PARAS SHARMA

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EDUCATION

Indian Institute of Technology, Delhi, India — July 2019 – Present

Bachelor of Technology in Engineering Physics — **CGPA: 9.39/10**

- *Department Rank 1*, among the 2023 Class of Engineering Physics, IITD.
- *Institute Merit Award*, among the *Top 7%* in the Institute for *four semesters*.

Navyug Convent School, Delhi, India — Apr. 2017 – Mar. 2019

Senior High School Education — **Percentage: 90.4%**

ACHIEVEMENTS AND HONORS

Mitacs GRI Scholar, was awarded Scholarship for Summer Internship at Univ. Of Toronto, Canada. 2022

Summer Undergraduate Research Award, awarded by Industrial R&D Unit (IRD)-IIT Delhi. 2021

Mudit Sharma Memorial Scholarship Recipient, for having the highest GPA in the Department. 2021

B-83 Scholarship Recipient, awarded by the 1983 alumni of IITD for Academic Excellence. 2021

IIT-JEE 2019, was among the **Top 0.2%** students out of *1.2 million* students across India. 2019

KEY RESEARCH EXPERIENCE

Role Of Mg II absorbers on the rotation measure of the background quasars — Aug. 2022 – Present

Supervisors: Prof. Suprit Singh, Department of Physics, IIT Delhi
Dr. Sunil Malik, Institute of Physics and Astronomy, Universität Potsdam

- Mapping the Quasars from NVSS RM catalog of 37K quasars to those of 750K quasars from SDSS DR16.
- Probing the LOS magnetic fields in high-redshift galaxies using excess extragalactic contribution to residual rotation measure (RRM) for quasar sightlines with and without intervening Mg II absorbers.
- Using RRM to explore the evolution of magnetic fields of galaxies over a redshift range of $0.38 \leq z \leq 2.3$.

Exploring the Neutral ISM using spectra of atomic hydrogen — May 2022 – Aug. 2022

Supervisors: Prof. Peter G. Martin, Canadian Institute for Theoretical Astrophysics, Univ. of Toronto
Dr. Antoine Marchal, Canadian Institute for Theoretical Astrophysics, Univ. of Toronto

- Analyzed the multiphase structure of an intermediate latitude HI field among the GHIGLS 21-cm line surveys using the ROHSA multi-Gaussian decomposition code.
- Analyzed the archival HI spectral data stored in data cubes for assessment of the distribution of the gas among the thermal phases and their physical properties, and insight into the dynamical origin of the phase transition.
- Related the results of gaussian decomposition to other tracers of the ISM, such as the thermal emission by dust grains seen by the Herschel and molecular gas traced by CO emissions, which provided insights into the evolution of the constituents of the ISM toward denser conditions.

Radio Astronomy Winter School 2021 — Dec. 2021 – Jan. 2022

Organizer: Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India

- Attended talks on various topics in radio astronomy: Single Dish Radio Telescopes, Fast Radio Bursts, EM - Waves in plasma, Polarization at radio freq., Galaxies and supermassive Black Holes, H-I observations of galaxies, etc.
- Analysis of data obtained from Ooty Radio Telescope (ORT) and Giant Metrewave Radio Telescope (GMRT). Included detecting pulsars using ORT, analysis of neutral hydrogen absorption line data from GMRT.
- Experiments involving Verifying the inv. square law using WiFi signals, Figuring out the effect of back reflectors on directivity of radio antennas, Interferometry using direct and reflected rays from a surface. RAWS-2021 Certificate.

Simulations of Quantum Key Distribution using BBM-92 Protocol — May 2021 – Aug. 2021

Supervisor: Prof. Bhaskar Kanseri, Department of Physics, IIT Delhi

- Literature review of Quantum Key Distribution and error correction algorithms for QKD.
- Implementation of **post-processing algorithms** to develop software repository for QKD post-processing on github.
- Error correction of sifted keys using algorithms such as **Cascade, Winnow & LDPC**.
- Tested post-processing software against experimental data extracted from implementation of BBM-92 protocol.

Competitive Research

International Theoretical Physics Olympiad — Rank 12 out of 150+ teams worldwide Jan. 2021

- Involved solving rigorous theoretical physics problems within a time constraint of 24 hours.

The University Physics Competition — Silver Medal (Rank 12 out of 244 teams worldwide) Nov. 2020

- Using Ion Thrusters to determine the most optimal trajectory for a satellite from Earth's LEO to Saturn's orbit.
- Co-authored "Ion Thrusters to Saturn" from calculations to analysis within a time constraint of 48 hours. Certificate.

Technical Skills

Computational Tools:

- Extensively used Python and it's scientific libraries for various astronomy and simulations based projects.
- Recently, I've started using Julia, due to it's fast performance compared to python in scientific research.
- Used symbolic computation from Wolfram Mathematica a lot for quick calculations.
- Versatile in using the OS environments of Windows, MacOS and Linux.

Other Useful Tools: Github, Overleaf, LaTeX, Markdown, MS Office.

Teaching Experience

Undergraduate Teaching Assistant | *PYL121: Mathematical Physics*. Fall 2022

- Only student in the department selected as a UG TA.
- Conducted weekly doubt sessions, Graded Answer scripts and Prepared Assignments.

Institute Academic Mentor | *PYL101: Electromagnetic Waves & Quantum Mechanics*. Fall 2020

- Conducted weekly doubt sessions for First-year students.

Relevant Coursework

Graduate Physics: Field Theory & Quantum Electrodynamics*, General Relativity & Cosmology, Quantum Information & Computation, Computational Optical Imaging, Non-Linear Dynamics and Chaos*.

Undergraduate Physics: Statistical Physics, Computational Physics, Particle Accelerators, Applied Quantum Mechanics, Quantum Mechanics I and II, Electrodynamics, Classical Mechanics and Relativity, Applied Optics, Optics and Photonics, Mathematical Physics, Solid State Physics.

Lab Courses: Semiconductor Physics Lab, Applied Optics Lab, Introductory Electrical Lab, Introductory Chemistry Lab.

Outreach

Science Communication: Produced educational videos in physics. Youtube Channel.

Former Collaborator, Gramoly: At Gramoly, I organized online boot-camps and a lecture-series on "Basics Of Tensors and Differential Geometry", which can be found here.

Extra-Curriculars

Former Production Head, IITD OnAir: Designing and editing content for the media body of IIT Delhi, i.e., IITD OnAir. Interviewed alumni's of IIT Delhi to share their experiences with the community.

Former Member, Robotics Club IITD: Designed a Rugby Playing Robot with a team of 30 people to compete in ABU Robocon 2020 (Revoked due to Covid). Programmed a Line Follower Robot using arduino microcontroller as part of a workshop conducted by Robotics Club IITD.

Youth Parliament Winner (Delhi Region): Won the 28^{th} National Youth Parliament (Delhi Region) competition in 2015 with a team of 50+ students during Junior High School. Certificate.

* Ongoing Courses – Fall 2022