ATHARV GOEL

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Education

- **Indraprastha Institute of Information Technology, Delhi (IIIT-Delhi)** *2021 - 2025*
  B.Tech in Computer Science & Engineering CGPA: 8.83/10.00
- **Indian Community School, Kuwait** *2017 - 2021*
  High School Class XII: 96.6%

Research Experience

- **Vision Lab, IIIT Delhi | Thesis** *Jan 2024 - present*
  Undergrad Researcher New Delhi, India
  - Worked on Active Learning for Object Detection with **Prof. Saket Anand** for my undergraduate thesis.
  - Designed an active acquisition function based on neural collapse theory, demonstrating a significant boost in performance on downstream tasks.

- **Datalab, IIIT Delhi** *Jan 2025 - present*
  Research Associate New Delhi, India
  - Worked on open-ended reinforcement learning for analogical reasoning with **Dr. Gautam Shroff**.
  - Building a method for developer-aware generalization for emergent reasoning capabilities in AI agents.
  - Used techniques test-time adaptation (TTA), knowledge distillation, reward-shaping, offline RL, inverse RL, meta-learning, and more.

- **Centre for Artificial Intelligence (CAI-IIITD)** *June 2024 - Aug 2024*
  Research Intern New Delhi, India
  - Worked with the **Wildlife Institute of India** on computer vision solutions for wildlife conservation efforts with **Prof. Saket Anand**.
  - Worked on wildlife species re-identification algorithms using graph registration and neural subgraph matching. Extensively used techniques from spectral graph theory and geometric deep learning.

- **Theoretical Computer Science Lab, IIIT Delhi** *June 2023 - Aug 2023*
  Summer Intern New Delhi, India
  - Implemented core-set construction algorithms for feature selection in high-dimensional regression tasks under the guidance of **Prof. Supratim Shit**.
  - Conducted extensive benchmarking and analysis of various core-set algorithms.

Selected Projects

- **OV3D: Open Vocabulary 3D Object Detector Without 3D Supervision** *Mar 2024*
  Tools: Python, PyTorch [**Paper** | **Code**]
  - Designed and validated a **novel algorithm** for detecting 3D objects that do not require any 3D annotations, using back-projection and 3D rotating calipers.
  - Created a **synthetic Pseudo-NuScenes** dataset featuring pseudo-LiDAR data from ring cameras with realistic fog injected in RGB images, based on a light scattering physical model.

- **ARC: Neural Analogical Reasoning for Artificial General Intelligence** *Sep 2024 - Nov 2024*
  Tools: Python, PyTorch, transformers [**Paper**]
  - Worked on solving the Abstraction & Reasoning Challenge, an open challenge intended for measuring skill-acquisition efficiency of AI systems.
  - Designed and implemented various methods based on **Neurosymbolic AI** using discrete program search, model-based meta-learning, and **large-language models (LLMs)**.
  - Implemented self-supervised **test-time fine-tuning** in **Llama-3.2B** models with **LoRA**.
  - Designed an **LLM inferencing method** based on depth-first search over token distribution with heuristics for pruning combinatorial search space, building over **Tree-of-Thought (ToT)**.

- **Explainable Neural Networks for Computer Vision** *Apr 2025*
  Tools: Python, PyTorch

- Made computer vision models **interpretable** by generating spatially localized concept heatmaps.
- Used LLMs to generate relevant concepts for each class, eliminating need for human annotation.
- Built a spatial bottleneck module for concept classification, providing both spatial heatmaps and global concept explanations.

- **VXGI: 3D Graphics Rendering Engine** *Oct 2023 - Dec 2023*
  Tools: C++, OpenGL [**Paper** | **Code**]
  - Wrote a rendering engine in OpenGL that simulates **global illumination** in real-time.
  - Implemented a **dynamic voxelization** scheme combined with **voxel cone tracing** for indirect lighting, achieving interactive performance **(50-60 FPS)** even in complex dynamic mesh blocks.
  - Added an **interactive GUI** for adjusting material properties, lighting, voxelization, object movement, etc.

- **Distributed Hash Table: Raft Algorithm** *Apr 2024*
  Tools: Python, gRPC [**Code**]
  - Implemented a **Distributed Key-Value Store** using a custom **Raft Consensus algorithm** implementation to ensure fault tolerance and consistency, operating through leader election and log replication.
  - Integrated **leader lease** mechanism to reduce the time complexity of read operations, demonstrating significant gains for geo-distributed databases.

Skills

- **Programming Languages:** Python, C, C++, Java, JavaScript, HTML&CSS, SQL
- **Technologies:** Linux, Git, GitHub, Docker, PyTorch, OpenCV, OpenGL, GLSL, Numpy, Matplotlib, Scikit-Learn, pandas, fastAI

Coursework

- **Graduate:** Meta-Learning, Reinforcement Learning, Explainable AI, Computer Vision, Linear Optimization, Distributed Systems; **Undergrad:** Computer Graphics, Game Theory, Statistical Machine Learning

Awards

- Awarded **distinguished top-ranker (A+)** in advanced AI courses (*Meta-Learning, Explainable AI, Computer Vision*) for exceptional performance and novel project work.
- Received the **Best TA Award** for excellent service and management as Head Teaching Assistant for Computer Vision, taken by PhD and M.Tech students.
- Received the **Dean's List Award** for excellent academic performance (9.4 GPA in final year)
- **Amazon ML Summer School 2024:** Among the **top 3% out of 85,000** selected candidates.
- **World Cube Association 2022:** Ranked **top-100 among 20+ million** candidates for competitive speedcubing in India. **Ranked #1** all over Kuwait for a record-breaking 8.55 second solve.

Positions of Responsibility

- **Head Teaching Assistant – Computer Vision** *Jan 2025 - May 2025*
  IIIT Delhi
  - Managed a team of 7 TA's; mentored student teams on various research projects; designed assignments and exams; conducted office hours for 1-to-1 tutoring.

- **Placement Cell Coordinator** *Feb 2023 - Mar 2024*
  IIIT Delhi
  - Coordinated operations between companies and students for campus hiring.
  - Organized the IIITD Startup Fair 2023, hosting over 30 startups.

- **Founder** *Dec 2020 - present*
  The DASA Community
  - Built and maintained a community of **1,500+** foreign students from **15+** countries, building a senior-junior mentorship system for college admissions.
  - Wrote wikipages and articles to help students navigate the process, held Q&A and AMA sessions for college guidance and exam prep help.

- **Organizer, ESYA 2023** *Jun 23 - Aug 23*
  IIITD Tech Fest
  - Independently conducted one of India's largest Speedcubing contests, affiliated with the **World Cube Association**, featuring **160+ competitors** from **3 countries** competing for **Rs. 2.5L+** in prizes.
- **Founding Member and Mentor,** Undergraduate Research Council (URC, IIITD) *Sep 2023 - present*
- **Freshman Student Mentor,** Student Council *Aug 2023*

CERTIFICATIONS

- **GPU Programming Specialization:** Certificate *Nov 2024*
- **Amazon ML Summer School 2024:** Certificate *Aug 2024*
- **Machine Learning Engineering for Production (MLOps)** Certificate *May 2024*
- **Generative Adversarial Networks (GANs)** Certificate *May 2024*