

# 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

- ✉ soumak93@gmail.com
- ✉ soumak.maitra@theory.tifr.res.in
- ✉ soumak.maitra@tifr.res.in
- ☎ +91 8174997160
- 📍 DTP, TIFR, Homi Bhabha Road  
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	Postdoctoral Researcher
📍 Tata Institute of Fundamental Research, Mumbai, India	
📅 11/2021 - 8/2024	Postdoctoral Researcher
📍 INAF-Osservatorio Astronomico di Trieste, Italy	
📅 08/2021 - 11/2021	Enhanced Research Fellow
📍 Inter-University Centre for Astronomy and Astrophysics, Pune, India	
📅 08/2016 - 07/2021	Ph.D (Astrophysics)
📍 Inter-University Centre for Astronomy and Astrophysics, Pune, India	
Advisor: Prof. Raghunathan Srianand	
Thesis title: <i>Probing the astrophysical and cosmological aspects of Intergalactic Medium using Quasar spectra</i>	

## EDUCATION

📅 07/2014 - 07/2016	Master of Science (Physics)
📍 Indian Institute of Technology - Kanpur, Kanpur, India	
Specialization in Cosmology and General Relativity	
GPA Obtained - 9.3/10, First Class	
📅 06/2011 - 06/2014	Bachelor of Science (Physics)
📍 Jadavpur University, Kolkata, India	
Percentage Obtained - 78.25/100, First Class	
📅 05/2011	C.B.S.E Senior School Certificate Exam
📍 B. D. Memorial Institute, Kolkata, India	
Percentage Obtained - 94.0/100	
📅 05/2009	C.B.S.E Secondary School Exam
📍 B. D. Memorial Institute, Kolkata, India	
Percentage Obtained - 95.2/100	

## RESEARCH INTERESTS

- Large-scale structure formation and cosmic reionization
- Astrophysics of the Intergalactic Medium (IGM)
- Lyman- $\alpha$  forest and Lyman- $\alpha$  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- $\alpha$  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- $\alpha$  forest for astrophysical & cosmological parameter inference"

Talk at *Baryons Beyond Galactic Boundaries-2024 conference*.
- June, 2022

Trieste, Italy

"Higher-order clustering study of Lyman- $\alpha$  forest"

Poster at *"HACK100: Past, Present and Future of Astrophysical Spectroscopy"* conference.
- March, 2022

Kavli IPMU, Japan

"Clustering statistics of Lyman- $\alpha$  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- $\alpha$  forest"

Invited Talk.
- September, 2018

Kavli IPMU, Japan

"Three point correlation of the IGM"

Talk at *IGM2018 Conference*.
- March, 2018

NISER Bhubaneswar, 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

---

DeepCHART: Mapping the 3D dark matter density field from Ly $\alpha$  forest surveys using deep learning

👤 **Soumak Maitra**, Matteo Viel, Girish Kulkarni

📅 2025      📖 Submitted to MNRAS

🔗 [arXiv](#)

The Lyman- $\alpha$  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](#)

Parameter estimation from Ly $\alpha$  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](#)

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](#)

Higher order clustering of Ly $\alpha$  forest

👤 **Soumak Maitra**

📅 2023      📖 MemSAIt, Vol.94 n.2

🔗 [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](#)

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](#)

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  $\text{Ly}\alpha$  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](#)

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](#)

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](#)