Joohyun Lee

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RESEARCH INTEREST

Theoritical & Computational Astrophysics
numerical cosmological simulation of epoch of reionization;
role of dark matter models in the growth of structures;
general galaxy formation & evolution; usage of machine learning in simulation analysis

EDUCATION

Ph.D. in Astronomy, University of Texas at Austin 09/2021 - present
Supervisor: Paul Shapiro

B.Sc. in Physics & B.Eng. in Electrical and Computer, Seoul National University 03/2014 - 08/2021

RESEARCH EXPERIENCE

Research Associate, Computational Cosmology Group, Seoul National University 09/2019 - 08/2021
(Supervisor: Prof. Ji-hoon Kim)

- Estimating Galactic Baryonic Properties from Their Dark Matter Using Machine Learning
  - Applied trained machine to the cosmological simulation halo catalog (IllustrisTNG simulation)
  - Computed and compared two-point correlation function in IllustrisTNG halo catalog and machine-predicted halo catalog
- Dark Matter Deficient Galaxies Produced Via High-velocity Galaxy Collision in Cosmological Simulation
  - Studied IllustrisTNG catalog to find high-speed collision event of dwarf galaxies to compare with idealized simulation
- pc-scale Simulation of Simultaneous Formation of Dark Matter Deficient Galaxies and Star Clusters
  - Runned a suite of 1.25 pc-resolution galaxy collision simulations with different merger configuration and feedback schemes
  - Resolved and tracked the formation process of dark matter deficient galaxies and massive star clusters

Research Associate, AGN Research Group, Seoul National University 09/2020 - 02/2021
(Supervisor: Prof. Jong-Hak Woo)

- Calibrated and Applied Novel Method of Measuring SFR in AGNs
  - Tested Oxygen emission line flux as SFR indicator by statistically analyzing SDSS spectroscopty data and IR surveys
  - Investigated correlation between gas outflow strength from AGNs and star formation of host galaxies

AWARDED FELLOWSHIPS & SCHOLARSHIPS

FINESST Fellowship (**$150k**), NASA 09/2022 - 08/2025
Dean's Excellence Fellowship, University of Texas at Austin 09/2021 - 08/2022
Presidential Science Scholarship (∼ **$40k**), Korea Student Aid Foundation 03/2014 - 08/2020

PUBLICATIONS

- **Lee, J.**, Shin, E. -j., Kim, J. -h., Shapiro, P. R., & Chung, E., "Multiple Beads-on-a-string: Dark Matter-Deficient Galaxy Formation in a Mini-bullet Satellite-satellite Galaxy Collision", *ApJ Submitted*, *astro-ph:2312.11350*
- **Lee, J.**, Shin, E. -j., & Kim, J. -h., "Dark Matter Deficient Galaxies And Their Member Star Clusters Form Simultaneously During High-velocity Galaxy Collisions In 1.25 pc Resolution Simulations", *ApJL 917 (2021) L15*, *astro-ph:2108.01102*
- Shin, E. -j., Jung, M., Kwon, G., Kim, J. -h, **Lee, J.**, Jo, Y., & Oh, B. K., "Dark Matter Deficient Galaxies Produced Via High-velocity Galaxy Collisions In High-resolution Numerical Simulations", *ApJ 899 (2020) 25*, *astro-ph:2007.09889*

CONTRIBUTED TALKS & PRESENTATIONS

- UT Austin Extragalactic/Cosmology Seminar 11/2023
- FirstLight Conference (poster) 06/2023
- UT Austin Extragalactic/Cosmology Seminar 05/2023
- IAUGA 2022 (poster) 08/2022
- APS April Meeting 2022 04/2022
- Galaxy Evolution Workshop 2021, ASIAA 02/2022
- Numerical Galaxy Formation Mini-Workshop, SNU 01/2022
- SAZERAC-SIPS Early Galaxy Formation Near and Far — Preparing for a Long Journey with JWST 12/2021
- The 1st KIAA Forum on Gas in Galaxies for Early Career Scientists (KooGiG-Junior workshop) 10/2021
- UT Austin Extragalactic/Cosmology Seminar 09/2021
- AGORA WORKSHOP 2021 08/2021

COMPUTING SKILLS & EXPERIENCES

Languages: Python, LaTex, C, C++ (skilled); Fortran, MATLAB, Mathematica, html, Markdown (familiar); IDL, RISC-V assembly language (basic)
Astrophysical Simulation Codes: Enzo, Gadget, DICE, yt
Machine Learning: PyTorch, TensorFlow (familiar)
High performance computing experience:

- Local cluster of Computational Cosmology Group, Seoul National University (CentOS)
- Nurion, Korea Institute of Science and Technology Information (CentOS)
- Frontera, Texas Advanced Computing Center (CentOS)
- Stampede2, Texas Advanced Computing Center (Red Hat)
- Andes, Oak Ridge National Laboratory (Linux)

MENTORING, OUTREACH & TEACHING EXPERIENCES

GUMMY Mentor in UT Astro. Dept. 08/2023 -
Informal Mentor of NSF REU Scholars 06 - 08/2022 & 06 - 08/2023
Korea Student Aid Foundation Science Teaching Service Organization 01 - 02/2015
Habitat for Humanity in Cebu, Phillippines 02/2016
Military Service at Korean Air Force 5th Air Mobility Wing 05/2017 - 04/2019

OTHER SKILLS

Languages: Korean (native), English, Japanese (fluent)