

# Qian Hu

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## EDUCATION

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**University of Science and Technology of China (USTC)**

**Hefei, China**

*B.S. (Hon.) in Astrophysics, Expected in July 2021*

GPA: 3.90/4.30. Ranking: 2/30 in Department of Astronomy

## RESEARCH INTERESTS

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- **Gravitational-Wave (GW) Astronomy:** Data analysis, multi-messenger astronomy & GW's physical implications, next generation GW detectors.
- **Numerical Relativity:** Simulation of compact objects.

## RESEARCH EXPERIENCE

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**Semi-analytical algorithm of source localization of gravitational waves**

**June 2020 - Present**

*Advisor: Prof. Linqing Wen @The University of Western Australia*

- Analyzed the realistic distribution of rearranged parameters of GWs using Monte Carlo simulation, and proposed a novel bimodal prior distribution function.
- Derived a semi-analytical solution for the Bayesian posterior probability of GW source sky location.
- According to injection tests on design noise and O2 noise of LIGO&Virgo, this localization algorithm was rapid and fairly self-consistent. It will be implemented to the online GW detection pipeline SPIIR.
- Paper will be submitted to PRD. (As the first author, now in proofreading.)

**Research on joint observations of space-borne GW detectors**

**Feb 2020 - June 2020**

*Advisor: Prof. Wen Zhao @USTC*

- Modified the Python package Bilby, and enabled it to perform Bayesian parameter estimation for supermassive black hole binaries on space-borne GW detectors.
- Investigated the improvements of GW source localization and constraint on parity-violating gravity given by space-borne GW detector networks.
- Illustrated that detector networks could significantly improve source localization (especially for overhead binaries), while for constraining parity-violating gravity, the improvement was not distinct.
- Paper was submitted to PRD. (As the first author.)

**Fast gravitational wave localization based on null SNR**

**July 2019 - Aug 2019**

*Advisor: Prof. Linqing Wen @The University of Western Australia*

- Used the stability of distribution of null SNR to reduce the influence caused by non-Gaussian noise during GW source localization.
- Constructed probability skymap based on null SNR and coherent SNR, and gave GW source localization.

**Model-Independent test of the parity symmetry of gravity using GWs**

**Feb 2019 - Aug 2020**

*Advisor: Prof. Wen Zhao @USTC*

- Developed a waveform-independent method to extract right-hand and left-hand polarizations of GWs from GW data.
- By comparing arrival time of circular polarizations, gave the constraint on velocity birefringence in parity-violating gravity.
- Paper was published on EPJC. (As a coauthor.)

## PUBLICATIONS

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1. **Qian Hu**, Cong Zhou, Jhao-Hong Peng, Linqing Wen, Qi Chu, Manoj Kovalam, *Semi-analytical Approach for Sky Localization of Gravitational Waves*, in preparation.
2. **Qian Hu**, Mingzheng Li, Rui Niu, and Wen Zhao. *Joint Observations of Space-borne Gravitational-wave Detectors: Source Localization and Implication for Parity-violating Gravity*, submitted to Physical Review D.
3. Wen Zhao, Tan Liu, Linqing Wen, Tao Zhu, Anzhong Wang, **Qian Hu**, and Cong Zhou. *Model-independent test of the parity symmetry of gravity with gravitational waves. The European Physical Journal C*, 80(7), Jul 2020.

## TEACHING

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### Physical experimental software design & development

July 2020 - Dec 2020

*National virtual experimental teaching project*

- Designed and developed an educational application of GW data simulation, data analysis and Bayesian parameter estimation for physical experimental teaching.
- The software will be employed in experimental teaching for junior students major in astronomy at USTC from 2021.

### Classical Mechanics and Electrodynamics

2020 Fall @USTC

*Teaching assistant*

- Correct homework, answer questions and give refresher classes.

## AWARDS

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- National Scholarship (top  $\sim 2\%$ ), USTC, 2020
- National Astronomical Observatory Scholarship, USTC, 2020
- Outstanding Student Scholarship (Grade 3), USTC, 2019
- CGN Scholarship (Gold), USTC, 2019
- Outstanding Student Scholarship (Grade 2), USTC, 2018

## STANDARDIZED TEST

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- TOEFL 101 (R: 28 L: 29 S: 22 W: 22). TOEFL Best Score: 105

## PROFESSIONAL SKILLS

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- Python, C, Matlab, Mathematica,  $\text{\LaTeX}$ .