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.
- Statistical methods and machine learning in astrophysics.
- Instrumentation, deep sky surveys, astronomical data reduction.

Education

Graduate Student, Department of Astrophysical Sciences, Princeton University, U.S.　　　Starting from Sept 2021

Bachelor of Science (highest honor), Department of Astronomy, Peking University, China　　　Sept 2016 - July 2020

- Major: Astrophysics　　GPA: 3.80/4.00　　Rank: 2 / 28　　　　　　　　　　　| Detailed Transcript

  Thesis: *Probing low surface brightness features in the NGC 1052 field with Dragonfly Telephoto Array*

Research Positions

Research Assistant, KIAA, Peking University, China	Sept 2020 – Sept 2021
Undergraduate Research Intern, Yale University, U.S.	June 2019 – Sept 2019
Undergraduate Research Fellow, University of California, Santa Cruz, U.S.	Oct 2018 – Jan 2019
Undergraduate Research Assistant, Peking University, China	July 2017 – June 2020

References

Prof. Jenny Greene　　　　　　　　　　　　　　　　　　　　　　　　　Princeton University
✉ jgreene@astro.princeton.edu

Prof. Alexie Leauthaud　　　　　　　　　　　　　　　　University of California, Santa Cruz
✉ alexie@ucsc.edu

Prof. Pieter van Dokkum　　　　　　　　　　　　　　　　　　　　　　　　Yale University
✉ pieter.vandokkum@ucsc.edu

Prof. Yingjie Peng　　　　　Kavli Institute for Astronomy and Astrophysics, Peking University
✉ yjpeng@pku.edu.cn

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., Guo K., Huang S., Zhang C., SDSS IV MaNGA: Inside-out quenching galaxies with Hα ring-like structures, in preparation.

3. Miller T. B., van Dokkum P., Danieli S., **Li J.**, Abraham R., Conroy C., Gilhuly C., Greco J. P., Liu Q., Lokhorst D., Merritt A., The Dragonfly Wide Field Survey. II. Accurate Total Luminosities and Colors of Nearby Massive Galaxies and Implications for the Galaxy Stellar Mass Function, *ApJ* submitted.

4. 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, *PASP*, 132, 1013 (2020).

5. 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, *ApJ*, 894, 2 (2020).

RESEARCH EXPERIENCE

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^2) 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 Hα ring-like structures

    Advisor: Yingjie Peng   Research Assistant, Peking University, China. July 2017 – Now

- Helped discover galaxies with Hα 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 Hα 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 Hα 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 Hα ring-like structure.
- Currently working on a first-authored paper manuscript.

HONORS AND AWARDS

Outstanding Undergraduate Thesis Award in Beijing (北京市本科优秀毕业论文)	Sept 2020
Weiming Bachelor ("未名学士" 称号)	June 2020
Outstanding Graduate of General Colleges and Universities in Beijing (北京市普通高校优秀毕业生)	June 2020
Outstanding Graduate of Peking University (北京大学优秀毕业生)	June 2020
PKU Scholar in Physics (未名物理学子)	2017 – 2020
Tang Li-Xin Scholarship (10,000 RMB per year, most competitive scholarship in PKU)	May 2019
AEON Scholarship, Peking University (10,000 RMB, 2/202)	Sept 2018

Leo KoGuan Scholarship, Peking University (10,000 RMB, 4/202)	Oct 2017
National Undergraduate Research & Training Program (10,000 RMB)	May 2019
Lin-bridge Prize for Excellent Undergraduate Research (2,800 RMB, endowed by Prof. Douglas Lin)	Sept 2018
Merit Student, Peking University	2017, 2018
Excellent Member of Communist Youth League (优秀共青团员), Peking University	Mar 2018
Innovation Prize, Peking University	Oct 2017
First Prize, 8th China Undergraduate Physicists Tournament	Aug 2017
Meritorious Winner in Mathematical Contest In Modeling (MCM/ICM)	Apr 2018
8th Place in Beijing Division, AI Challenger: SEARCHING SUPERNOVAE IN SKY SURVEY	Apr 2019
Silver Medal, 9th International Olympiad on Astronomy and Astrophysics (IOAA)	Aug 2015
Gold Medal & Best Result, China National Astronomy Olympiad	2014, 2015
Gold Medal (3rd place), 1st Princeton University Physics Competition	Jan 2015

COMPUTER SKILLS

Skilled in:	Python, 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

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

• 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

Presentation at HSC galaxy group telecon	June 2019
Theoretical Problems Designer, 12th 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

Leadership Experience

President of Peking University Youth Astronomy Society (YAS)   May 2017 – May 2018
Monitor of Undergraduate Class 2016, Department of Astronomy   Sept 2016 – Now
Leader of Isotropic Group   Sept 2018 – Now