PARAS SHARMA

Senior Undergraduate | IIT Delhi, India

ph1190644@iitd.ac.in | +91-817-814-2472
linkedin/nutanstrek | github/nutanstrek

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*, was 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%**

SCHOLASTIC ACHIEVEMENTS

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

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 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

Supervisor: Prof. Peter G. Martin, Canadian Institute for Theoretical Astrophysics, Univ. of Toronto

- Analysis of the multiphase structure of an intermediate latitude HI field among the GHIGLS 21-cm line surveys using the ROHSA multi-Gaussian decomposition code, an optimization tool for inverse problem solving.
- Analyzing 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.
- Relating the results of gaussian decomposition to other tracers of the ISM, such as the thermal emission by dust grains seen by the Herschel, IRAS, Planck, and WISE satellites and/or molecular gas traced by CO emissions, thus providing insights into the evolution of the constituents of the interstellar medium 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 for QKD post-processing.
- 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.

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.

Other Courses: Tensors & Differential Geometry, Partial Differential Equations, Calculus I - III, Linear Algebra and Differential Equations, Digital Electronics, Signals & Systems, Chemical Synthesis of Functional Materials, Engineering Mechanics, Intro. to Chemistry, Intro. to Computer Science., Intro. to Biology.

Technical Skills

Computational Tools: Windows, Linux, MacOS | Python, Mathematica, C#, ROHSA (Regularized Optimization for Hyper-Spectral Analysis), Computer Graphics, Image Processing, Numpy, Scipy, Astropy, Matplotlib, etc.

Other Tools: LaTeX, Markdown, Unity Game Engine, Blender 3D, Adobe Creative Suite, MS Office Suite.

Teaching & Outreach

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

- Only student in the department selected as a UG TA.
- Conducted weekly doubt sessions for a class of 50+ students.

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

- Conducted weekly doubt sessions for First-year students.

Science Communication: Making videos to impact the Indian Science Community and encourage young learners to pursue their interests, be it Science, Technology, or any other field. Youtube Channel.

Former Collaborator, Gramoly: Worked with Gramoly, a non-proft educational startup which aims to encourage young learners pursue their passion, by organizing free STEM bootcamps, olympiads, etc. My Contribution.

Extra-Curriculars

- **Procedural Animation**: Using software like OpenGL, Unity 3D, ManimGL, Blender 3D, etc. to visualize scientific models. Working on a library to produce visually pleasing and physically accurate scientific models.
- **Former Production Head, IITD OnAir**: Was responsible for 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