Sangjun Cha — CV

Department of Astronomy, College of Science, Yonsei University
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Education

Yonsei University
Ph.D. in Astronomy *2021/03 – 2026/08 (expected)*
Thesis: High-Precision Mapping of Dark Matter in Galaxy Clusters Through Strong and Weak Lensing with Deep-Learning Techniques
Supervisor: Prof. Myungkook James Jee

Yonsei University
B.S. in Astronomy & Physics (Double majors) *2015/03 – 2021/02*
(Studies were interrupted by compulsory military service, 2016–2017)

Research Interests

Cosmology, Deep learning, Galaxy clusters, Large-scale structure of the universe, Strong gravitational lensing, Weak gravitational lensing

Publication Statistics

18 total refereed/under-review papers. **6 first-author papers** (6 refereed),
4 second or third author and **8 co-author papers** (8 refereed, 4 under review)

Fellowship, Grants, Scholarship, and Awards

2018 – 2020: Truth Scholarship (Yonsei University), ∼ USD 4500

2021 – 2023: Integrated Undergraduate-and-Graduate Program Scholarship (Yonsei University; Three-year full-tuition), ∼ USD 23000

2021 – 2023: Brain Korea 21 Plus Fellowship (Yonsei University), ∼ USD 30000

2023: Yonsei Merit Academic Paper Award (Yonsei University)

2024: Excellent Academic Paper Award (Yonsei University), ∼ USD 400

2024 – 2026: Doctoral Student Research Fellowship (National Research Foundation of Korea) - Title: A research on Cosmological Parameter Prediction in Modern Cosmology Combining Strong Gravitational Lensing and Deep-Learning technique, ∼ USD 40000

2024: International Joint Research Grant by Yonsei Graduate School, ∼ USD 1800

2025: Academic Research Fellowship (Yonsei University), ∼ USD 1400

Teaching Assistant

2021: UNDERSTANDING OF SPACE (Yonsei University)

2021: ASTROPHYSICS (Yonsei University)

2022: INTRODUCTION TO ASTROPHYSICS (Yonsei University)

2022: SCIENTIFIC IMAGE DATA PROCESSING (Yonsei University)

Successful Proposals

Hubble Space Telescope Cycle 33 (25.8 hours, co-I)

Requiem's Return: Precision cosmology from a decade-delayed, strongly-lensed supernova and its new sibling

MeerKAT (ID: MKT-25073, 5.5 hours, co-I)

From First Impact to Apocenter: Merger-Driven Diffuse Radio Emission from Bullet-like Systems at Distinct Phases

Presentations

Talk

2025: Probing Dark Matter and Cluster Merger with JWST Strong and Weak Lensing: Case Studies of the Bullet Cluster and Abell 2744 / 33rd Texas Symposium on Relativistic Astrophysics / USA / Contributed (accepted)

2025: Weak-lensing Detection and Reconstruction of Filamentary Structures in the Rubin Era: A Case Study of Abell 2744 / Korean Rubin Science Workshop 2025 / South Korea / Contributed

2025: From Cluster Cores to Filaments: Gravitational Lensing Studies of Galaxy Clusters / CfA Galaxy Clusters Group Meetings / USA

2025: Lensing Analysis of Merging Clusters in the JWST Era: The Bullet Cluster and Abell 2744 / 2025 Merging Cluster Workshop / South Korea / Contributed

2025: JWST Lensing Analysis of Merging Galaxy Clusters: The Bullet Cluster and Abell 2744 / CL2025: Entering a Golden Age of Galaxy Cluster Studies / Taiwan / Contributed

2025: Probing Galaxy Cluster Mergers by Combining Strong and Weak Gravitational Lensing in the JWST Era / MPA Cosmology Seminar / Germany

2024: Probing Galaxy Clusters by Combining Strong and Weak Gravitational Lensing in the JWST Era / NOIRLab, University of Arizona / USA

2024: Probing Galaxy Clusters by Combining Strong and Weak Lensing in the JWST Era: Mass Reconstruction of Abell 2744 / The 11th KIAS Workshop on Cosmology and Structure Formation / South Korea / Contributed

2024: Do Globular Cluster Trace Dark Matter? / 2024 KAS Fall Meeting / South Korea / Contributed

2024: Constraining Cosmological Parameters through Strong Lensing / 2024 KAS Spring Meeting / South Korea / Contributed

2023: Precision MARS Mass Reconstruction of Abell 2744: Combining Large Strong and Weak Lensing Datasets from JWST / 2023 KAS Fall Meeting / South Korea / Contributed

2022: Wide-field Weak-lensing Mass Reconstruction with Improved Convolutional Neural Network / 2022 KAS Fall Meeting / South Korea / Contributed

2022: MARS Probe of Hubble Frontier Fields Clusters / IAUGA 2022 / South Korea / Contributed

Poster

2025: Probing Galaxy Clusters from Cores to the Outskirts in the JWST Era: Mass Reconstruction of the Galaxy Cluster Abell 2744 by Combining Strong and Weak Lensing / Tracing Cosmic Evolution with Galaxy Clusters V / Italy

2025: Lensing through JWST: Greater Detail Nearby, New Perspectives High Redshift / EAS 2025 / Ireland

2025: Lensing Analysis of the Bullet Cluster with JWST / 2025 KAS Spring Meeting / South Korea

2024: Multi-resolution MAximum-entropy Reconstruction Technique Integrating Analytic Node (Mr.MARTIAN): A New Hybrid Lensing Reconstruction Method for the JWST Era / The 11th KIAS Workshop on Cosmology and Structure Formation / South Korea

2024: Precision MARS Mass Reconstruction of A2744: Synergizing the Largest Strong-lensing and Densest Weak-lensing Data Sets from JWST / EAS 2024 / Italy

2024: Constraining Cosmological Parameters through Strong Lensing / EAS 2024 / Italy

2023: MAximum-entropy ReconStruction (MARS): A New Strong-lensing Reconstruction Algorithm for the JWST Era / IAUS 381: Strong gravitational lensing in the era of Big Data / Italy

2022: A New Maximum-entropy-regularized Strong Lensing Mass Reconstruction Method / 240th AAS Meeting / USA

Service and Outreach

Military Service (Served as a part of the compulsory military service in South Korea)

2016 – 2017: Korea National Police Agency Auxiliary Police

2023: Merging Cluster Workshop 2023 at Yonsei – Served as a LOC

2025: First-author paper on the Bullet Cluster (ApJL, 987, L15) was featured in a NASA press release

2025: Merging Cluster Workshop 2025 at Yonsei – Served as a LOC

Publication List

Refereed Publications

First Author

[6]: MrMARTIAN: A Multi-resolution Mass Reconstruction Algorithm Combining Free-form and Analytic Components, **Cha, S.**, Jee, M. J., 2025, arXiv:2508.13262, accepted in ApJ

[5]: A High-Caliber View of the Bullet Cluster Through JWST Strong and Weak Lensing Analyses, **Cha, S.**, Cho, B. Y., Joo, H., Lee, W., HyeongHan, K., Scofield, Z. P., Finner, K., Jee, M. J., 2025, ApJL, 987, L15

[4]: Weak-lensing Mass Reconstruction of Galaxy Clusters with a Convolutional Neural Network. II. Application to Next-Generation Wide-Field Surveys, **Cha, S.**, Jee, M. J., Hong, S. E., Park, S., Bak, D., Kim, T., 2025, ApJ, 981, 52

[3]: Precision MARS Mass Reconstruction of A2744: Synergizing the Largest Strong-lensing and Densest Weak-lensing Data Sets from JWST, **Cha, S.**, HyeongHan, K., Scofield, Z. P., Joo, H., Jee, M. J., 2024, ApJ, 961, 186

[2]: Model-independent Mass Reconstruction of the Hubble Frontier Field Clusters with MARS Based on Self-consistent Strong-lensing data, **Cha, S.**, Jee, M. J., 2023, ApJ, 951, 140

[1]: MARS: A New Maximum-entropy-regularized Strong Lensing Mass Reconstruction Method, **Cha, S.**, Jee, M. J., 2022, ApJ, 931, 127

Co-Author

[8]: JWST Discovery of Strong Lensing from a Galaxy Cluster at Cosmic Noon: Giant Arcs and a Highly Concentrated Core of XLSSC 122, Finner, K., **Cha, S.**, Scofield, Z. P., Jee, M. J., Lin, Y.-. heng ., Joo, H., Park, H., Morishita, T., Faisst, A., Lee, B., Wang, W., Chary, R.-R., 2025, arXiv:2508.08356, accepted in ApJL

[7]: Is Earendel a Star?: Investigating the Sunrise Arc Using JWST Strong and Weak Gravitational Lensing Analyses, Scofield, Z. P., Jee, M. J., **Cha, S.**, Park, H., 2025, ApJ, 993, 226

[6]: Cosmology with Supernova Encore in the strong lensing cluster MACS J0138-2155: photometry, cluster members, and lens mass model, Ertl, S., Suyu, S. H., Schuldt, S., Granata, G., Grillo, C., Caminha, G. B., Acebron, A., Bergamini, P., Cañameras, R., **Cha, S.**, Diego, J. M., Foo, N., Frye, B. L., Fudamoto, Y., Halkola, A., Jee, M. J., Kamieneski, P. S., Koekemoer, A. M., Meena, A. K., Nishida, S., Oguri, M., Pierel, J. D. R., Rosati, P., Tortorelli, L., Wang, H., Zitrin, A., 2025, A&A, 702, A157

[5]: SN H0pe: The First Measurement of H_0 from a Multiply Imaged Type Ia Supernova, Discovered by JWST, Pascale, M., Frye, B. L., Pierel, J. D. R., Chen, W., Kelly, P. L., Cohen, S. H., Windhorst, R. A., Riess, A. G., Kamieneski, P. S., Diego, J. M., Meena, A. K., **Cha, S.**, Oguri, M., Zitrin, A., Jee, M. J., Foo, N., Leimbach, R., Koekemoer, A. M., Conselice, C. J., Dai, L., Goobar, A., Siebert, M. R., Strolger, L., Willner, S. P., 2025, ApJ, 979, 13

[4]: Weak-lensing detection of intracluster filaments in the Coma cluster, HyeongHan, K., Jee, M. J., **Cha, S.**, Cho, H., 2024, NatAs, 8, 377

[3]: Weak-lensing Analysis of the Complex Cluster Merger A746 with Subaru/Hyper Suprime-Cam, HyeongHan, K., Cho, H., Jee, M. J., Wittman, D., **Cha, S.**, Lee, W., Finner, K., Rajpurohit, K., Brüggen, M., Forman, W., Jones, C., van Weeren, R., Botteon, A., Lovisari, L., Stroe, A., Domínguez-Fernández, P., O'Sullivan, E., Vrtilek, J., 2024, ApJ, 962, 100

[2]: Weak-lensing Mass Bias in Merging Galaxy Clusters, Lee, W., **Cha, S.**, Jee, M. J., Nagai, D., King, L., ZuHone, J., Chadayammuri, U., Felix, S., Finner, K., 2023, ApJ, 945, 71

[1]: Weak-lensing Mass Reconstruction of Galaxy Clusters with a Convolutional Neural Network, Hong, S. E., Park, S., Jee, M. J., Bak, D., **Cha, S.**, 2021, ApJ, 923, 266

Submitted Publications

[4]: Reproducing Abell 2744 with the HyperMillennium Simulation, Wang, Q., Li, M., Gao, L., Guo, Q., Angulo, R. E., **Cha, S.**, Cole, S., Frenk. C. S., HyeongHan, K., Li, R., Pei, W., Shan, H., Wang, J., White, S. D. M., 2025, arXiv, arXiv:2510.27291, submitted to MNRAS

[3]: Cosmology with supernova Encore in the strong lensing cluster MACS J0138-2155: Lens model comparison and H0 measurement, Suyu, S. H., Acebron, A., Grillo, C., Bergamini, P., Caminha, G. B., **Cha, S.**, Diego, J. M., Ertl, S., Foo, N., Frye, B. L., Fudamoto, Y., Granata, G., Halkola, A., Jee, M. J., Kamieneski, P. S., Koekemoer, A. M., Meena, A. K., Newman, A. B., Nishida, S., Oguri, M., Rosati, P., Schuldt, S., Zitrin, A., Cañameras, R., Hayes, E. E., Larison, C., Mamuzic, E., Millon, M., Pierel, J. D. R., Tortorelli, L., and Wang, H., 2025, arXiv, arXiv:2509.12319, submitted to A&A

[2]: Cosmology with supernova Encore in the strong lensing cluster MACS J0138-2155: Time delays & Hubble constant measurement, Pierel, J. D. R., Hayes, E. E., Millon, M., Larison, C., Mamuzic, E., Acebron, A., Agrawal, A., Bergamini, P., **Cha, S.**, Dhawan, S., Diego, J. M., Frye, B. L., Gilman, D., Granata, G., Grillo, C., Jee, M. J., Kamieneski, P. S., Koekemoer, A. M., Meena, A. K., Newman, A. B., Oguri, M., Padilla-Gonzalez, E., Poidevin, F., Rosati, P., Schuldt, S., Strolger, L. G., Suyu, S. H., Thorp, S., and Zitrin, A., 2025, arXiv, arXiv:2509.12301, submitted to ApJ

[1]: A dynamical mass measure of an inactive black hole in the distant universe, Newman, A. B., Gu, M., Belli, S., Ellis, R. S., Gangula, S., Greene, J. E., Walsh, J. L., Suyu, S. H., Ertl, S., Caminha, G., Granata, G., Grillo, C., Schuldt, S., Barone, T. M., Bird, S., Glazebrook, K., Jafariyazani, M., Kriek, M., Matthews, A., Morishita, T., Nanayakkara, T., Pierel, J. D. R., Acebron, A., Bergamini, P., **Cha, S.**, Diego, J. M., Foo, N., Frye, B., Fudamoto, Y., Jee, M. J., Kamieneski, P. S., Koekemoer, A. M., Meena, A. K., Nishida, S., Oguri, M., Rosati, P., Zitrin, A., 2025, arXiv:2503.17478, submitted

Conference Proceedings

[1]: MAximum-entropy ReconStruction (MARS): A New Strong-lensing Reconstruction Algorithm for the JWST Era, **Cha, S.**, Jee, M. J., Proceedings of the International Astronomical Union , Volume 18 , Symposium S381: Strong Gravitational Lensing in the Era of Big Data , December 2022 , pp. 102 - 105