**Suryaansh Jain**
**Computer Science & Engineering**
**Program: M.S. (2027)**

**Email:** suryaansh2003@gmail.com
**Email:** suryaanshjai@umass.edu
**Website:** srynsh

| Level | Degree | Institution | Year | GPA |
|---|---|---|---|---|
| Graduate | M.S. | University of Massachusetts - Amherst | 2027 | 3.9/4 |
| Undergraduate | B.Tech | IIT Hyderabad | 2025 | 3.91/4 (9.41/10) |

## Technical Skills

| | |
|---|---|
| **Programming** | C++, C, Python, JavaScript, Java, Bash, Sed, Awk, Solidity, Move, Rust, Dart |
| **Web Development** | Flutter, Express, Bootstrap, aiosql, Django, fast-api, socket programming, AWS |
| **Libraries** | NumPy, Matplotlib, PyTorch, Pandas, TensorFlow, SpaCy, NLTK, diffusers, clip, Scipy, Sklearn, openai, OpenCV, cuda, Docker, OpenGL, LangChain, LangGraph, JAX, boto3, streamlit, cmake, ROS2, Gazebo |

## Research Experience

### Improve fine-grained image captioning model from detailed rewards *(2026-\*)*
*Guide | Dr. David Seunghyun Yoon* — *Adobe*

- Developing a **reinforcement learning** framework for **fine-grained image captioning** using detailed reward signals from external evaluators such as **CLIPScore, BLIP-2, and GPT**-based consistency models.
- Integrating hallucination and factuality-checking modules based on **ViT-GPT2, BLIP, and Flamingo-style vision-language models** to generate **fine-grained supervision**.
- Training and evaluating transformer-based captioning models (ViT-GPT2, BLIP-2) on public benchmarks, reducing hallucinations and improving coverage and descriptive accuracy.

### Learning State Abstractions for $c^{\text{th}}$-Order Markov Processes in STAR *(2025-\*)*
*Guide | Prof. Bruno Castro Da Silva* — *University of Massachusetts Amherst*

- Studying **state abstraction learning** by constructing $\phi$-functions that induce a reduced state space satisfying the $c^{\text{th}}$**-order Markov property**.
- Derived **theoretical conditions** under which a $\phi$ abstraction preserves the Markov structure, and proposed **autoencoder-based architectures** to learn abstractions meeting these guarantees.
- Modeled abstracted environment dynamics using **Gaussian Neural Networks**, enabling more efficient and accurate **off-policy reinforcement learning**.
- Preparing a full research manuscript targeting submission to **NeurIPS 2026**.

### Beyond Consensus: Mitigating Agreeableness Bias in LLM Judge Evaluations *(2024–25)*
*Guide | Prof. Ben Leong* — *National University of Singapore*

- Extended **LLM-as-a-judge** frameworks for **subjective evaluation tasks** by incorporating **statistical modeling** and **regression-based calibration**.
- Proposed a novel **Item Response Theory (IRT)**–based approach that introduces **latent variables** to estimate evaluator bias and model precision.
- Achieved an average error rate of **3%** across multiple LLMs, outperforming prior benchmarking methods.
- First author of paper titled *Beyond Consensus: Mitigating the Agreeableness Bias in LLM Judge Evaluations* at **ICLR 2026**.

### Bounds on the Cop Number via $k$-Component Order Connectivity *(2023–24)*
*Guide | Prof. Subrahmanyam Kalyanasundaram* — *IIT Hyderabad*

- Developed new theoretical bounds on the **cop number** of graphs using $k$-**component order connectivity**, analyzing graph structure via vertex covers with bounded component sizes.
- Strengthened the state-of-the-art upper bound, improving it from $|U|/2 + 1$ to $|U|/3 + 9$, representing a significant asymptotic improvement.
- First author of paper titled *A bound for the cops and robber problem in terms of k-component order connectivity*.

### Inter Blockchain Communication *(2023)*
*Guide | Prof. Kotaro Kataoka* — *IIT Hyderabad*

- Published the paper "OTEx: Ownership Transfer and Execution Protocol for Blockchain Interoperability."
- Conducted research **funded by Toyota** on establishing **communication between blockchains** using OTEx.
- Developed methods for communication between private, public blockchains and decentralized storage for asset and NFT ownership records.

## Work Experience

### Bryt Schools | *ML and Software Engineering Intern | 10 weeks* *(2025)*

- Developed an **LLM-powered conversational chatbot** for student doubt resolution, integrating **model fine-tuning**, evaluation, and deployment into the existing system.

- Implemented **section name aliasing** to improve content retrieval and user experience, contributing production-level changes across **100+ files** in a large-scale codebase.

**Crow Canyon Software** | *Machine Learning Intern | 4 weeks* (2023)
- Designed and implemented a **retrieval-augmented generation (RAG)** system for answering user queries over large **PDF document corpora**, including document ingestion, chunking, and embedding pipelines.
- Built and benchmarked multiple RAG pipelines using **LangChain**, **LangGraph**, and a custom orchestration framework to improve retrieval accuracy and response quality.
- Investigated **RLHF-based fine-tuning** strategies to align model outputs with user intent and improve output quality.

## Academic Projects

**Robustness of Object Detection Models to Adversarial Attacks** | *Course: Computer Vision* (2025)
- Studied and reproduced **patch-based** and **gradient-based adversarial attacks**, and designed a novel attack variant **(Edge-DPAttacks)** evaluated on state-of-the-art object detectors including **YOLO** and **Faster R-CNN**.

**Graph Neural Networks and Diffusion Models for Graph Coloring** | *Course: Adv. Topics in DL* (2024)
- Designed a **diffusion-based generative framework** over graph-structured data, combining **Graph Neural Networks (GNNs)** to solve the graph coloring problem.
- Applied the model to **4-colorable graphs**, achieving a **10% coloring error rate**, and extended the approach to **arbitrary $k$-colorable graphs**.

**Recommender Systems Using Deep Generative Models** | *Course: Deep Learning* (2024)
- Surveyed SOTA recommender system models like **DiffRec**, **Diff4Rec**, and **Contrastive Variational AutoEncoder** for Sequential Recommendation. Presented these papers and proposed potential improvements.

**Drone Motor Failure Detection** | *Inter-IIT Tech Meet* (2024)
- Designed an **LSTM-based failure detection model** using multivariate sensor telemetry from drone motors.
- Deployed the model in **C++ within ROS2** for **real-time inference** on **PX4** drone hardware.

**Image manipulation DSL** | *Course: Compilers-II* (2023)
- Implemented a **Domain Specific Language** that aids in manipulating BMP format images.
- The language enables users to draw on images and apply convolution filters to them. It allows users to define drawings that can be applied to images and create videos from them.

**Stack Overflow Clone** | *Course: Database management systems* (2023)
- Implemented a scalable backend system using data from **Stack Overflow's Internet Archive**, supporting efficient storage and query processing at scale.

**Firewall and Bandwidth Limiter** | *Networking Club at IITH, Kludge* (2023)
- Developed a **Firewall and Bandwidth Limiter** using NFQUEUES in C++ for router-based network control.
- Implemented access control policies, including speed limits, configurable data caps (daily/weekly/monthly), and filtering based on ports, protocols (TCP/UDP), and IP addresses.

## Selected Courses Undertaken

| | |
|---|---|
| **Undergraduate** | Theory of Computation, Discrete Math, Foundations of Machine Learning, Operating Systems, Linear Optimization, Game Theory and Mechanism Design, Information Theory, Deep Learning, Spectral Graph Theory, Convex Optimization, Reinforcement Learning, Cryptology, Quantum Computing, Computational Complexity, Advanced topics in Deep Learning, Computer Vision, Communication Complexity, Approximate Algorithms, Topics in Combinatorics, Calculus, Linear Algebra, Probability & Statistics, Transform Techniques |
| **Graduate** | Advanced topics in ML, RL, Complexity Theory, Probabilistic Graphical Models, Robotics, Industry Research |

## Scholastic Achievements

- Received **OnePlus-Oppo Genius+ scholarship** awarded to **6 students** across India (2022)
- **All India Rank of 311** in the IIT-JEE Advanced out of 1,55,000 candidates (2021)
- **All India Rank of 458** in the IIT-JEE Mains out of 10,00,000 candidates (2021)
- Awarded the **KVPY Fellowship twice** by the Government of India conducted by IISc Bengaluru (2019, 2020)

## Olympiads

- Secured **All India Rank of 27** and selected for the **Orientation Camp** for the IChO conducted by HBCSE (2021)
- **State topper** at the **National Science Examination in Physics conducted** by HBCSE (2021)
- Among the **top 300** students selected for **InPhO** the qualifying round for **IPhO**. (2020)

## Extracurriculars

- **Teaching Assistant** for **Information Theory, Theory of Computation** (2025, 2024)
- **3rd Place** in Math Bowl (CMI) Competition at **Inter-IIT Tech Meet** (2024)
- **Head** of Web-Dev Team in Milan (2024)
- **2nd Place** in **Math Bowl (CMI) Competition** at **Inter-IIT Tech Meet** (2023)
- **Gold** in **Milan Robotics Contest** (RoboArt) and **Web Dev Contest** (Intra-IIT contest) (2023)