Arnav Samal

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Education

Present – Nov 2022 | **National Institute of Technology (NIT) Rourkela** — **Rourkela, India**
Bachelor of Technology, Computer Science & Engineering | CGPA: 9.21/10
Coursework: Probability & Statistics, Computer Vision, Natural Language Processing, Machine Learning; self-studied Convex Optimization, Deep Learning (NPTEL)

Research Experience

Present – July 2025 | **NIT Rourkela | Dept. of CS** — **Rourkela, India**
Undergraduate Researcher | Advisor: Dr. Prasenjit Dey
- Developing novel architectural modifications to diffusion models for sketch-to-face synthesis to enhance geometric faithfulness and feature mapping.
- Integrating explainability mechanisms to ensure interpretable and controllable generation of facial features from sketch inputs.

Dec 2025 – May 2025 | **IIT Hyderabad | Lab 1055 (AI & Vision-Language Group), Dept. of CS** — **Hyderabad, India**
Research Intern | Advisor: Prof. Vineeth N Balasubramanian, in collaboration with Microsoft Research
- Investigated concept quality in CBMs by analyzing concept locality to diagnose concept leakage; processing 2TB+ medical imaging data and applying locality-to-concept specific metrics
- Results show models attend 45% more to spurious regions than diagnostically relevant features

May 2025 – Mar 2025 | **KIIT University | RespAI Lab, Dept. of CS** [🌐] — **Remote**
Undergraduate Researcher | Mentor: Dr. Murari Mandal
- Applied sparse autoencoders to extract and steer reasoning-specific features (uncertainty, reflection) in large language models.
- Maintained task performance while reducing response length, improving generation efficiency.

Aug 2024 – May 2024 | **IIT Hyderabad | Data-driven Intelligence & Learning Lab, Dept. of AI** [🌐] — **Hyderabad, India**
Research Intern | Advisor: Dr. Konda Reddy Mopuri
- Conducted comparative analysis of post-hoc explainability techniques in Vision Transformers, including attention rollout and token pruning methods.
- Implemented and evaluated token pruning strategies for computational efficiency while maintaining classification performance.

Selected Projects

SketchWarp — Mar'25 - May'25
Paper | Source Code
- Developed a self-supervised learning framework in PyTorch for dense photo-to-sketch correspondences, enabling automatic image-to-sketch warping.
- Designed and implemented training and evaluation pipelines inspired by the "*Learning Dense Correspondences between Photos and Sketches*" paper.

Capsule Vision Challenge 2024 | Team Seq2Cure — Sep'24 - Nov'24
Preprint | Competition Website | Source Code
- Developed a fine-tuned, multi-model ensemble combining CNN and Transformer architectures, leveraging techniques like weighted random sampling and focal loss to address significant class imbalance.
- The proposed method secured the 5th position in the international challenge, resulting in co-authorship in the official challenge summary paper.

NeurIPS Ariel Data Challenge 2024 | Team Markov's Chain — Aug'24 - Oct'24
Competition Website | Source Code
- Developed a pipeline for exoplanet spectral prediction using calibrated multi-sensor time-series data, implementing spatial-temporal aggregation, phase detection via gradient analysis, and Nelder-Mead optimization.
- Ranked in the top 20% in the NeurIPS-Ariel Challenge, with an evaluation score of 0.5704.

Technical Skills

- **Programming Languages**: Python, C++, C, SQL
- **Libraries & Frameworks**: PyTorch, JAX, HuggingFace (Transformers, PEFT/LoRA, Datasets), NumPy, SciPy, scikit-learn, OpenCV, timm, Matplotlib, W&B
- **Tools & Platforms**: Git, GitHub, uv, Conda, Docker, Jupyter, LaTeX, Microsoft SQL Server

Honours and Awards

Departmental Rank #5 [🌐] Ranked 5th in the Computer Science & Engineering department at NIT Rourkela based on cumulative academic performance.

ACM-IKDD Uplink 2025 Program [🌐] Selected for the competitive CS mentorship program (acceptance rate ∼2%).

Research in Intelligence & Security Challenges (RISC) 2025 Program [🌐] Selected for the prestigious program at the University of Maryland.

Worldwide Rank 5 | Capsule Vision Challenge 2024 [🌐] Top-performing team (Team Seq2Cure) in the Capsule Vision Challenge organized by CVIP 2024.

2nd Place | HackFest 2024 Secured 2nd place at the hackathon organized by ML4E for undergraduates.

Kaggle Expert [🌐] Earned expert status for contributions in Datasets & Notebooks.

Leadership & Extra-Curricular Activities

ML4E Society, NIT Rourkela *Core Member* Aug'23 – Present

- Helped establish and grow a student-led machine learning society; conducted sessions, mentored juniors, and contributed to research discussions.

Inquizzitive, NIT Rourkela *Quizzer* Sept'23 – Present

- Active member of the quizzing society; participated in quizzes and contributed to discussions on trivia and strategy.

Rotaract Club, NIT Rourkela *Member* Oct'23 – Mar'24

- Contributed to social initiatives, helping organize and participate in community outreach and development events.

Innovision 2K23, NIT Rourkela *Event Coordinator, Organizer* Sept'23 – Nov'23

- Co-organized events for the annual technical fest, coordinating logistics and team operations.