Sayan Saha

Curriculum Vitae

Département de Physique Théorique,
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s-sayan

Personal Information

Date of Birth 9th August 1996

Nationality Indian

Present Position

Aug. 2019 - Present **PhD student**, *Department of Physics, Indian Institute of Science Education and Research, Pune, India*

Sep. 2022 - Aug. 2023 **Swiss Government Excellence Fellow**, *Département de Physique Théorique, Université de Genève, Switzerland*

April 2022 - Present **Visiting Research Fellow**, *Astronomy and Astrophysics, Raman Research Institute, Bengaluru, India*

Education

2017–2019 **M.Sc. in Physics**, *Department of Physics, IISER-Pune, India*

2014–2017 **B.Sc. in Physics**, *Ramakrishna Mission Residential College, Narendrapur (Calcutta University), India*

Awards & Scholarship

March 2023 Recipient of **Infosys Foundation Travel Award** (50,000 INR) to attend the **Future Cosmology** workshop at IESC Cargese, France. Designated as **Infosys Foundation Fellow** - Award letter

March 2023 Recipient of grant (2000 CHF) from **Société académique de Genève (SACAD)** to attend the **Future Science with CMB x LSS** workshop at YITP, Kyoto University. - Award letter

Sep 2022 - Aug 2023 Recipient of **Swiss Government Excellence Scholarship (Research), ESKAS No. 2022.0316**, hosted by the University of Geneva. - Award Letter

August 2019 Recipient of Institute PhD fellowship from IISER-Pune, MHRD.

2017 - 2019 Recipient of Institute M.Sc. fellowship from IISER-Pune, MHRD.

2017 Certificate of merit as **State Topper** for being placed among the top 1% of 774 candidates in **National Graduate Physics Examination 2017** conducted by **Indian Association of Physics Teachers (IAPT)**.

2014–2017 Recipient of DST-Inspire Scholarship for College & University students by MHRD, Govt. of India.

Publications

2023 S. Saha, L. Legrand, and J. Carron, **Cluster profiles from beyond-the-QE CMB lensing mass maps**, arXiv:2307.11711 [astro-ph.CO].

2021 S. Saha, S. Shaikh, S. Mukherjee, T. Souradeep, and B. D. Wandelt, **Bayesian estimation of our local motion from the Planck-2018 CMB temperature map**, arXiv:2106.07666 [astro-ph.CO], JCAP 10 (2021) 072.

Research Experience

Current	Studying weak gravitational lensing of the CMB by galaxy clusters in small angular scales. Developing simulations of a CMB flat sky patch lensed by galaxy clusters. Building a sophisticated estimator to estimate cluster mass for CMB S4-like experiments. I am building upon the clusterlens part of python module Lensit by Julien Carron.
Last project	Studied signatures of statistical isotropy violation of the CMB due to the motion of our observation frame. Estimated the velocity of our local motion with a high significance using Bayesian parameter estimation and Hamiltonian Monte-Carlo (HMC) technique.
M.Sc.	Worked on data analysis of high-energy cosmic ray air-shower data using Machine Learning (ML) and Deep Learning (DL) techniques. Developed a Monte-Carlo pipeline to simulate air-showers for different primaries and trained ML and DL models for particle classification.

Experiments & Collaborations

CMB-S4	Working on the forecast of galaxy cluster mass detection and its significance
Planck	Studying the violation signatures of isotropy of foreground cleaned CMB maps
Cosmoglobe	Working on implementing Hamtonian Monte-Carlo (HMC) in Commander3 and part of the OpenHFI group

Contributed talks & posters

May-June 2023	Third EuCAPT Annual Symposium, CERN, Geneva, Switzerland. Talk - **Extracting Cluster Information from small-scale CMB**. [Link]
April 2023	Future Cosmology, Institut d'Etudes Scientifiques de Cargèse (IESC), France. Talk - **Dark Matter Halos under the spotlight of CMB-Lensing**.
April 2023	Future Science with CMB x LSS, Yukawa Institute for Theoretical Physics, Kyoto University, Kyoto, Japan. Talk & Poster - **Dark Matter Halos under the spotlight of CMB-Lensing**.
January 2023	Cosmoglobe Winter Workshop, University of Oslo, Oslo, Norway. Talk - **Inferring our local motion from Small-scale CMB**.

Schools

January 2022	**Physics of the Early Universe**, International Centre for Theoretical Sciences (ICTS), Bengaluru, India.
August 2021	**School-cum-Workshop on Data Analysis in Cosmology and Astroparticle Physics**, Technology Innovation Hub (TIH), Indian Statistical Institute, Kolkata, India. - Course Certificate
June 2021	**Summer School in Statistics for Astronomers**, Penn State University. - Course Certificate
March, 2019	Pune-Mumbai Collider Meet, Indian Institute of Science Education and Research (IISER), Pune-411008, India

Computation Skills

OS	Windows, Linux, macOS
Languages	Python, Fortran 90, Shell script
Tools	Git, LaTeX, HTML, MS Office
Codes	LensIt, plancklens, CAMB, HEALPix (healpy).
Sampling	MCMC Sampling (Metropolis–Hastings, HMC).
ML/DL Libs	scikit-learn, tensorflow.

Relevant ML & DL Courses

1 **Neural Networks and Deep Learning**, DeepLearning.AI - Course Certificate

2 **Structuring Machine Learning Projects**, DeepLearning.AI - Course Certificate

3 **Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization**, DeepLearning.AI - Course Certificate

Teaching Experience

Aug 2019 - Dec 2019 Teaching Assistant for the course **"Electricity** & **Magnetism, PHY201"** for 2nd year BS-MS students at IISER, Pune under Dr. Aparna Deshpande and Dr. Diptimoy Ghosh.

Jan 2020 - April 2020 Teaching Assistant for the course **"Nuclear** & **Particle Physics, PHY422"** for 4th year BS-MS students at IISER, Pune under Prof. Sunil Mukhi.

Sep 2020 - Jan 2021 Teaching Assistant for the course **"Group Theory in Physics PHY356"** for 4th year BS-MS students at IISER, Pune under Prof. Sudarshan Ananth.

Journal Clubs

Unige Member of weekly **Cosmology Journal Club** at Département de Physique Théorique, Université de Genève.

RRI Bengaluru Member of weekly Journal club, **Very Sirius Meeting (VSM)** at Astronomy and Astrophysics Department, Raman Research Institute.

IISER Pune Organizer of **Astrophysics, Cosmology, and Particle Physics Journal Club** at IISER-Pune (September 2019 - March 2020).

Languages

Bengali Mother tongue

English Fluent

Hindi Fluent

Referees

PhD advisor Prof Tarun Souradeep, Raman Research Institute, Bengaluru, India, Email: tarun@rri.es.in

Collaborator Prof Julien Carron, University of Geneva, Switzerland, Email: julien.carron@unige.ch

Collaborator Prof Benjamin D. Wandelt, Institut d'Astrophysique de Paris, France, Email: bwandelt@iap.fr