gao**, L. Shao, G. Desvignes, D. I. Jones, M. Kramer, G. Yim, *Precession of magnetars: dynamical evolutions and modulations on polarized electromagnetic waves*, Mon. Not. Roy. Astron. Soc. **1**, 1080-1097 [arXiv:2211.17087].
12. **Y. Gao**, R. Xu, L. Shao, *Precession of spheroids under Lorentz violation and observational consequences for neutron stars*, in Proceedings of the Ninth Meeting on CPT and Lorentz Symmetry, published.
11. **Y. Gao**, X.-Y. Lai, L. Shao, R.-X. Xu, (2022) *Rotation and deformation of strangeon stars in the Lennard-Jones model*, Mon. Not. R. Astron. Soc. **509**, 2758 [arXiv:2109.13234].
10. **Y. Gao**, L. Shao, R. Xu, L. Sun, C. Liu, R.-X. Xu, (2020) *Triaxially-deformed freely-precessing neutron stars: continuous electromagnetic and gravitational radiation*, Mon. Not. R. Astron. Soc. **498**, 1826 [arXiv:2007.02528].
9. **Y. Gao**, L. Shao, (2021) *Precession of triaxially deformed neutron stars*, Astron. Nachr. **342**, 364 [arXiv:2011.04472].
8. Z. Hu, **Y. Gao** , R. Xu, L. Shao, (2021) *Scalarized neutron stars in massive scalar-tensor gravity: X-ray pulsars and tidal deformability*, Phys. Rev. D **104**, 104014 [arXiv:2109.13453].
7. H.-B. Li, **Y. Gao** , L. Shao, R.-X. Xu, R. Xu, (2022) *Oscillation modes and gravitational waves from strangeon stars*, Mon. Not. R. Astron. Soc. **516**, 6172 [arXiv:2206.09407].

6. R. Xu, **Y. Gao**, L. Shao, (2022) *Neutron stars in massive scalar-Gauss-Bonnet gravity: Spherical structure and time-independent perturbations*, Phys. Rev. D **105**, 024003 [arXiv:2111.06561].
5. R. Xu, **Y. Gao**, L. Shao, (2021) Signature of Lorentz violation in continuous gravitational-wave spectra of ellipsoidal neutron stars, Galaxies **9**, 12 [arXiv:2101.09431].
4. R. Xu, **Y. Gao**, L. Shao, (2021) *Precession of spheroids under Lorentz violation and observational consequences for neutron stars*, Phys. Rev. D **103**, 084028 [arXiv:2012.01320].
3. R. Xu, **Y. Gao**, L. Shao, (2020) *Strong-field effects in massive scalar-tensor gravity for slowly spinning neutron stars and application to X-ray pulsar pulse profiles*, Phys. Rev. D **102**, 064057 [arXiv:2007.10080].
2. J. Zhao, L. Shao, **Y. Gao**, C. Liu, Z. Cao, B.-Q. Ma, (2021) *Probing dipole radiation from binary neutron stars with ground-based laser-interferometer and atom-interferometer gravitational-wave observatories*, Phys. Rev. D **104**, 084008 [arXiv:2106.04883].
1. C. Liu, L. Shao, J. Zhao, **Y. Gao**, (2020) *Multiband observation of LIGO/Virgo binary black hole mergers in the gravitational-wave transient catalog GWTC-1*, Mon. Not. R. Astron. Soc. **496**, 182 [arXiv:2004.12096].

Popular Science Articles

3. **Y. Gao**, L. Shao, R.-X. Xu, (2019) The waltz of a binary neutron star system (an article about GW170817, *in Chinese*).
2. **Y. Gao**, (2022) The structures of neutron stars (an article about dense matter in neutron stars, *in Chinese*).
1. **Y. Gao**, L. Shao, (2022) Does Einstein's theory of gravity hold up to the latest LIGO/VIRGO/KAGRA observations? (**translated** from the English version).

Invited Talks

5. Yangzhou University, School of Physics Science and Technology, Seminar — December 2024
4. Yangzhou University, School of Physics Science and Technology, Seminar — September 2022
3. Peking University, School of Physics, CuiYing Graduate Student Salon — February 2021
2. Max Planck Institut für Gravitationsphysik Colloquium (*online*) — September 2020
1. University of Tartu, Theoretical Physics Laboratory Colloquium (*online*) — October 2020

Contributed Talks

10. Brainstorming workshop: Deciphering the equation of state using gravitational waves from astrophysical sources, University of Warsaw, Poland — August 2024
9. SKA Pulsar Science Symposium 2022 — August 2022
8. FAST/Future Pulsar Symposium 11 — August 2022
7. Summer Science Day, KIAA, Peking University — July 2022
6. The 60th Anniversary of X-Ray Astronomy (*online*) — June 2022
5. Ninth Meeting on CPT and Lorentz Symmetry (*online*) — May 2022
4. FAST/Future Pulsar Symposium 10 — July 2021
3. Gravitation and Relativistic Astrophysics, Chinese Physical Society — April 2021
2. Gravitation and Cosmology Symposium — December 2020
1. FAST/Future Pulsar Symposium 9 — August 2020

References

Lijing Shao, Assistant Professor of Kavli Institute for Astronomy and Astrophysics, Peking University
K217, Kavli Institute for Astronomy and Astrophysics
5 Yiheyuan Road, Haidian District
Beijing 100871, P. R. China
email: lshao@pku.edu.cn
office phone: 86-10-6275-8461

Renxin Xu, Professor of Physics, Peking University
2912, Science Teaching Building No. 2, Department of Astronomy
5 Yiheyuan Road, Haidian District
Beijing 100871, P. R. China
email: r.x.xu@pku.edu.cn
office phone: 86-10-6275-8631

Masaru Shibata, Director at Max Planck Institute for Gravitational Physics & Head of the division Computational Relativistic Astrophysics
1.18, Albert Einstein Institute
Am Mühlenberg 1
Potsdam 14476, Germany
email: masaru.shibata@aei.mpg.de
office phone: 49-331-567-7222

David Ian Jones, Professor of Mathematical Physics, University of Southampton
B54, West Highfield Campus
University Road, SO17 1BJ
Southampton, United Kingdom
email: d.i.jones@soton.ac.uk
office phone: 44-23-8059-4829

Gregory Desvignes, Postdoctoral Researcher of Radio Astronomy, Max Planck Institute for Radio Astronomy
Auf dem Hügel 69
D-53121 Bonn, Germany
email: gdesvignes.astro@gmail.com