

# RUI LUO

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Postal Address: PO Box 76, Epping, NSW 1710, Australia

## EDUCATION

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### Peking University

Sep 2013 – Jul 2019

Department of Astronomy, School of Physics

*Doctor of Philosophy, Astrophysics*

Dissertation: *Measurement of the luminosity function of Fast Radio Bursts*

Advisor: Prof. K.J. Lee (KIAA-PKU)

### Huazhong University of Science and Technology

Sep 2009 – Jun 2013

School of Physics

*Bachelor of Science, Applied Physics*

## EMPLOYMENT

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### CSIRO Space and Astronomy

Aug 2019 – present

Australia Telescope National Facility

*Research Plus Postdoctoral Fellow*

Supervisor: Dr. George Hobbs (CSIRO-ATNF)

## RESEARCH INTERESTS

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**Radio Astronomy:** Fast Radio Bursts (FRBs), Pulsars, Radio Frequency Interference (RFI), the unknown unknowns

**Statistics:** Bayesian inference, Markov Chain Monte Carlo (MCMC)

**Machine Learning:** Convolutional Neural Network (CNN), Bayesian Optimization

## AWARDS AND PRIZES

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Rank No.1, Top 10 Research Progresses, Chinese Astronomy (Team Award) 2020

Vela Prize for oral presentations, FAST/Future Pulsar Symposium 8 2019

Second Academic Scholarship, Peking University 2013 – 2018

Kwang-Hua Scholarship, Peking University 2016

Second Prize of Chen Hu-Xiong Scholarship, Peking University 2015

Annual Scholarship, National Astronomical Observatories, Chinese Academy of Sciences 2013

## OBSERVING EXPERIENCE

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### Five-hundred-meter Aperture Spherical radio Telescope

PI: *Monitoring the repeating FRB candidates*, 12 hours

Jul – Oct 2019

Engineering: *Helped configure ROACH2 and monitor the real-time bandpass*

Apr 2016

### Parkes 64-m radio telescope

Co-I: *Monitoring the repeating FRB 180301*, 32.5 hours

2021APRS

PI: *Observing the repeating FRB 180301 with the Parkes UWL*, 32.5 hours

2020OCTS

PI: *Monitoring the repeating FRB candidates in the Southern Sky*, 16 hours

2020APRS

Contributions: Parkes Pulsar Timing Array, 60+ hours

Nov 2020 – present

### Australia Telescope Compact Array

PI: *Observing CU Virginis at 16cm wavelength using the Green Time*, 9 hours

2019OCTS

## Kunming 40-m radio telescope

Engineering: *Installed FRB backend and configured the FRB real-time searching software* Aug 2017

Engineering: *Assisted calibration for two polarization channels of the digital backend* Oct 2014

## Miyun 50-m radio telescope

Engineering: *Tested ROACH2 to observe bright pulsars* Aug 2015

## STUDENTS CO-ADVISED

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**Lunhua Shang:** Joint-PhD student at NJUST and CSIRO 2020 – present

*Research projects: Studies on the pulsed variable stars with radio observations*

**Weiyang Wang:** PhD at UCAS-NAOC, graduated in the end of 2020 2017 – 2020

*Research projects: Theoretical studies on Fast Radio Bursts*

## TEACHING AND OUTREACH

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**PULSE@Parkes:** Remote sessions of pulsar observing for the high-school students in Australia 2020

TA: GENERAL PHYSICS, School of Earth and Space Sciences, Peking University 2017

TA: ATOMIC PHYSICS, School of Physics, Peking University 2015

## SUPPORTS AND SERVICES

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**The CSIRO-ATNF Co-learnia:** One of main organisers 2019 – present

Duties: Seeking the voluntary speakers, scheduling the weekly talks, sending email reminders, hosting the speakers and maintaining the resources on the website

The ATCA **Duty Astronomer** 2019 – present

Duties: Assisting the observers to calibrate and configure the observations, reporting and solving possible observing issues.

Updates on the **ATNF-PSRCAT** 2020 – present

Duties: Collecting the new parameters for known and new pulsars in the literature, making and compiling the update files.

## TALKS IN CONFERENCES OR SEMINARS

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**C3DIS 2021 Conference**, Virtual, Australia Jul 2021

Contributed oral presentation: *simulateSearch – A package for simulating high time-resolution data in radio astronomy*

**MQ AAASeminar**, Macquarie University, Sydney, Australia May 2021

Invited in-person talk: *Diverse polarization angle swings from a repeating fast radio burst source*

**ASKAP-CRAFT Group Meeting**, ATNF-Swinburne-Curtin, Australia Mar 2021

Invited remote talk: *Current FRB Science Outcomes with FAST*

**Pulsar Group Meeting**, MPIfR, Bonn, Germany Feb 2021

Invited remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*

**Colloquium**, Curtin Institute of Radio Astronomy, Perth, Australia Jan 2021

Invited remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*

**Colloquium**, Department of Astrophysics, University of Radboud, Netherlands Dec 2020

Invited remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*

**Lunch Talk**, Kavli IPMU, University of Tokyo, Japan Dec 2020

Invited remote talk: *Diverse polarization angle swings from a repeating fast radio burst source*

**CSIRO-ATNF Co-learnium**, Marsfield, NSW, Australia Dec 2020

Contributed remote talk: <i>Life changes of the local residents around the FAST site</i> <b>CHIME/FRB Journal Club</b> , Canada <a href="#">[Video Recording]</a>	Dec 2020
Invited remote talk: <i>Diverse polarization angle swings from a repeating fast radio burst source</i> <b>Seminar, AUS-NZ-PSR Group Meeting</b> , Australasia	Nov 2020
Contributed remote talk: <i>Diverse polarization angle swings from a repeating fast radio burst source</i> <b>FRB 2020 International Meeting</b> , Zoom Webinar <a href="#">[Video Recording]</a>	Jul 2020
Contributed remote talk: <i>Measurement of the luminosity function of Fast Radio Bursts</i> <b>ATNF Bolton Symposium</b> , Kensington, Perth, Australia	Mar 2020
Contributed talk: <i>A new repeating FRB discovered by the FAST telescope</i> <b>CSIRO-ATNF Co-learnium</b> , Marsfield, NSW, Australia	Dec 2019
Contributed talk: <i>A beginner's guide to Bayesian inference</i> <b>CSIRO-ATNF Colloquium</b> , Marsfield, NSW, Australia	Sep 2019
Invited talk: <i>Measurement of the luminosity function of Fast Radio Bursts</i> <b>FAST/Future Pulsar Symposium 8</b> , Xi'an, China	Jun 2019
Contributed talk: <i>Measurement of the luminosity function of Fast Radio Bursts</i> <b>Cosmology Group Meeting, NAOC</b> , Beijing, China	Mar 2019
Invited talk: <i>Measurements on the FRB luminosity function</i> <b>KIAA Graduate Dinner Talk</b> , Beijing, China	Dec 2018
Invited talk: <i>An Overview on Fast Radio Bursts and FRB luminosity function</i> <b>NAOC Graduate Student Seminar</b> , Beijing, China	Apr 2018
Invited talk: <i>A Review of Fast Radio Bursts and FRB luminosity function</i> <b>Radio Astronomy Forum 2017</b> , Pingtang, China	Sep 2017
Poster talk: <i>Simulating DM of host galaxies to derive FRB luminosity function</i> <b>Chinese Astronomical Society Annual Meeting 2016</b> , Wuhan, China	Nov 2016
Contributed talk: <i>Simulating the dispersion measure of host galaxies</i> <b>Jing-Guang-Xia Astrophysics Meeting</b> , Xiamen, China	Jul 2016
Contributed talk: <i>Simulating the dispersion measure of host galaxies</i> <b>QTT Colloquium Series 2016</b> , Zunyi, China	Jul 2016
Contributed talk: <i>Simulating the dispersion measure of FRB host galaxies</i> <b>PKU-XAO Bilateral Meeting</b> , Urumqi, China	Jun 2016
Contributed talk: <i>Simulating the dispersion measure of FRB host galaxies</i> <b>Chinese Astronomical Society Annual Meeting 2015</b> , Beijing, China	Oct 2015
Contributed talk: <i>Consideration of Research on FRBs</i> <b>QTT Colloquium Series 2015</b> , Ming'antu, China	Jul 2015
Contributed talk: <i>Consideration of Research on FRBs</i> <b>KIAA-SHAO Bilateral Workshop</b> , Beijing, China	May 2015
Contributed talk: <i>Consideration of FRB searching</i>	

## TECHNICAL SKILLS

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<b>Programming</b>	PYTHON (Proficient), C, C++, UNIX
<b>Softwares</b>	MATLAB, MATHEMATICA, PRESTO, TEMPO2, MULTINEST
<b>Tools</b>	GIT, LATEX, WIKI, HTML

## LANGUAGES

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<b>Chinese</b>	Native
<b>English</b>	Fluent
<b>Japanese</b>	Elementary

## REFERENCES

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### **Kejia Lee**

*Associate Professor*

Kavli Institute for Astronomy and Astrophysics, Peking University

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### **George Hobbs**

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### **Duncan Lorimer**

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### **R. N. Manchester**

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### **Bing Zhang**

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## PUBLICATIONS

(Summary: 18 publications in total, including one first-author paper in Nature. H-index: 8, – Jul 2021)

### First-author papers:

3. **Luo, R.**, Wang, B. J., Men, Y. P., Zhang, C. F., Jiang, J. C., Xu, H., Wang, W. Y., Lee, K. J., Han, J. L., Zhang, B., Caballero, R. N., Chen, M. Z., Chen, X. L., Gan, H. Q., Guo, Y. J., Hao, L. F., Huang, Y. X., Jiang, P., Li, H., Li, J., Li, Z. X., Luo, J. T., Pan, J., Pei, X., Qian, L., Sun, J. H., Wang, M., Wang, N., Wen, Z. G., Xu, R. X., Xu, Y. H., Yan, J., Yan, W. M., Yu, D. J., Yuan, J. P., Zhang, S. B., & Zhu, Y., *Diverse polarization angle swings from a repeating fast radio burst source*, 2020, [Nature](#), **586**, 693
2. **Luo, R.**, Men, Y. P., Lee, K. J., Wang, W. Y., Lorimer, D. R., & Zhang, B., *On the FRB luminosity function - II. Event rate density*, 2020, [MNRAS](#), **494**, 665
1. **Luo, R.**, Lee, K. J., Lorimer, D. R., & Zhang, B., *On the normalized FRB luminosity function*, 2018, [MNRAS](#), **481**, 2320

### Second/Third-author papers:

7. Niu, C.-H., Li, D., **Luo, R.**, Wang, W.-Y., Yao, J., Zhang, B., Zhu, W.-W., et al. *CRAFTS for Fast Radio Bursts – II. Extending the dispersion-fluence relation with new FRBs detected by FAST*, 2021, [ApJ](#), **909**, L8
6. Zhu, W., Li, D., **Luo, R.**, Miao, C., Zhang, B., Spitler, L., Lorimer, D., Kramer, M., Champion, D., Yue, Y., Cameron, A., Cruces, M., Duan, R., Feng, Y., Han, J., Hobbs, G., Niu, C., et al., *A Fast Radio Burst discovered in FAST drift scan survey*, 2020, [ApJ](#), **895**, L6
5. Jiang, J. C., Wang, W. Y., **Luo, R.**, Du, S., Chen, X. L., Lee, K. J., & Xu, R. X., *FRB 171019: An event of binary neutron star merger?*, 2020, [RAA](#), **20**, 4, 56
4. Men, Y. P., **Luo, R.**, Chen, M. Z., Hao, L. F., Lee, K. J., Li, J., Li, Z. X., Liu, Z. Y., Pei, X., Wen, Z. G., Wu, J. J., Xu, Y. H., Xu, R. X., Yuan, J. P., & Zhang, C. F., *Piggyback searching for fast radio bursts using Nanshan 26m and Kunming 40m radio telescopes – I. Observing and data analysis systems, discovery of a mysterious peryton*, 2019, [MNRAS](#), **488**, 3957
3. Yi, S.-X., Cheng, K. S., & **Luo, R.**, *Clumpy jets from black hole-massive star binaries as engines of Fast Radio Bursts*, 2019, [MNRAS](#), **483**, 4197
2. Wang, W. Y., **Luo, R.**, Yue, H., Chen, X. L., Lee, K. J., & Xu, R. X., *FRB 121102: A Starquake-induced Repeater?*, 2018, [ApJ](#), **852**, 140
1. Yang, Y.-P., **Luo, R.**, Li, Z., & Zhang, B., *Large Host-galaxy Dispersion Measure of Fast Radio Bursts*, 2017, [ApJ](#), **839**, L25

### Other co-author papers:

8. Niu, C.-H., Aggarwal, K., Li, D., Zhang, X., Chatterjee, S., Tsai, C.-W., Yu, W., Law, C. J., Burke-Spolaor, S., Cordes, J. M., Zhang, Y.-K., Ocker, S., Yao, J.-M., Wang, P., Feng, Y., Niino, Y., Bochenek, C., Cruces, M., Connor, L., Jiang, J.-A., Dai, S., **Luo, R.**, Li, G.-D., Miao, C.-C., Niu, J.-R., Anna-Thomas, R., Stern, D., Wang, W.-Y., Yuan, M., Yue, Y.-L., Zhou, D.-J., Yan, Z., Zhu, W.-W., & Zhang, B., *A highly active repeating fast radio burst in a complex local environment*, 2021, *Nature*, submitted
7. Yang, X., Zhang, S.-B., Wang, J.-S., Hobbs, G., Sun, T.-R., Manchester, R. N., Geng, J.-J., Russell, C. J., **Luo, R.**, Tang, Z.-F., Wang, C., Wei, J.-J., Staveley-Smith, L., Dai, S., Li, Y., Yang, Y.-Y., & Wu, X.-F., *81 New Candidate Fast Radio Bursts in Parkes Archive*, 2021, *MNRAS*, submitted

6. Goncharov, B., Shannon, R. M., Reardon, D. J., Hobbs, G., Zic, A., Bailes, M., Curylo, M., Dai, S., Kerr, M., Lower, M. E., Manchester, R. N., Mandow, R., Middleton, H., Miles, M. T., Parthasarathy, A., Thrane, E., Thyagarajan, N., Xue, X., Zhu, X.-J., Cameron, A. D., Feng, Y., **Luo, R.**, Russell, C. J., Sarkissian, J., Spiewak, R., Wang, S., Wang, J. B., Zhang, L., & Zhang, S., *On the evidence for a common-spectrum process in the search for the nanohertz gravitational wave background with the Parkes Pulsar Timing Array*, 2021, *ApJL*, submitted
5. Zhang, C. F., Xu, J. W., Men, Y. P., Deng, X. H., Xu, H., Jiang, J. C., Wang, B. J., Lee, K. J., Li, J., Yuan, J. P., Liu, Z. Y., Huang, Y. X., Xu, Y. H., Li, Z. X., Hao, L. F., Luo, J. T., Dai, S., **Luo, R.**, Zakie, H., & Ma, Z. Y., *Fast radio burst detection in the presence of coloured noise*, 2021, *MNRAS*, **503**, 5223
4. Dai, S., Lu, J. G., Wang, C., Wang, W. Y., Xu, R. X., Yang, Y.-P., Zhang, S.-B., Hobbs, G., Li, D., **Luo, R.**, Filipovic, M., & Jiang, J. C., *On the Non-detection of Circular Polarisation from Repeating Fast Radio Bursts*, 2020, *ApJ*, submitted
3. Zhang, S.-B., Hobbs, G., Russell, C. J., Toomey, L., Dai, S., Dempsey, J., Manchester, R. N., Johnston, S., Staveley-Smith, L., Wu, X.-F., Li, D., Yang, Y.-Y., Wang, S.-Q., Qiu, H., **Luo, R.**, Wang, C., Zhang, C., Zhang, L., & Mandow, R., *Parkes transient events: I. Database of single pulses, initial results and missing FRBs*, 2020, *ApJS*, **249**, 14
2. Men, Y. P., Aggarwal, K., Li, Y., Palaniswamy, D., Burke-Spolaor, S., Lee, K. J., **Luo, R.**, Demorest, P., Tendulkar, S., Agarwal, D., Young, O., & Zhang, B., *Non-detection of fast radio bursts from six gamma-ray burst remnants with a possible magnetar engine*, 2019, *MNRAS*, **489**, 3643
1. Wang, W. Y., Lu, J. G., Zhang, S. B., Chen, X. L., **Luo, R.**, & Xu, R. X., *Pulsar giant pulse: coherent instability near light cylinder*, 2019, *SCPMA*, **62(7)**, 979511