

# Yong Gao

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## CONTACT INFORMATION

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## EDUCATION

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

Dissertation Advisor: Prof. Lijing Shao

Dissertation Title: *Probing Structures of Neutron Stars with Gravitational Waves*

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

Degree conferred with honor.

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

Thesis Title: *The Electron Distributions of Strangelets in the Thomas-Fermi Model*

## RESEARCH INTERESTS

**Understanding the composition and state of matter under the extreme conditions inside neutron stars (NSs).** One major theme is modelling gravitational waves (GWs) from systems involving NSs: tidal/spin effects in the inspiral phase of binary NS systems, GW asteroseismology of oscillating NSs, continuous GWs from NS "mountains". A second major theme is studying the dynamics and observational consequences of freely precessing NSs.

**Testing gravity in the strong-field regime of NSs.** Focusing on the global properties of rotating, tidally-deformed, and oscillating NSs 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 (FPS9) **August 2020**

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

**Merit Student**, 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**

**National Encouragement Scholarship**, Dalian University of Technology **2015-2016**

## TEACHING EXPERIENCE

**Teaching Assistant**, Peking University

**Electrodynamics (B)**

**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-advise with Prof. Lijing Shao and Prof. Renxin Xu **2021–present**  
*Oscillations of neutron stars and gravitational-wave asteroseismology*

##### Undergraduate Students, Peking University

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

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

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

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

#### PROFESSIONAL ACTIVITIES, OUTREACH, AND SERVICE

##### KAGRA Collaboration

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

##### Chair of conference session/group meeting

**KAGRA Future Working Group 1st Open Meeting** (*online*) **November 2021**  
 Chair of the group meeting, **KIAAGRAVITY** **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**

#### COMPUTER SKILLS

Proficient in MATHEMATICA, Python, and Matlab. Experience in C, Bash, and HPC.  
 Markup languages:  $\text{\LaTeX}$ , Markdown.

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

#### SUBMITTED PUBLICATIONS

12. H.-B. Li, **Y. Gao (Corresponding author)**, L. Shao, R.-X. Xu, R. Xu, (2022) *Oscillation modes and gravitational waves from strangeon stars* [[arXiv:2206.09407](https://arxiv.org/abs/2206.09407)].
11. **Y. Gao**, R. Xu, L. Shao, *Precession of spheroids under Lorentz violation and observational consequences for neutron stars*, submitted to Proceedings of the Ninth Meeting on CPT and Lorentz Symmetry.

#### REFEREED PUBLICATIONS

10. **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](https://arxiv.org/abs/2109.13234)].
9. **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](https://arxiv.org/abs/2007.02528)].

8. Z. Hu, **Y. Gao (Corresponding author)**, 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. 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](#)].
6. 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](#)].
5. 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](#)].
4. 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](#)].
3. 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](#)].
2. **Y. Gao**, L. Shao, (2021) *Precession of triaxially deformed neutron stars*, *Astron. Nachr.* **342**, 364 [[arXiv:2011.04472](#)].
1. 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](#)].

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

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|----|--|----------------|
| 3. | Peking University, School of Physics, CuiYing Graduate Student Salon             | February 2021  |
| 2. | Max Planck Institut f. Gravitationsphysik Colloquium ( <i>online</i> )           | September 2020 |
| 1. | University of Tartu, Theoretical Physics Laboratory Colloquium ( <i>online</i> ) | October 2020   |

CONTRIBUTED  
TALKS

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|----|---|---------------|
| 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 ( <i>online</i> )           | June 2022     |
| 5. | Ninth Meeting on CPT and Lorentz Symmetry ( <i>online</i> )         | 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  
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**Renxin Xu**, Professor of Physics, Peking University  
2912, Science Teaching Building No. 2, Department of Astronomy  
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