

# Anowar J. Shajib

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## CONTACT INFORMATION

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## RESEARCH INTERESTS

Gravitational Lensing, Observational Cosmology

## EDUCATION

### University of California, Los Angeles, USA

Ph.D. Candidate, Astronomy, March 2017 (expected graduation date: June 2020)

- Dissertation Topic: “Shining light on the dark energy with time-delay cosmography”
- Advisor: Prof. Tommaso Treu

M.S., Astronomy, June 2016

- Advisor: Prof. Edward L. Wright

### The University of Tokyo, Japan

B.S., Physics, March 2014

## HONORS AND AWARDS

**Dissertation Year Fellowship**, UCLA, 2019-2020, \$20,000

Graduate Student Travel Stipend, MIAPP, 2018, €500

Graduate Student Travel Grant, UCLA, 2017, \$2000

**Graduate Division Fellowship**, UCLA, 2014-2015, \$18,000

**MEXT<sup>1</sup> Scholarship**, 2009-2014 (equivalent to \$92,000)

## PUBLICATION STATISTICS

10 refereed papers (including 3 as first author, and one as single author), 3 papers under review (including 1 as first author).

## PUBLICATIONS

### First Author Publications

5. Shajib, A. J., et al. STRIDES: A 3.9 per cent measurement of the Hubble constant from the strong lens system DES J0408-5354. [arXiv:1910.06306](https://arxiv.org/abs/1910.06306), 2019.
4. Shajib, A. J. Unified lensing and kinematic analysis for *any* elliptical mass profile. [MNRAS](https://arxiv.org/abs/1907.04869), 488, 1387-1400, 2019.
3. Shajib, A. J., et al. Is every strong lens model unhappy in its own way? Uniform modelling of a sample of 13 quadruply+ imaged quasars. [MNRAS](https://arxiv.org/abs/1907.04869), 483, 5649-5671, 2019.
2. Shajib, A. J., Treu, T., and Agnello, A. Improving time-delay cosmography with spatially resolved kinematics. [MNRAS](https://arxiv.org/abs/1810.04869), 473, 210-226, 2018.
1. Shajib, A. J. and Wright, E. L. Measurement of the integrated Sachs-Wolfe effect using the AllWISE data release. [ApJ](https://arxiv.org/abs/1608.04869), 827:116 (9pp), 2016.

### Contributing Author Publications

10. Wong, C. K., et al. H0LiCOW XIII. A 2.4% measurement of  $H_0$  from lensed quasars: 5.3 $\sigma$  tension between early and late-Universe probes. [arXiv:1907.04869](https://arxiv.org/abs/1907.04869), 2019.

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<sup>1</sup>Ministry of Education, Culture, Sports, Science and Technology, Government of Japan

9. Chen, G. C.-F., et al. A SHARP view of H0LiCOW: H0 from three time-delay gravitational lens systems with adaptive optics imaging. *MNRAS*, [stz2547](#), 2019.
8. Taubenberger, S., et al. The Hubble Constant determined through an inverse distance ladder including quasar time delays and Type Ia supernovae. *A&A*, [628, L7](#), 2019.
7. Rusu, C. E., et al. H0LiCOW XII. Lens mass model of WFI2033-4723 and blind measurement of its time-delay distance and  $H_0$ . [arXiv:1905.09338](#), 2019.
6. Sluse, D., et al. H0LiCOW XI: Spectroscopic/imaging survey and galaxy-group identification around the strong gravitational lens system WFI2033-4723. *MNRAS*, [stz2483](#), 2019.
5. Beaton, R. L., et al. Measuring the Hubble Constant Near and Far in the Era of ELT's. *BAAS* [51\(3\) 456](#), 2019.
4. Birrer, S., et al. H0LiCOW - IX. Cosmographic analysis of the doubly imaged quasar SDSS 1206+4332 and a new measurement of the Hubble constant. *MNRAS*, [484, 4726-4753](#), 2019.
3. Chen, G. C.-F., et al. Constraining the microlensing effect on time delays with new time-delay prediction model in  $H_0$  measurements. *MNRAS*, [481, 1115-1125](#), 2018.
2. Ding, X., Treu, T., **Shajib, A. J.**, et al. Time Delay Lens Modeling Challenge: I. Experimental Design. [arXiv:1801.01506](#), 2018.
1. Williams, P. R., et al. Discovery of three strongly lensed quasars in the Sloan Digital Sky Survey. *MNRAS: Letters*, [477, L70-L74](#), 2018.

#### INVITED TALKS

1. MPA Lensing Group Seminar, Munich, Germany, June 2018.

#### CONTRIBUTED TALKS

13. Thursday lunch seminar, Princeton University, New Jersey, USA, October 2019.
12. Galaxy lunch talk, Yale University, Connecticut, USA, October 2019.
11. Galaxies and Cosmology Seminar, Center for Astrophysics, Harvard University, Massachusetts, USA, October 2019.
10. Galaxy journal club, STScI, Maryland, USA, October 2019.
9. Particle Astrophysics Seminar, Fermilab, Illinois, USA, October 2019.
8. Lunch talk, Carnegie Observatories, California, USA, September 2019.
7. Non-Standard Cosmology Probes, Aspen Center of Physics, Colorado, USA, August 2019.
6. Tensions between the Early and the Late Universe. Kavli Institute for Theoretical Physics, UCSB, USA, July 2019.
5. Astronomy seminar. University of California, Riverside, USA, May 2019.
4. Keck Science Meeting. Caltech, USA, September 2018.
3. Extragalactic distance scale in the *GAIA* era, MIAPP workshop. Munich, Germany, June 2018.
2. Shedding Light on the Dark Universe with Extremely Large Telescopes. UCLA, USA, April 2018.
1. Strong Lensing by Galaxies and Clusters. Aosta, Italy, June 2017.

#### COLLABORATION MEMBERSHIP

- Co-PI, STRong-lensing Insights into Dark Energy Survey (STRIDES), an external collaboration of the Dark Energy Survey (DES)
- $H_0$  Lenses in COSMOGRAIL's Wellspring (H0LiCOW)

PROFESSIONAL SERVICE	<ul style="list-style-type: none"> <li>• Journal referee for Monthly Notices of the Royal Astronomical Society and American Astronomical Society</li> <li>• Graduate admission committee member (2019), Division of Astronomy, UCLA</li> </ul>
MENTORING	<ul style="list-style-type: none"> <li>• <b>Eden Molina:</b> UCLA undergraduate, completing a project to model doubly-imaged lensed quasars from NIRC2 imaging data. Mentored since Fall 2018.</li> <li>• <b>Vedant Sahu:</b> UCLA undergraduate, working on a project to apply machine learning in modelling quadruply-lensed quasars. Mentored since Summer 2019.</li> </ul>
TEACHING	<p><b>University of California, Los Angeles, USA</b></p> <p><i>Guest Lecturer</i></p> <ul style="list-style-type: none"> <li>• Physics 127 - General Relativity (Spring 2015)</li> <li>• Astro 81 - Astronomy I: Stars and Nebulae (Winter 2016)</li> </ul> <p><i>Teaching Assistant</i></p> <ul style="list-style-type: none"> <li>• Astronomy 3 - Nature of Universe (Fall 2014)</li> <li>• Physics 1C - Electrodynamics, Optics and Special Relativity (Winter 2015)</li> <li>• Physics 127 - General Relativity (Spring 2015)</li> <li>• Physics 6C - Physics for Life Sciences Majors: Light, Fluids, Thermodynamics, Modern Physics (Fall 2015)</li> <li>• Astronomy 81 - Astrophysics I: Stars and Nebulae (Winter 2016)</li> <li>• Astronomy 140 - Stellar Systems and Cosmology (Spring 2016)</li> <li>• Physics 12 - Physics of Sustainable Energy (Winter 2017)</li> </ul>
WORKSHOPS	<ol style="list-style-type: none"> <li>4. Non-Standard Cosmology Probes, Aspen Center of Physics, Colorado, USA, August–September 2019.</li> <li>3. TMT Early Career Initiative Workshop, Los Angeles, December 2018.</li> <li>2. Extragalactic distance scale in the <i>GAIA</i> era, MIAPP, Germany, June–July 2018.</li> <li>1. Mary Lea &amp; C. Donald Shane Observational Astronomy Workshop, UCO/Lick Observatory, October 2014.</li> </ol>
POSTER PRESENTATION	<ol style="list-style-type: none"> <li>2. Cosmic Controversies. Kavli Institute for Cosmological Physics, University of Chicago, USA, October 2019.</li> <li>1. Tensions between the Early and the Late Universe. Kavli Institute for Theoretical Physics, UCSB, USA, August 2019.</li> </ol>
APPROVED OBSERVING PROPOSALS (CoI)	<ol style="list-style-type: none"> <li>4. <i>Hubble Space Telescope</i> GO-15652 (2018). PI: Treu. <math>H_0</math>, the stellar initial mass function, and other dark matters from a large sample of quadruply imaged quasars.</li> <li>3. 2-m Himalayan Chandra Telescope (2018). PI: Courbin. Photometric monitoring of the quadruply lensed quasar PS0J0147+4630.</li> <li>2. Very Large Telescope, MUSE NFM Science Verification (2018, 103A). PI: Zanella. From cosmology to star-forming regions: two compelling cases for MUSE NFM.</li> <li>1. Keck U053(2017A), U032(2017B), U011(2018A), U011(2018B), U029(2019A), U065(2019B). PI: Treu. Dark energy with gravitational time-delay: OSIRIS spectroscopy of lensing galaxies.</li> </ol>

APPROVED COMPUTING PROPOSALS	1. XSEDE Startup Allocation, 200,000 CPU hours (TG-AST190038, 2019). PI: Treu, co-PI: Shajib. Highly-detailed strong-gravitational lens modeling to measure the Hubble constant.
OBSERVING EXPERIENCE	OSIRIS, Keck I, 11.5 nights, NIRC2, Keck II, 3 nights, MOSFIRE, Keck I, 3 nights, Shane telescope PFCam, Lick Observatory, 0.5 nights, Nickel telescope imager, Lick Observatory, 0.5 nights.
DATA ANALYSIS EXPERIENCE	<i>Hubble Space Telescope</i> (WFC3), W. M. Keck Observatory (OSIRIS, NIRC2), Very Large Telescope (MUSE), <i>Wide-field Infrared Survey Explorer</i> , <i>Wilkinson Microwave Anisotropy Probe</i> , <i>Planck</i> , Sloan Digital Sky Survey.
COMPUTER SKILLS	<b>Programming Languages:</b> Python, C, C++, PHP, SQL, JavaScript <b>Astronomy software:</b> Lenstronomy, IRAF, PyRAF, SExtractor, DS9 <b>Software/Framework:</b> TensorFlow, Flask
OUTREACH	<b>Cal-Bridge program</b> , hosted a workshop at UCLA for California State University undergraduates on Graduate admission preparation, March, 2019. <b>Lecturer at Astronomy Live! summer workshop</b> for high school students, 2018. <b>Astronomy Live!</b> , visited K-12 schools to perform various demos as part of the UCLA Astronomy outreach program. <b>Exploring Your Universe</b> , performed various demos in UCLA's annual science festival, 2014-17. <b>Star show</b> , UCLA Planetarium, 2014-2016. <b>Public talk</b> , UCLA Planetarium, 2014.