AMIT KUMAR   Researcher in Astrophysics & Cosmology

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RESEARCH INTERESTS

Cosmology, Weak gravitational lensing, Galaxy clusters, Satellite evolution, Stellar-to-Halo mass relations

RESEARCH WORK

Subaru HSC weak lensing of SDSS redMaPPer cluster satellite galaxies: Empirical upper limit on orphan fractions

Kumar et al., 2022 ⇒ **https://doi.org/10.1093/mnras/stac2862**

- Measured weak lensing masses of redMaPPer satellites using data from HSC-SSP Y1 PDR.
- Subhalo masses of satellite galaxies turned out systematically smaller than that of the field galaxies, with differences as large as a **factor of two** particularly for satellites evolving very close to the BCG.
- Established **first ever direct upper limit** from observations on the population of orphan galaxies admissible at various cluster-centric distances.

Over-abundance of orphan galaxies in the UniverseMachine

Kumar et al., 2023 ⇒ **https://doi.org/10.1093/mnrasl/slae023**

- Successfully ran a mock cluster finding algorithm similar to redMaPPer, on publicly available galaxy catalogues from the UniverseMachine algorithm implemented on BolshoiPlank haloes.
- The UniverseMachine galaxy catalogue shows a **continuous decline in the prevalence of orphan galaxies** as the separation of satellites increases from the cluster center.
- The Orphan fractions in the mock redMaPPer catalogue are marginally consistent with our previously established constraints, for satellites with projected separations of $[0.1, 0.3]h^{-1}$Mpc. However, at larger separations, the fraction of orphan galaxies invoked by UniverseMachine is significantly higher than our previously established limits using HSC+redMaPPer observations.

Mass luminosity relationships for redMaPPer satelltes

Ongoing

- Establish Mass-luminosity relationship for redMaPPer satellites using HSC-Y3 shape catalogue.
- Establish SHMR for redMaPPer satellites.

EDUCATION

Doctor of Philosophy
Inter University Centre for Astronomy and Astrophysics
Pune, Maharashtra, India

📅 August 2018 – 24

- Advisor : Prof. Surhud More

M.Sc. Physics
Deaprtment of Physics & Astrophysics, University of Delhi, Delhi

📅 August 2014 – July 2016

ACADEMICS ACHIEVEMENTS

🏆 **Joint Engineering Screening Test- 2018**
All India Rank : 99

🏆 **Council of Scientific and Industrial Research Junior Research Fellowship - National Eligibility Test 2017**
All India Rank: 141

🏆 **GATE 2016 & 17, IIT- JAM 2014, National Scholarship-2014-16**

✉
- **Offered Ph.D. position from IIT-Hyderabad.**
- **Offered Ph.D. position from Saha Institute of Nuclear Physics.**
- **Offered Ph.D. position from Inter-University Center for Astronomy & Astrophysics.**

COMPUTER SKILLS

Python | GitHub | Machine Learning
Linux & Windows | SQL | Bash scripting
Web Development | C, C++ | Visual Basic

- Explore the effect of tidal stripping on subhalo masses of satellites binned by cluster-richness.

TEACHING ASSISTANCE EXPERIENCE

- Teaching assistant for "Cosmology" course for IUCAA-NCRA grad school by Prof. Surhud More
- Teaching assistant for "Cosmology" course @ IUCAA-SPPU MSc.(Physics) by Prof. Surhud More

ADMINISTRATIVE RESPONSIBILITIES

- Managed & Organised half yearly student seminars @ IUCAA for 3 years.
- Active participation in National Science Day @ IUCAA.
- Active member of Scientific Public Outreach Program(SciPOP) at IUCAA

UNDERGRAD ACADEMIC PROJECTS

Astrophotography:Study of Extinction coefficients, Instrumental magnitudes using CCD

Department of Physics and Astrophysics, University of Delhi

📅 Feb 2016-Apr 2016

- Observed Pleiades star cluster for one night using 11" Schimdt-Cassegrain telescope(CGE 1100).
- Reduced raw data from the telescope using IRAM&ds9 to understand the variability of atmospheric extinction.

Robot :The office helper

Department of Physics and Astrophysics, University of Delhi

📅 Jan 2016-May 2016

- Made a micro-controller based low-cost robot hardware (mechatronics and sensors) and software system.
- Provide interfaces for navigation, perform tasks related to vigilance, get live video coverage, and sense human presence.

TALKS & POSTERS

Contributed Talks

- 42nd Annual meeting of Astronomical Society of India, IISC-2024 @ Bangalore
- Largest Cosmological Surveys and Big Data Science, ICTS - 2023 @ Bangalore
- Young Astronomers' Meet- 2022, Aries @ Nainital
- International Conference on Gravitation and Cosmology-2019, IISER Mohali

Posters

- Astronomical Society of India-2022, IIT Roorkee
- International Conference on Gravitation and Cosmology-2019, IISER Mohali

LANGUAGES

English ●●●●●

Hindi ●●●●●

EXTRA CURRICULAR

- Active participant in Science Open Day at IUCAA
- Work for animal rehabilitation
- Fitness enthusiast

REFERENCES

Surhud S. More, *Professor*
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Susmita Adhikari, *Assistant Professor*
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Dr. Homi Bhabha Road, Pune 411008, India
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Tomomi Sunayama, *Post-doctoral fellow*
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