

# HUANIAN ZHANG

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## Education and Employment

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- **Associate Professor** Huazhong University of Science and Technology 2021.09 – Present
- **DESI Fellow** (Xiaohui Fan) The University of Arizona 2020.08 – 2021.08
- **Postdoc Research Fellow** (Dennis Zaritsky) The University of Arizona 2016.08 – 2020.08
- **Doctor of Philosophy, Physics** The University of Arizona 2011.08 – 2016.08  
Galileo Circle Scholarship (2016.03) • Fanfare Grant (2014.03, 2015.04)
- **Bachelor of Science, Physics** Shandong University 2007.09 – 2011.06  
Excellent Student Award (2008.10, 2010.10) • National Scholarship of China (2008.10)

## Research Interests

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- The detection of the Circumgalactic Medium (CGM) of nearby galaxies via emission lines using SDSS spectra stacking, with a series of papers published.
- Study of the CGM/IGM of low redshift galaxies and moderate redshift galaxies using emission or Quasar absorption features from DESI spectroscopy.
- Searching for high redshift Quasars using machine learning via the combination of multi-band photometry data (DECaLS, PanSTARRS, and WISE).
- The CGM Mapping of local individual galaxies (NGC 0864 at 20.9 Mpc as an example) within 50 kpc with moderate resolution in radial (2 bins) and azimuthal (12 bins) direction at the MMT/Magellan Telescope.
- Searching for Globular Clusters within 2 Mpc in the local volume using the photometric data from the DECaLS, SDSS, Galex and WISE surveys using machine learning technique. We had the first run of observation for candidates for two nights, although none of them was confirmed as Globular Clusters (GCs).
- Measuring the total mass of Milky Way Galaxy from escape velocity using the H3 (“Hectochele in the Halo at High Resolution”) halo star catalog.
- Searching for Ultra Diffuse Galaxies (UDGs) from the all-sky DECaLS survey and studying the properties from the statistics point of view.

## Proposals

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- Huanian Zhang and Dennis Zaritsky observed using the IMACS Spectrograph at the Magellan Telescope for 2 nights (May 4-5th 2019A) to search the isolated globular clusters within 2 Mpc in the local volume. 2019.05
- Mapping the Circumgalactic Medium of the local individual galaxy NGC 0864 out to 50 kpc at the MMT/Magellan Telescope, PI: Huanian Zhang, Co-I: Dennis Zaritsky, Peter Behroozi, Jessica Werk, Robert Kennicutt, Xiaohu Yang, Xiaohui Fan. 2021B 0.5 night

## Mentoring

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- Mentoring an undergraduate student (Limeng Jiang) to search for the high redshift quasars ( $z > 6$ ) using the combined datasets of DECaLS, Pan-STARRS, and WISE. We developed a method to obtain the near-infrared photometry data for the missing data using the spectra and an automated machine learning algorithm (random forest, deep learning) to search for the high- $z$  quasars. 2020.08 – Present

- Mentoring an undergraduate student (Andres Jaramillo) to search the Globular Clusters within 2 Mpc in the local volume. Specifically, I am mentoring the student to develop an automated machine learning algorithm to search for GCs using the combined datasets of DECaLS, SDSS, Galex and WISE. 2018.08 – 2020.08
- Mentoring two graduate students (Hongyu Gao and Yun Zheng) at Shanghai Jiaotong University (SJTU) on a program to detect the [O II]  $\lambda\lambda 3727, 3729$  emission signal in galaxies with median redshift  $\sim 0.75$  from the VVDS and VIPERS low-resolution spectroscopy surveys, with the aim at studying the luminosity function and the mass – metallicity relationship for those high redshift galaxies. 2019.06 – Present

## Teaching

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- Advanced Electromagnetism 2022 Spring
- Taught 3 labs each semester for 4 and half years (more than 400 students taught). Helped design easier physics experiments for students to learn. 2011.08 – 2015.12

## Conferences/Seminars/Workshops

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- The Circumgalactic Medium at the DESI era, **invited colloquium** at USTC, Hefei 2021.12
- The Circumgalactic Medium at the DESI era, **invited colloquium** at USTC, Hefei 2020.10
- The Circumgalactic Medium at the DESI era, Steward Observatory, Tucson 2020.09
- The Circumgalactic Medium perspective from emission lines, IPMU, Tokyo 2020.04
- Narrative of the Circumgalactic Medium, Steward Observatory, Tucson 2020.04
- The cool component of the Circumgalactic Medium, GMTO, San Diego, CA 2019.09
- The Circumgalactic Medium of nearby galaxies, **invited** talk at the Purple Mountain Observatory, Nanjing 2019.07
- Visiting scholar, Shanghai Jiaotong University, Shanghai 2019.06 – 07
- The Circumgalactic Medium, **Colloquium** at Tsinghua University, Beijing 2019.06
- The Circumgalactic Medium, **Colloquium** at SJTU University, Shanghai 2019.06
- Visiting scholar, Peking University, Beijing 2019.05 – 06
- The Circumgalactic Medium, **invited** seminar, Peking University, Beijing 2019.05
- Detection of the Circumgalactic Medium via emission lines, igm-inter2018, Marseille 2018.07
- Visiting scholar, Shanghai Jiaotong University, Shanghai 2018.06 – 07
- Container Camp and HPC Workshop, University of Arizona, Tucson 2018.03
- Gaseous halos of Nearby Galaxies and the Milky Way, UCSC, Santa Cruz 2017.08
- Visiting scholar, Tsinghua University, Beijing 2017.06 – 07
- Hydrogen Emission in the halos of Nearby Galaxies and Absorption in the Milky Way, Peking University, Beijing, and Xiamen University, Xiamen 2017.06
- Higgs boson and  $Z$  boson assisted stop search at hadron colliders, APS Four Corner Meeting, Phoenix 2015.10
- Electroweak symmetry breaking and new physics beyond the Standard Model, CTEQ Workshop, Pittsburgh 2015.07
- Exotic stop search at LHC, Pheno Symposium 2014, Pittsburgh 2014.05

## Publications – Leading Author

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1. An Empirical Determination of the Dependence of the Circumgalactic Mass Cooling Rate and Outflow Mass Loading Factor on Galactic Stellar Mass  
**Huanian Zhang**, Dennis Zaritsky, Karen Olsen, Peter Behroozi, Robert Kennicutt et al, ApJ, 916, 101, 2021

2. Observing the Effects of Galaxy Interactions on the Circumgalactic Medium  
**Huanian Zhang**, Taotao Fang, Dennis Zaritsky et al, ApJL, 893, 1, 2020
3. H $\alpha$  Emission and the Dependence of the Circumgalactic Cool Gas Fraction on Halo Mass  
**Huanian Zhang**, Xiaohu Yang, Dennis Zaritsky et al, ApJ, 880, 33, 2020
4. On The Effect of Environment on Line Emission from the Circumgalactic Medium  
**Huanian Zhang**, Dennis Zaritsky, Peter Behroozi, Jessica Werk, ApJ 880 28, 2019
5. Emission line ratios for the Circumgalactic Medium and the “Bimodal” Nature of Galaxies  
**Huanian Zhang**, Dennis Zaritsky, Jessica Werk, Peter Behroozi, ApJL 866 1, 2018
6. Emission from the Ionized Gaseous Halos of Low Redshift Galaxies and Their Neighbors  
**Huanian Zhang**, Dennis Zaritsky, Peter Behroozi, ApJ 861 34, 2018
7. The Galaxy’s Veil of Excited Hydrogen  
**Huanian Zhang** & Dennis Zaritsky, **Nature Astronomy** 0103, 2017.  
**Press Release:** <https://phys.org/news/2017-04-hydrogen-halo-veil-galactic-home.html>
8. Hydrogen Emission from the Ionized Gaseous Halos of Low Redshift Galaxies  
**Huanian Zhang**, Dennis Zaritsky et al, ApJ 833 276, 2016
9. Examining early-type galaxy scaling relations using simple dynamical models  
**Huanian Zhang** & Dennis Zaritsky, MNRAS 455 1364, 2015
10. Higgs and Z Assisted Stop Searches at Hadron Colliders  
Shufang Su, **Huanian Zhang**, J. of High Energy Physics 05 135, 2018 (*authors in alphabetical order, corresponding author*)
11. Sbottom discovery via mixed decays at the LHC  
Tao Han, Shufang Su, Yongcheng Wu, Bin Zhang, **Huanian Zhang**, Phys. Rev. D 92 115009, 2015 (*authors in alphabetical order, corresponding author*)
12. Complex decay chains of top and bottom squarks  
Jonathan Eckel, Shufang Su, **Huanian Zhang**, J. of High Energy Physics 07 075, 2015 (*authors in alphabetical order, corresponding author*)

### Publications – Co-Author

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13. Systematically Measuring Ultra-Diffuse Galaxies (SMUDGes). II. Expanded Survey Description and the Stripe 82 Catalog  
Dennis Zaritsky, Richard Donnerstein, Arjun Dey, Jennifer Kadowaki, **Huanian Zhang**, ApJS, 240, 1Z, 2018
14. One hundred SMUDGes in S-PLUS: ultra-diffuse galaxies flourish in the field  
C. E. Barbosa, D. Zaritsky, R. Donnerstein, **Huanian Zhang**, et al, ApJS 247, 2, 2020
15. H3 and a Lower Mass Limit for the Milky Way Galaxy  
Dennis Zaritsky, Charlie Conroy, **Huanian Zhang**, et al, ApJ 888, 114Z, 2020
16. Systematically Measuring Ultra Diffuse Galaxies (SMUDGes). I. Survey Description and First Results in the Coma Galaxy Cluster and Environs  
Dennis Zaritsky, Richard Donnerstein, Arjun Dey, Jennifer Kadowaki, **Huanian Zhang**, ApJS, 240, 1Z, 2018
17. Astro2020: Empirically Constraining Galaxy Evolution  
Peter Behroozi et al, arXiv:1903.04509, 2019

18. Astro2020: Emission Line Mapping of the Circumgalactic Medium of Nearby Galaxies  
Dennis Zaritsky et al, arXiv:1904.06398, 2019

### Programming/Computational Skills

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- **Programming:** Python (NumPy, SciPy, Pandas, scikit-learn), C/C++, Latex, R, Linux commands, shell script, SQL, MATLAB, Microsoft Office (Word, Excel, PPT)
- **Modeling:** Machine Learning algorithm including linear regression, classification (logistic regression, Support Vector Machine (SVM), K Nearest Neighbor (KNN), Random Forest (RF)), MCMC, clustering, Principle Component Analysis (PCA), neural network (NN)
- **Statistics:** Probability theory, Maximum likelihood, Bayesian method (MAP estimate), Confidence interval

### Reference

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- **Dennis Zaritsky**, [dennis.zaritsky@gmail.com](mailto:dennis.zaritsky@gmail.com), professor at Steward Observatory, the University of Arizona.
- **Peter Behroozi**, [pbehroozi@gmail.com](mailto:pbehroozi@gmail.com), professor at Steward Observatory, the University of Arizona.
- **Xiaohui Fan**, [fan@as.arizona.edu](mailto:fan@as.arizona.edu), professor at Steward Observatory, the University of Arizona.