Zhaozhou Li

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Work Experience

• Marie Skłodowska-Curie Fellow	Hebrew University of Jerusalem, Israel	2023 –
• Postdoctoral Fellow	Hebrew University of Jerusalem, Israel	2021 – 2023
• Postdoctoral Researcher	Shanghai Jiao Tong University, China	2018 – 2021

Education

• Ph.D. in Astrophysics	Shanghai Astronomical Observatory, China	2011 – 2017
• B.S. in Applied Physics	Beihang University, China	2007 – 2011

Research Projects

Project series that I lead, mostly on the **dynamics and formation of cosmic structures**

• Galaxy structural evolution by mass changes, heating, and tidal stripping	2021 –
• Main-sequence ridgeline of open clusters in color-magnitude diagram (CMD)	2019 – 2020
• Dynamical modeling with non-parametric distribution functions (DFs)	2018 – 2021
• Mass profile and boundary of the Milky Way halo from satellite kinematics	2017 – 2021
• Initial and final orbital distribution of satellite galaxies	2013 – 2018

Professional Expertise

- Cosmological/isolated simulation & analysis
  Merger tree, (sub)structure finding, tidal field, two-point correlation function, GADGET
- Galactic dynamics
  DF modeling, Jeans equation, violent relaxation, orbit integration, action analysis (Galpy/Agama)
- Observational data analysis
  Analysis of survey catalogs (SDSS/BOSS, *Gaia*), modeling stellar populations in CMD
- Statistics and machine learning
  Hierarchical Bayes, mixture model, Gaussian process, Bayes optimization, robust statistics, clustering
- Programming (Expert – Python; familiar – C, Fortran, SQL)
  High performance computing (OpenMP, parallel Python, Cython), numerical analysis (Scipy, GSL)

Open-source Practice

- Ranking by public contribution: top 10% overall on StackOverflow with ∼2.7M people reached
  371 in Israel on GitHub
- Selected open-source software, see more at https://syrte.github.io/code
  - cyper: running Cython codes on the fly for high performance Python ⊙
  - robustgp: proposed novel Gaussian process regression for contaminated data ⊙
  - ndtest: multi-dimensional statistical tests (incl. 2D K-S test; >30 citations) ⊙
  - ParsecQuery: querying isochrones from the PARSEC stellar evolution model ⊙

- Code cited by 48 papers of various disciplines (incl. exoplanets, bioinformatics, agriculture, etc.) 🎓
- Occasional contributor of infrastructure libraries including Numpy, Scipy, Cython

HONORS AND AWARDS

- Marie Skłodowska-Curie Actions Fellowship (score: 99/100), 200,000€, Europe — 2023 – 2025
- Rosenblum Award for Excellence in Astrophysics (travel fund), 2,500$, HUJI — 2022
- Second Prize of the National Mathematics Competitions for College Students, China — 2010
- First Prize of the Physics Experiment Competition for College Students, Beijing — 2009
- Outstanding Freshman Scholarship, Second Prize, Beihang Univ. — 2007

SERVICES

- Referee for scientific journal: MNRAS — 2022 –
- Coordinator of the astrophysics seminar at HUJI — 2022 –
- LOC member of the conference *Studying the Universe with Galaxy Surveys*, Shanghai — 2018
- Founder and maintainer of the AstroPython wechat discussion groups (∼1000 users) — 2016 –
- Maintainer of the computing servers of the cosmology group at SHAO — 2014 – 2020
- Coordinator of the cosmology journal club at SHAO and SJTU — 2014 – 2016, 2018 – 2019

TEACHING

- HUJI — guest lecturer — Advanced Cosmology (graduate course, 4h) — 2022S, 2023S
- HUJI — project advisor — Astrophysics Seminar (undergraduate research training, 20h) — 2022S
- Shanghai — lecturer — Applied Python in Astronomy (workshop, 4h) — 2015

OUTREACH

- Public lecture at a book club, "A Ramble under the Starry Sky" (2h), Changsha — Jul 2023
- Expositor of the open day of physics and astronomy (20h), SJTU — 2017 – 2019
- Lecturer/advisor in scientific practice projects for high school students (100h), Shanghai 🖾 — 2016 – 2018
- Volunteer guide at the Shanghai Natural History Museum — 2016
- Lecturer of introductory astro/geo courses in primary and middle schools (25h), Shanghai — 2015 – 2017
- Member of the Interplanetary Immigration Agency, a near-future science fiction project ⸙ — 2014 –
- Co-organizer of sidewalk astronomy nights and stargazing camps (> 20), Beijing — 2007 – 2011

SOCIAL SERVICES

- Coordinator of the photography exhibition of migrant children, *Voice of Flowing Hearts*, Beijing — 2010
- Volunteer in a field survey of schools for migrant children, Beijing — 2010
- Disaster volunteer of the Sichuan earthquake (1 month), Pengzhou — 2008

SEMINAR TALKS

- Ben-Gurion University, Israel — Jan 2024
- Purple Mountain Observatory, China — Dec 2023
- Nanjing University, China — Dec 2023
- Shanghai Normal University, China — Dec 2023
- CCA, Flatiron Institute, US — Oct 2023
- Yale University, US — Oct 2023
- National Astronomical Observatories, China (×2) — Jul 2023
- Shanghai Astronomical Observatory, China — Jun 2023
- University of Minnesota, US — Nov 2022
- Hebrew University of Jerusalem, Israel — Apr 2022
- Hebrew University of Jerusalem, Israel — Mar 2021

- Kavli IPMU, University of Tokyo, Japan   Sep 2020
- KIAA, Peking University, China   Jun 2020
- Shanghai Astronomical Observatory, China   Apl 2020
- SWIFAR, Yunnan University, China   Nov 2019
- ICC, Durham University, UK   Jul 2019
- Kavli IPMU, University of Tokyo, Japan   Aug 2018
- Department of Astronomy, Shanghai Jiao Tong University, China   Nov 2017

Conference Presentations

- Santa Cruz Galaxy Workshop   Aug 2023
- Collaboration Workshop on Cosmology and Galaxy Formation, Shanghai (*Invited*) Jun 2023
- DDA54: Annual Meeting of the Division on Dynamical Astronomy of AAS, Remote   May 2023
  Modeling the formation of dark-matter deficient galaxies
- AI for Astronomy, Online/Shenzhen   Nov 2022
  Robust Gaussian process and its application to resolved stellar population
- Santa Cruz Galaxy Workshop   Aug 2022
  Modeling the Response of Halos to Gas Ejection and Tidal Stripping
- DDA53: Annual Meeting of the Division on Dynamical Astronomy of AAS, Remote   Apr 2022
  Modeling the response of dark matter haloes to gas ejection
- EAS: European Astronomical Society Annual Meeting, Online   Jul 2021
  Measuring the Milky Way mass profile from satellite galaxies kinematics
- DDA52: Annual Meeting of the Division on Dynamical Astronomy of AAS, Online   May 2021
  A novel dynamical modeling method based on the data-driven distribution function
- Guoshoujing Meeting on Galaxies and Cosmology, Hangzhou   May 2021
  The outer edges of the Milky Way halo from the motion of nearby galaxies
- Cross-Strait Symposium on Star Cluster Studies, Online   Dec 2020
  Precise determination of the main sequence of open clusters in the CMD
- Chinese Astronomical Society Annual Meeting, Online   Oct 2020
- Shanghai Assembly on Cosmology and Galaxy Formation, Shanghai   Nov 2019
  Constrain the Milky Way Mass Profile with Phase Space Distribution of Satellite Galaxies
- Galaxy Angular Momentum Alignment 2019, Shanghai   Oct 2019
  Satellite Kinematics and Milky Way Halo Mass
- The Milky Way 2019: LAMOST and Other Leading Surveys, Yichang   Oct 2019
  Measure the Milky Way Mass Profile with Satellite Galaxies in Phase Space
- Small Galaxies, Cosmic Questions, Durham (*poster talk*)   Jul 2019
  Milky Way Mass Profile from Satellite Dynamics
- Astrophysical Dynamics, Tsung-Dao Lee Institute, Shanghai   Jul 2019
- Galactic Dynamics in the Era of Large Surveys, Shanghai   Jul 2019
  Measure the Milky Way Mass Profile with Satellite Galaxies in Phase Space
- Halo and Galaxy Assembly Bias — from Theory to Observation, Shanghai   Jun 2019
  Constrain Massive Cluster Formation with SDSS
- The Life and Times of the Milky Way, Shanghai   Nov 2018
- Studying the Universe with Galaxy Surveys Revealing the Unlimited in Shanghai   Jun 2018
  Milky Way Halo Mass from Satellite Kinematics
- SHAO-PKU Bilateral Symposium, Shanghai   Aug 2017
- 11th Zhang Heng Meeting of the Chinese Astronomical Society, Guiyang   Jun 2017
  Determination of Milky Way Halo Mass from Kinematics of Satellite Galaxies

# Publications

Since 2017: 28 papers (9 as lead author) + 2 proceedings, 410 citations, H=10 [ADS ✎, arXiv ✎]

Major contributions

28. Phase space distribution functions and energy distributions of dark matter particles in haloes
Gross, A., **Li, Z.**, and Qian, Y.-Z., 2024, arXiv:2402.02740 ✎

27. Feedback-free starbursts at cosmic dawn: Observable predictions for JWST
Li, Z., Dekel, A., Sarkar, K.C., Aung, H., Giavalisco, M., Mandelker, N., and Tacchella, S., 2023, arXiv:2311.14662 ✎

26. The response of dark matter haloes to gas ejection: CuspCore II
Li, Z., Dekel, A., Mandelker, N., Freundlich, J., François, T., 2023, MNRAS, 518, 5356 ✎

25. The outermost edges of the Milky Way halo from galaxy kinematics
Li, Z.-Z. and Han, J., 2021, ApJL, 915, L18 ✎

24. Robust Gaussian process regression based on iterative trimming
Li, Z.-Z., Li, L., and Shao, Z., 2021, Astronomy and Computing, 36, 100483 ✎

23. Orbital distribution of infalling satellite halos across cosmic time
Li, Z.-Z., Zhao, D.-H., Jing, Y.P., Han, J., and Dong, F.-Y., 2020, ApJ, 905, 177 ✎

22. Constraining the Milky Way mass profile with phase-space distribution of satellite galaxies
Li, Z.-Z., Qian, Y.-Z., Han, J., Li, T.S., Wang, W., and Jing, Y.P., 2020, ApJ, 894, 10 ✎

21. A versatile and accurate method for halo mass determination from phase-space distribution of satellite galaxies
Li, Z.-Z., Qian, Y.-Z., Han, J., Wang, W., and Jing, Y.P., 2019, ApJ, 886, 69 ✎

20. The structure finders and the subhalo population in cosmological simulations (*Review in Chinese*)
Li, Z.-Z., Han, J.-X., 2018, Progress in Astronomy, 36-3, 306 ✎

19. Determination of dark matter halo mass from dynamics of satellite galaxies
Li, Z.-Z., Jing, Y.P., Qian, Y.-Z., Yuan, Z., and Zhao, D.-H., 2017, ApJ, 850, 116 ✎

Collaboration papers

18. The true number density of massive galaxies in the early Universe revealed by JWST/MIRI
Wang, T., Sun, H., Zhou, L., Xu, K., Cheng, C., **Li, Z.**, et al., 2024, arXiv, arXiv:2403.02399 ✎

17. Are Odd Radio Circles virial shocks around massive galaxies? Implications for cosmic-ray diffusion in the circumgalactic medium
Yamasaki, S., Sarkar, K.C., and **Li, Z.**, 2024, MNRAS, 528, 3854 ✎

16. Evidence for a Shallow Evolution in the Volume Densities of Massive Galaxies at z=4 to 8 from CEERS
Chworowsky, K., Finkelstein, S.L., Boylan-Kolchin, M., et al. (incl. **Li, Z.**), 2023, arXiv:2311.14804 ✎

15. Effects of feedback-free starburst galaxies on the 21-cm signal and reionization history
Libanore, S., Flitter, J., Kovetz, E.D., **Li, Z.**, and Dekel, A., 2023, arXiv:2310.03021 ✎

14. DESI Legacy Imaging Surveys Data Release 9: Cosmological Constraints from Galaxy Clustering and Weak Lensing using the Minimal Bias Model
Xu, H., Li, H., Zhang, J., et al. (incl. **Li, Z.**), 2023, Science China: Physics, Mechanics & Astronomy, 66, 129811 ✎

13. Unraveling the Complexity of Dwarf Galaxy Dynamics: A Study of Binary Orbital Motions
Wang, W., Zhu, L., Jing, Y., Grand, R.J.J., **Li, Z.**, et al., 2023, ApJ, 956, 91 ✎

12. Physical evolution of dark matter halo around the depletion boundary
Gao, H., Han, J., Fong, M., Jing, Y.P., and **Li, Z.**, 2023, ApJ, 953, 37 ✎

11. Efficient Formation of Massive Galaxies at Cosmic Dawn by Feedback-Free Starbursts
Dekel, A., Sarkar, K.S., Birnboim, Y., Mandelker, N., and **Li, Z.**, 2023, MNRAS, 523, 3201 ✎

10. Is the core-cusp problem a matter of perspective: Jeans Anisotropic Modeling against numerical simulations
Wang, W., Zhu, L., **Li, Z.**, Chen, Y., Han, J., He, F., Yang, X., et al., 2022, ApJ, 941, 108 ✎

9. The growth pattern of liver metastases on MRI predicts early recurrence in patients with colorectal cancer: a multicenter study
Cai, Q., Mao, Y., Dai, S., et al. (incl. **Li, Z.**), 2022, European Radiology, 32, 7872 ✎

8. The Universal Specific Merger Rate of Dark Matter Halos
   Dong, F., Zhao, D., Han, J., **Li, Z.**, Jing, Y., and Yang, X., 2022, ApJ, 929, 120 ✂

7. A machine learning approach to infer the accreted stellar mass fractions of galaxies
   Shi, R., Wang, W., **Li, Z.**, et al., 2022, MNRAS, 515, 3938S ✂

6. What to expect from dynamical modelling of cluster haloes - I. The information content of different dynamical tracers
   Li, Q., Han, J., Wang, W., Cui, W., **Li, Z.**, and Yang, X., 2021, MNRAS, 505, 3907 ✂

5. Weak equivalence principle, swampland and H_0 tension with fast single radio bursts FRB 180924 and FRB 190523
   Wang, D., **Li, Z.**, and Zhang, J., 2020, Physics of the Dark Universe, 29, 100571 ✂

4. Modeling Unresolved Binaries of Open Clusters in the Color-Magnitude Diagram. I. Method and Application of NGC 3532
   Li, L., Shao, Z., **Li, Z.-Z.**, Yu, J., Zhong, J., and Chen, L., 2020, ApJ, 901, 49 ✂

3. The mass of our Milky Way (*Invited Review*)
   Wang, W., Han, J., Cautun, M., **Li, Z.**, and Ishigaki, M.N., 2020, Science China: Physics, Mechanics & Astronomy, 63, 109801 ✂

2. The first constraint from SDSS galaxy-galaxy weak lensing measurements on interacting dark energy models
   Zhang, J., An, R., Luo, W., **Li, Z.**, Liao, S., and Wang, B., 2019, ApJL, 875, L11 ✂

1. Fully self-consistent cosmological simulation pipeline for interacting dark energy models
   Zhang, J., An, R., Liao, S., Luo, W., **Li, Z.**, and Wang, B., 2018, Phy. Rev. D, 98, 103530 ✂

Conference proceedings

2. Dynamical interaction in the stellar cluster – Evidence from binaries of NGC3532
   Li, L., Shao, Z., **Li, Z.-Z.**, 2021, Joint Statistical Meetings (JSM) proceedings, 2021.317202

1. Satellite galaxies as better tracers of the Milky Way halo mass
   Han, J., Wang, W., and **Li, Z.**, 2020, Galactic Dynamics in the Era of Large Surveys, IAU Symposium, 353, 109 ✂