

Education

2021 – 2025 **Indian Institute of Technology Bombay**, Mumbai, India
Bachelor of Technology in Engineering Physics
Dual Minor in Computer Science and Artificial Intelligence
GPA: 9.59/10 | Department Rank 3
Received the Undergraduate Research Award from IIT Bombay
Research Interests: Compressed Sensing, Computational Imaging

Research Experience

Winter 2023 **Vision, Graphics, Imaging and Learning Laboratory, IIT Bombay**, *Research Assistant*.
- Present Guide: Prof. Ajit Rajwade, Computer Science, IIT Bombay
Title: Level Set Estimation from Compressive Measurements via Shearlet Regularization
Developing a tree-based algorithm augmented with shearlet regularization to estimate level sets of images directly from compressive measurements, that reduces imaging time by 50% - 75%. To be used in image processing pipelines in bioengineering applications such as nuclear magnetic resonance imaging for protein molecules

Winter 2022 **IIT Bombay and Max Planck Institute for Software Systems**, *Research Student*.
- Spring 2024 Guides: Prof. Krishna S, Computer Science, IIT Bombay and Dr. Khushraj M, MPI-SWS
Title: Partially Adjacent 1-Timed Propositional Temporal Logic is Decidable
Showed a theoretical reduction between two temporal logic classes, Partially Adjacent 1-Timed Propositional Temporal Logic (PA 1-TPTL) and Partially Punctual Metric Temporal Logic (PPMTL) to prove decidability
Utilised proof techniques such as projections and relativization to prove equivalence of PA 1-TPTL and PPMTL

Publications and Preprints

Openness and Partial Adjacency in One Variable Timed Propositional Temporal Logic
S.N. Krishna, K. Madnani, **A. Nag**, P.K. Pandya ([arXiv](#))

Hyper Pyramid Adapted Shearlet Transform with Application to Compressive Level Set Estimation
A. Yousuf, **A. Nag**, A. Rajwade (Paper Preparation in Progress)

International Experience

Summer 2024 **NUS Young Fellowship Program 2024**, *National University of Singapore*.
Represented IIT Bombay at the international level among a cohort of student researchers invited to collaborate on potential applications of generative artificial intelligence and machine learning in doctoral research

Professional Experience

Summer 2024 **Databricks**, *Software Engineering Intern*, Bangalore, India.
Designed and implemented algorithms in Databricks Java Driver Library for a fast file search mechanism in Databricks Cloud which serves as a foundation for data exchange between users and the database server. Implemented a framework for reconfigurable SQL queries using fewer arguments and precompiled templates for faster query processing. Received a Pre-Placement Offer for exceptional performance throughout the internship.

Entrepreneurial Experience

Autumn 2023 **UnearthAI**, *Co-Founder*, Mumbai, India ([Pitch Deck](#)).
- Spring 2024 Connecting talented college students to growing Indian startups for exciting internships
Automated hiring processes by building OpenAI API powered software to intelligently segregate resumes and used NLP models such as ColBERT to match resumes with best-fit roles through a WhatsApp chatbot
Generated \$1000 profit in first two months of operation | Received a grant of \$2000 from IIT Bombay

Other Projects

- Spring 2024 **Sustainable Engineering: Performance of EV Shuttles in IIT Bombay**, Environmental Research.
Performed a detailed study of the transport landscape at IIT Bombay to contrast usage of transport options
Proposed solutions to improve user experience by reducing travel time and increasing reliability
Surveyed 800 students and staff members across campus and analysed the data, organised a physiotherapy workshop to assist drivers in reducing back aches and improve working conditions
- 2022-2023 **ViBe Basket**, Entrepreneurial Project ([Pitch Deck](#)).
Developed a software application to intelligently match social groups with outing itineraries
Conducted market research and customer surveys with student populations across the country
Utilised fine tuned NLP models to determine user-outing fit with Discord as the application front end
- Spring 2024 **Sparsity Based Denoising for Low Dose Tomography**, Advanced Image Processing Project.
Implemented the K-SVD Algorithm to sparsify low-dose tomographic images for low error reconstruction
- Spring 2024 **Don't Let Labels Define You**, Introduction to Machine Learning Project.
Executed clustering algorithms to determine synthetic genres on a dataset of Spotify songs
- Autumn 2023 **Image Deblurring via Reverse Heat Equation**, Digital Image Processing Project.
Used various deblurring algorithms to improve image quality on a training dataset of blurry images
- Summer 2023 **VanGogh AI - A Generative Painting Agent**, Institute Technical Summer Project.
Implemented Neural Style Transfer to seamlessly blend artwork styles with image content
- Spring 2023 **Statistical Analysis of Random Pattern Detection**, Digital Systems Project.
Designed an experiment to verify the Central Limit Theorem from statistics through digital electronics
- Winter 2022 **Machine Learning with Quantum Computers**, Winter in Data Science.
Solved the Deutsch-Josza Problem and demonstrated the effectiveness of quantum computing
- Spring 2022 **HyperEntropicPingPong**, GameDev Hackathon, Developers' Community.
Designed a basic multi-level 2D ping-pong game with non-classical dynamics and quantum tunnelling

Skills

- Programming C++, Python, Java, MATLAB, Git, GitHub, \LaTeX , HTML, JavaScript, CSS
- Libraries NumPy, Pandas, Matplotlib, Seaborn, OpenCV, Plotly, SciKit Learn, OpenAI API, Google API
- Languages English (fluent), Hindi (intermediate), Bengali (intermediate)

Key Courses Undertaken

- Computer Science Logic in CS, Computer Programming and Utilisation, Data Structures and Algorithms, Design and Analysis of Algorithms, Introduction to Machine Learning, Foundations of Intelligent and Learning Agents, Digital Image Processing, Advanced Image Processing, Quantum Computing, Operating Systems
- Physics Quantum Mechanics, Photonics, Microprocessors, Condensed Matter Physics, Statistical Mechanics, Electromagnetism, Classical Mechanics, Data Analysis, Relativity, Waves, Thermal Physics, Electronics
- Mathematics Linear Algebra, Complex Analysis, Calculus, Differential Equations I & II, Numerical Analysis

Teaching and Mentorship

- Nov 2022 - Present **IIT Bombay**, *Undergraduate Teaching Assistant*.
Departments of Physics, Mathematics and Computer Science & Engineering
Assisted in the courses Calculus I, Calculus II, Classical Physics, Logic in Computer Science, Introduction to Classical and Quantum Mechanics by conducting weekly interactive problem solving sessions and clearing conceptual doubts for a batch of 45 junior students (agnipratimnag.github.io/teaching)
- 2023 - 2024 **Department of Physics, IIT Bombay**, *Academic Mentor*.
Mentored 9 sophomore students and assisting them in navigating the department's academic curriculum
Involved in designing event posters and maintaining an alumni database as part of the Outreach subteam

Volunteer Experience

- 2021-2022 **National Social Service, IIT Bombay**, *Educator*.
Worked with National Service Scheme, IIT Bombay to provide free education available to 110,000+ underprivileged students through educational science videos in the Bangla language on YouTube