SOUMAK MAITRA

I am a postdoctoral researcher at DTP-TIFR, exploring large-scale structure and cosmic reionization, with a growing interest in machine learning techniques.

CONTACT

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Mumbai 400005, India
0000-0002-7684-4205
NASA/ADS publication list

SKILLS

Programming
Python ●●●●●
MPI ●●●●○
Latex ●●●●○
C/C++ ●●●○○
Bash ●●○○○

ML Framework
Pytorch ●●●●○
JAX ●●●○○
Tensorflow ●●●○○

Operating Systems
Linux ●●●●●
Windows ●●●●○

Simulations
GADGET-2
GADGET-3

Observations
VLT/XSHOOTER
VLT/UVES
KECK/HIRES
HST-COS
SDSS

Others
VPFit ●●●●○

RESEARCH EXPERIENCE

10/2024 - Present
Tata Institute of Fundamental Research, Mumbai, India
Postdoctoral Researcher

11/2021 - 8/2024
INAF-Osservatorio Astronomico di Trieste, Italy
Postdoctoral Researcher

08/2021 - 11/2021
Inter-University Centre for Astronomy and Astrophysics, Pune, India
Enhanced Research Fellow

08/2016 - 07/2021
Inter-University Centre for Astronomy and Astrophysics, Pune, India
Ph.D (Astrophysics)
Advisor: Prof. Raghunathan Srianand

Thesis title: *Probing the astrophysical and cosmological aspects of Intergalactic Medium using Quasar spectra*

EDUCATION

07/2014 - 07/2016
Indian Institute of Technology - Kanpur, Kanpur, India
Master of Science (Physics)
Specialization in Cosmology and General Relativity
GPA Obtained - 9.3/10, First Class

06/2011 - 06/2014
Jadavpur University, Kolkata, India
Bachelor of Science (Physics)
Percentage Obtained - 78.25/100, First Class

05/2011
B. D. Memorial Institute, Kolkata, India
C.B.S.E Senior School Certificate Exam
Percentage Obtained - 94.0/100

05/2009
B. D. Memorial Institute, Kolkata, India
C.B.S.E Secondary School Exam
Percentage Obtained - 95.2/100

RESEARCH INTERESTS

- Large-scale structure formation and cosmic reionization
- Astrophysics of the Intergalactic Medium (IGM)
- Lyman-α forest and Lyman-α emitters as cosmological probes
- Quasar absorption lines and high-redshift spectroscopy
- Machine learning in astrophysical and cosmological analysis
- N-body and hydrodynamical simulations
- Observational cosmology with high-redshift tracers

ACADEMIC ACHIEVEMENTS AND AWARDS

- 2018- Awarded UGC Senior Research Fellowship
- 2016- Awarded UGC Junior Research Fellowship for qualifying **National Eligibility Test**

CONFERENCES/WORKSHOPS AND TALKS

January, 2025
IUCAA, Pune, India
"Parameter estimation from Lyman-α forest in Fourier space using Information Maximising Neural Networks"
Talk at *AI/ML Applications in Astronomy & Astrophysics workshop*.

December, 2024
IUCAA, Pune, India
"Neural Network approach in Lyman-α forest for astrophysical & cosmological parameter inference"
Talk at *Baryons Beyond Galactic Boundaries-2024 conference*.

June, 2022
Trieste, Italy
"Higher-order clustering study of Lyman-α forest"
Poster at *"HACK100: Past, Present and Future of Astrophysical Spectroscopy" conference*.

March, 2022
Kavli IPMU, Japan
"Clustering statistics of Lyman-α forest beyond 2-point "
Talk at *Cosmic Cartography 2022 conference*.

January, 2021
TIFR, Mumbai, India
"Higher-order clustering statistics in the Intergalactic Medium using Lyman-α forest"
Invited Talk.

September, 2018
Kavli IPMU, Japan
"Three point correlation of the IGM"
Talk at *IGM2018 Conference*.

March, 2018
NISER Bhubaneshwar, India
"Spatial correlations of the IGM"
Talk at *Introductory school on Galaxy formation*.

December, 2017
IUCAA, Pune, India
"Spatial correlations of the IGM"
Talk at *Galaxies in Absorption-2017* international workshop.

February, 2018
IUCAA, Pune, India
Attended *Franco-Indian Astronomy School on "From Re-ionization to large-scale structure: A multiwavelength approach"*.

October, 2017
IUCAA, Pune, India
Attended *International Workshop on Post-Planck Cosmology: Enigma, Challenges and Visions*.

September, 2017
IUCAA, Pune, India
Attended *Young Astronomers' Meet 2017*.

August, 2017
IUCAA, Pune, India
Attended *Meeting on Plasma Universe and its Structure Formation*.

DATE OF BIRTH

10 November, 1993

NATIONALITY

India

GENDER

Male

LANGUAGES

English
Hindi
Bengali

PROFESSIONAL REFERENCES

- **Girish Kulkarni**:
  TIFR, Mumbai, India — kulkarni@theory.tifr.res.in
- **Raghunathan Srianand**:
  IUCAA, Pune, India — anand@iucaa.in
- **Stefano Cristiani**:
  INAF-OATS, Italy — stefano.cristiani@inaf.it
- **Matteo Viel**:
  SISSA, Trieste, Italy — matteoviel@gmail.com
- **Roberto Trotta**:
  SISSA, Trieste, Italy — rtrotta@sissa.it
- **Patrick Petitjean**:
  IAP, Paris, France — ppetitje@iap.fr
- **Aseem Paranjape**:
  IUCAA, Pune, India — aseem@iucaa.in

PUBLICATIONS AND CONFERENCE PROCEEDINGS

Three- and two-point spatial correlations of intergalactic medium at $z \sim 2$ using projected quasar triplets

S. Maitra, R. Srianand, P. Petitjean, H. Rahmani, P. Gaikwad, T. R. Choudhury, C. Pichon

2019 — Monthly Notices of the Royal Astronomical Society, Volume 490, Issue 3, p.3633-3653 — ADS, arXiv

Three- and two-point spatial correlations of IGM at $z \sim 2$: cloud-based analysis using simulations

S. Maitra, R. Srianand, P. Gaikwad, T. R. Choudhury, A. Paranjape, P. Petitjean

2020 — Monthly Notices of the Royal Astronomical Society, Volume 498, Issue 4, pp.6100-6119 — ADS, arXiv

Redshift space three-point correlation function of IGM at $z < 0.48$

S. Maitra, R. Srianand, P. Gaikwad, N. Khandai

2022 — Monthly Notices of the Royal Astronomical Society, Volume 509, Issue 3, pp.4585-4607 — ADS,arXiv

Measurement of redshift space two- and three-point correlation of Lyα absorbers at $1.7 < z < 3.5$: Implications on evolution of the physical properties of IGM

S. Maitra, R. Srianand, P. Gaikwad

2022 — Monthly Notices of the Royal Astronomical Society, Volume 509, Issue 1, pp.1536-1556 — ADS,arXiv

Role of ionizing background on the statistics of metal absorbers in hydrodynamical simulations

Sukanya Mallik, Raghunathan Srianand, **Soumak Maitra**, Prakash Gaikwad, Nishikanta Khandai

2023 — Monthly Notices of the Royal Astronomical Society, Volume 523, Issue 2, pp.2296-2316 — ADS,arXiv

Spectroscopy of QUBRICS quasar candidates: 1672 new redshifts and a Golden Sample for the Sandage Test of the Redshift Drift

Stefano Cristiani, Matteo Porru, Francesco Guarneri, Giorgio Calderone, Konstantina Boutsia, Andrea Grazian, Guido Cupani, Valentina D'Odorico, Fabio Fontanot, Carlos J. A. P. Martins, Catarina M. J. Marques, **Soumak Maitra**, Andrea Trost

2023 — Monthly Notices of the Royal Astronomical Society, Volume 522, Issue 2, pp.2019-2028 — ADS, arXiv

Higher order clustering of Lyα forest

Soumak Maitra

2023 — MemSAIt, Vol.94 n.2 — arXiv

Role of ionizing background and galactic feedback on the redshift space clustering of OVI absorbers in hydrodynamical simulations

Soumak Maitra, Sukanya Mallik, Raghunathan Srianand,

2024 — Monthly Notices of the Royal Astronomical Society, Volume 530, Issue 3, May 2024, Pages 3013–3019 — ADS, arXiv

Parameter estimation from Lyα forest in Fourier space using Information Maximising Neural Network

Soumak Maitra, Stefano Cristiani, Matteo Viel, Roberto Trotta, Guido Cupani

2024 Astronomy&Astrophysics, Volume 690, October 2024 ADS,arXiv

The Lyman-α emitter bispectrum as a probe of reionization morphology

Soumak Maitra, Girish Kulkarni, Shikhar Asthana, James S. Bolton, Martin G. Haehnelt, Laura Keating

2025 Submitted to MNRAS arXiv