Prasoon Bajpai

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Education

Indian Institute of Technology, Delhi — Delhi, India
B.Tech. + M.Tech in Mathematics and Computing — July 2019 - June 2024
Overall GPA: **8.978/10.0**
PG GPA: **9.571/10**
Standardized Test Scores: TOEFL - 114/120

Awards and Honours

- Awarded the prestigious **Summer Undergraduate Research Award** for best summer research project.
- Achieved **All India Rank 262** in prestigious KVPY(SX) fellowships conducted by the Government of India.
- Secured percentile of **99.93 %** in Joint Entrance Examination (Mains) among over 1.2 million appearing applicants.
- Ranked **Top 1%** in National Standard Examinations in Physics and Astronomy to qualify for INPhO and INAO.
- Awarded Department Change to Maths & Computing at the end of first year for **exceptional academic performance**

Internships

Denoising in Astro-Imaging (Summer Undergraduate Research Award) — May 2022 - July 2022
Prof. Suprit Singh, Indian Institute of Technology, Delhi — *Research Internship*

- Processed Astro-Images captured using ZWO ASI533MC Pro CMOS, using Astropy, PhotUtils, and ASTAP.
- Plotted Hertzsprung-Russell diagram to estimate the stage of stellar evolution of stars in the de-noised image.
- Reduced background noise using Stetson's DAPHOT algorithm and de-mosaiced image for astrometrical purposes.

Proprietary Audio Processing Toolkit — May 2023 - July 2023
Audify Tech, India — *ML Development Internship*

- Developed audio remixer by training **StarGAN** on multi-genre CQT spectrograms followed by re-construction.
- Developed Image-to-Music tool with ViT+GPT2 image captioning model and text-to-music audiocraft model.
- Stress tested and created benchmark models for audio segmentation using 1D-CNN trained on GTZan dataset.

Project Experience

Multilingual Needle in a Haystack (code | paper | review) — June 2024 - August 2024
Prof. Tanmoy Chakraborty, IIT Delhi — (***Submitted at AAAI 2025***)

- Proposed **MLNeedle** test to evaluate LLMs' multilingual long context fact retrieval capabilities across 7 languages
- Conducted series of experiments to isolate **multilingual** context architecture factors affecting model performance.
- Offered preliminary insights into the emergence of such trends suggesting an inherent bias in multilingual LLMs.

Evaluating Reliability of LLMs as Science Communicators (review) — February 2024 - June 2024
Prof. Tanmoy Chakraborty, IIT Delhi — (***Submitted at EMNLP 2024***)

- Created **SCiPS-QA**: a collection of extremely complex scientific boolean problems grounded on nuanced objects.
- **Benchmarked** various proprietary and open-access LLMs to judge their correctness and hallucination levels.
- Showed that proprietary models fail to verify reasoning passages across metrics like correctness and convincingness

Information Anxiety in LLMs — October 2023 - February 2024
Prof. Tanmoy Chakraborty, IIT Delhi — (***To be submitted in Nature MI***)

- Analyzed effect of subject popularity on internal behavior of the LLMs through **mechanistic interpretation**.
- Observed human-like behaviors in state-of-the-art LLMs when answering queries under certain controlled setups
- Explained non-intuitive patterns by intercepting residual updates and analyzing attention scores across layers.

Radio Network Optimization — June 2022 - March 2023
*Prof. Niladri Chatterjee (In collaboration with **Nokia, India**)* — *(Research Project)*

- Analyzed correlation between Key Performance Indicators (KPIs) and validated their impact on overall call quality
- Reported effects of local network alarms on call accessibility and retention rate through **statistical modeling**.

Yoga Pose Classification October 2021

Prof. Rahul Garg, IIT Delhi *(Course Project)*

- Accurately classified 19 different Yoga poses through feature vectors from Alphapose and a Tree-based Classifier.
- Compared performance of multiple CNN models like DenseNet, ResNet, and InceptionV3 versus 3D pose detection

Operating System October 2022

Prof. Ashutosh Rai, IIT Delhi (*Course Project*)

- Implemented single-level page tables and developed API for optimized memory management and process control.
- Developed a process scheduler incorporating various strategies for efficient disk read and disk write management.
- Created starvation-free junction management system using synchronization primitives to resolve deadlocks.

Dynamic Memory Allocation System November 2020

Prof. Rahul Garg, IIT Delhi *(Course Project)*

- Designed a Dynamic Memory Allocation System for efficient reservations of memory for execution of processes
- Implemented data structures like **Balanced Binary Search Trees** for efficient allocation and improved runtime

Synchronous Circuit Simulations April 2021 - May 2021

Prof. Dhiman Mallick, IIT Delhi *(Course Project)*

- Designed and implemented various synchronous digital circuits, such as **4-Bit Gray-Code Counter**, **Ring Counter** and a **Sequence Generator FSM** using SR and D Flip-flops.
- Coded and simulated the finite state machines on **Icarus Verilog** with exhaustive simulations.

Technical Skills

Programming Languages: Python, MATLAB, R, C, C++, Java, Dart, Verilog, JavaScript, Standard ML
Frameworks/Libraries: PyTorch, Keras, TensorFlow, CVXOPT, OpenCV, Flutter, Django, Firebase
Tools/Utilities: Git, LaTeX, Autodesk Inventor

Relevant Coursework

Computer Science and Electrical Engineering: Machine Intelligence and Learning, Data Mining, Data Structures and Algorithms, Analysis and Design of Algorithms, Advanced Algorithms, Digital Electronics, Computer Architecture, Design and Systems Lab, Theory of Computation, Operating Systems

Mathematics: Probability and Stochastic Processes, Statistical Methods, Linear Algebra, Optimization, Fuzzy Sets and Applications, Abstract Algebra, Discrete Mathematical Structures, Real and Complex Analysis, Functional Analysis, Calculus, Numerical Methods and Computations, Differential Equations

Volunteering and Extra-Curricular Activities

Teaching Assistant, *Department of Mathematics & Electrical Engineering, IIT Delhi* August 2023 - June 2024

- Selected as a TA for a UG course on **Probability and Stochastic Processes** and **Statistical Inference**
- Selected as a TA for a UG+PG course on **Natural Language Processing**.
- Member of the teaching staff for the course; Conducted weekly tutorial and doubt-clearing sessions; Created assignments for evaluation purposes and took lectures on elementary topics to augment the scope of the syllabus.

Hostel Representative, *Quizzing Club, IIT Delhi* September 2020 - July 2021

- Executed various inter-hostel and external events; Instrumental in the club winning the Best Club award; Won the quizzing trophy with podium finishes in all quizzing competitive events.
- Planned 10+ extramural quizzes at the national level for IIT Delhi's cultural fest, Rendezvous 2021.

Mentor, *Board for Student Welfare, IIT Delhi* November 2022 - June 2024

- Guided 5 first-year undergraduate students and helped them acquaint themselves with college life

Academic Mentor, *Board for Student Welfare, IIT Delhi* December 2020 - March 2021

- Mentored 300+ first year undergraduate students in the course PYL100 (Introduction to Electromagnetism & Quantum Mechanics)