

# JIAXUAN LI

## PERSONAL INFORMATION

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## RESEARCH INTERESTS

I am enthusiastic about all aspects of astrophysics and cosmology, and I am especially interested in:

- Low surface brightness astrophysics: galaxy outskirts, intracluster/intragroup lights, ultra-diffuse galaxies.
- Galaxy evolution: quenching of galaxies, formation of massive galaxies, galaxy-halo connection, SMBHs.
- Cosmology: weak lensing, cosmological simulations, CMB, large-scale structure.
- Statistical methods and machine learning in astrophysics.
- Instrumentation, deep sky surveys, astronomical data reduction.

## EDUCATION

<b>Bachelor of Science</b> , Department of Astronomy, Peking University, China	Sept 2016 - July 2020 (expected)
• Major: Astrophysics GPA: 3.83/4.00 Rank: <b>1 / 28</b>	<a href="#">  Detailed Transcript</a>
Selected courses: <i>Physical Cosmology</i> (3.98, Rank 1), <i>Astrophysics Seminar</i> (3.96, Rank 1), <i>Astronomical Spectroscopy</i> (3.97, Rank 1), <i>Physics Lab II</i> (3.98, Rank 2), <i>Methods of Mathematical Physics</i> (3.93)	
• TOEFL iBT: 109. Reading: 29, Listening: 28, Speaking: 24, Writing: 28.	
• GRE General: Verbal 153/170, Quantitative 170/170, Analytical Writing 3.5	
• GRE Physics: 990/990, Percentile 94%	

## PUBLICATIONS

1. **Li J.**, Huang S., Leauthaud A., Moustakas J., Danieli S., Ardila F., van Dokkum P., Greene J., Abraham R., Kado-Fong E., Lupton R., Mowla L., Reaching for the Edge I: Probing the Outskirts of Massive Galaxies with HSC, DECaLS, SDSS and Dragonfly, in preparation.
2. **Li J.**, Peng Y.-j., Guo K., Huang S., Zhang C., SDSS IV MaNGA: Inside-out quenching galaxies with H $\alpha$  ring-like structures, in preparation.
3. van Dokkum P., Lokhorst D., Danieli S., **Li J.**, Merritt A., Abraham R., Gilhuly C., Greco J. P., [Multi-resolution filtering: an empirical method for isolating faint, extended emission in Dragonfly data and other low resolution images](#), arXiv:1910.12867, *PASP* submitted.
4. Danieli S., Lokhorst D., Zhang J., Merritt A., van Dokkum P., Abraham R., Conroy C., Gilhuly C., Greco J., Janssens S., **Li J.**, Liu Q., Miller T., Mowla L., [The Dragonfly Wide Field Survey. I. Telescope, Survey Design and Data Characterization](#), arXiv:1910.14045, *ApJ* submitted.

## REFERENCES

<b>Prof. Alexie Leauthaud</b> ✉ <a href="mailto:alexie@ucsc.edu">alexie@ucsc.edu</a>	University of California, Santa Cruz
<b>Prof. Pieter van Dokkum</b> ✉ <a href="mailto:pieter.vandokkum@ucsc.edu">pieter.vandokkum@ucsc.edu</a>	Yale University
<b>Prof. Yingjie Peng</b> ✉ <a href="mailto:yjpeng@pku.edu.cn">yjpeng@pku.edu.cn</a>	Kavli Institute on Astronomy and Astrophysics, Peking University

## RESEARCH EXPERIENCE

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### Multi-resolution filtering: an empirical method for isolating faint, extended emission in Dragonfly data and other low resolution images

**Advisor:** [Pieter van Dokkum](#)

Research Intern, Yale University, USA. June 2019 – Sept 2019

- Helped develop an empirical, self-contained method “Multi-resolution filtering” (MRF) to isolate and study faint, large-scale emission in imaging data of low spatial resolution (such as the Dragonfly Telephoto Array). This method is crucial for sciences using Dragonfly and has already been used in [van Dokkum et al. \(2019\)](#), [Gilhuly et al. \(2019\)](#) and [Danieli et al. \(2019\)](#).
- Implemented and packaged MRF algorithm into an open-source Python package [mrf](#) and built the [documentation](#) website. Helped complete a paper submitted to PASP ([arXiv:1910.12867](#)) as the fourth author.
- Proposed and implemented two variations of MRF (self-MRF and cross-MRF) when no intrinsically low-resolution image is available to be used. Tested the idea of surface brightness contrast and incorporate it into the [mrf](#) package.
- Currently working on applying MRF to the Dragonfly Wide Field Survey data ([Danieli et al. 2019](#)).

### Reaching for the Edge I: Probing the Outskirts of Massive Galaxies with HSC, DECaLS, SDSS and Dragonfly

**Advisors:** [Alexie Leauthaud](#), [Song Huang](#)

Research Fellow, UC Santa Cruz, USA. Sept 2018 – Jan 2019

- Explored the ability of different sky surveys (HSC, DECaLS, Dragonfly and SDSS) to extract the stellar halo light profiles of massive galaxies.
- Revealed that the sky background of HSC data release S18A (PDR2) is under-subtracted for galaxies at intermediate redshift and is still over-subtracted around bright galaxies, and proposed an efficient method to characterize and correct the sky residual based on mock galaxy tests.
- Concluded that Dragonfly shows the best ability ( $\mu_r > 30$  mag/arcsec<sup>2</sup>) in detecting low surface brightness feature for low- $z$  galaxies. DECaLS with customized pipeline still suffers from over-subtraction but could recover the stellar mass very well (with less than 0.05 dex deviation from HSC result).
- Currently working on a first-authored MNRAS paper manuscript.

### SDSS IV MaNGA: Inside-out quenching galaxies with H $\alpha$ ring-like structures

**Advisor:** [Yingjie Peng](#)

Research Assistant, Peking University, China. July 2017 – Now

- Helped discover galaxies with H $\alpha$  ring-like emission structures in the MaNGA survey using MaNGA Pipe3D data. Most of them are located in the “green valley” and experiencing the inside-out quenching process.
- Characterized H $\alpha$  rings by measuring their radii and found a tight correlation between the ring radii and the bar lengths for barred disk galaxies.
- Examined multiple properties of H $\alpha$  ring galaxies and found high bar fraction, bulge-to-total ratio, and AGN (Seyfert & LINER) fraction. This supports that the joint effects of bar, bulge, and AGN could quench the massive disk galaxies efficiently by the inside-out quenching mode and form the H $\alpha$  ring-like structure.
- Currently working on a first-authored paper manuscript.

## HONORS AND AWARDS

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<a href="#">Tang Li-Xin Scholarship</a> (10,000 RMB per year, most competitive scholarship in PKU)	May 2019
<a href="#">AEON Scholarship</a> , Peking University (10,000 RMB, 2/202)	Sept 2018
<a href="#">Leo KoGuan Scholarship</a> , Peking University (10,000 RMB, 4/202)	Oct 2017
Weiming Physics Outstanding Student (7,000 RMB per year)	2017, 2018, 2019
National Undergraduate Research & Training Program (10,000 RMB)	May 2019
<a href="#">Lin-bridge Prize</a> for Excellent Undergraduate Research (2,800 RMB, endowed by Prof. Douglas Lin)	Sept 2018
Merit Student, Peking University	2017, 2018
First Prize, 8 <sup>th</sup> China Undergraduate Physicists Tournament	Aug 2017
Meritorious Winner in Mathematical Contest In Modeling (MCM/ICM)	Apr 2018
8th Place in Beijing Division, AI Challenger: <a href="#">SEARCHING SUPERNOVAE IN SKY SURVEY</a>	Apr 2019
Silver Medal, 9 <sup>th</sup> International Olympiad on Astronomy and Astrophysics (IOAA)	Aug 2015
Gold Medal & Best Result, China National Astronomy Olympiad	2014, 2015
Gold Medal (3 <sup>rd</sup> place), 1 <sup>st</sup> Princeton University Physics Competition	Jan 2015

## COMPUTER SKILLS

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- Skilled in:** Python,  $\text{\LaTeX}$ , Mathematica, Shell/Bash, Git.
- Experienced with:**
- Significant experience with [HSC](#), [DECaLS](#), [Dragonfly](#) and [SDSS-MaNGA](#) data
  - Manipulating catalogs, analyzing dataset and visualization
  - Photometry of galaxies and low surface brightness features
- Often-used Packages:** [Astropy](#), [IRAF](#), [SExtractor](#), [SWarp](#), [The tractor](#), [GalSim](#), [emcee](#), [PyTorch](#).
- Basic Knowledge:** SQL/ADQL, C/C++, Lightroom, Photoshop.
- Software Contributions:**
- [mrf](#): Multi-Resolution Filtering – a method for isolating faint extended emission in Dragonfly data and other low resolution images
  - [kungpao](#): Photometric analysis library for Hyper Suprime-Camera images
  - [unagi](#): For searching and downloading data from Hyper Suprime-Camera
  - [lvhuo](#): Image stacking analysis tool for Hyper Suprime-Camera data
  - More works can be found on my Github: [@AstroJacobLi](#)

## OBSERVATIONAL EXPERIENCE

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Peking University 40-cm Telescope (PKUFT): photometry and spectroscopy	2017 – 2019
Shane 3-m Telescope, UCO Lick Observatory: 2 nights observation of spectroscopy.	Jan 2019
Xinglong 2.16-m Telescope (NAOC): 2 nights observation of photometry.	Oct 2019

## OUTREACH EXPERIENCE

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- President of Peking University [Youth Astronomy Society](#) (largest academic student association at PKU).  
I organized and also gave public talks on topics in astrophysics.
- Mentor of the Chinese Astronomy Olympiad National Team, and wrote a [textbook](#) on Astronomy Olympiad.
- Invited to a television show “Voice” (开讲啦) on CCTV-1 as a youth representative.  
I talked about the public outreach of astronomy in China and the future of Chinese astronomy. [▶](#)

## ACTIVITIES AND TALKS

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Presentation at HSC galaxy group telecon	June 2019
<a href="#">Theoretical Problems Designer</a> , 12 <sup>th</sup> IOAA	Nov 2018
PKU Undergraduate Astronomy Symposium	Sept 2018
Mentor, Training for Chinese Astronomy Olympiad National Team	July 2018
PKU Representative, “Young Talent Plan” 10 Year Anniversary Symposium, USTC	July 2018
Asian Science Camp, Kampar, Malaysia	Aug 2017
Pacific Astronomy and Engineering Summit, Hawaii, U.S.	Aug 2014