Aaron Jerry Ninan | **190100001**
Electrical Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 3/22/2001

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2023	9.21
Intermediate	CBSE	Delhi Public School, Bhilai	2017	10
Matriculation	CBSE	Delhi Public School, Bhilai	2019	94.80%

Pursuing Minor in **Computer Science and Engineering**

Scholastic Achievements

- Awarded Branch Change to Electrical Engineering for **Exemplary Academic Performance** (8 students out of 1k+)
- Secured an **All India Rank of 599** in JEE Main and **785** in JEE Advanced among 1.2 million candidates *2019*
- Among the **Top 300** students in **Indian National Olympiads** of Physics, Chemistry, and Astronomy *2019*
- Qualified **Twice** for **Indian National Mathematics Olympiad**, conducted by **HBCSE**, India *2018, 2017*
- Recipient of the **Kishore Vaigyanik Protsahan Yojana (KVPY)** fellowship with All India Rank **292** *2017*

Research Experience

Automated Data Storytelling
May '22 - Jul '22

Research Intern — *Adobe Research Lab, Bangalore*

- Worked on an **automatic insight generation** system that extracts insights from large-scale datasets and presents them in the form of storyline sequence powered by **chart visualizations** and **natural language narratives**
- Proposed a **novel Reinforcement Learning** approach outperforming the existing state of the art in running time
- Developed a Segmented approach to illustrate the data story in a dashboard using **clustering** techniques
- Ranked insights based on metrics to increase **coherence** between insights and **coverage** of dataset for the story

[**Co-Authored a US Patent Disclosure**]

An Analysis of LASSO for RTPCR Group Testing
Jan '22 - Present

Guide: Prof. Ajit Rajwade | RnD Project — *IIT Bombay*

- Performed simulation studies on **RT-PCR** Group Testing using **Log-Weighted LASSO** for including Statistical Priors from CT side information to show it outperforms LASSO formulations working with no side information
- Deriving bounds for Data-Dependent **Weighted LASSO** under Low-Variance **Multiplicative Gaussian Noise**

UAV Control using Gesture Recognition
May '21 - July '21

Guide: Prof. Michael Felsberg | Research Intern — *Computer Vision Lab, Linköping University, Sweden*

- Worked on real-time gesture recognition using UAV camera, for efficient control of UAV in an outdoor setting
- Adapted the methods from **Temporal Pyramidal Network(CVPR 2020)** for action recognition
- Achieved an Top-1 accuracy of **94.29 %** , with **716.89 fps** and **latency of 0.0893** seconds, outperforming the current **state of the art** of **91.9 %** set by **Pose-CNN** on the **UAV-GESTURE** dataset
- Proposed a **Time-Series** based approach using key features like **Pose Coordinates**, angles, angular velocity, and distances between joints for input to an **LSTM** based architecture for gesture classification

Topological Data Analysis
May '21 - July '21

Guide: Prof. Debasish Chatterjee | Summer Undergraduate Research Programme — *IIT Bombay*

- Studied introductory **Group Theory** and **Algebraic Topology(Simplicial Complexes)**, for various applications in biological data, control theory and learning methods
- Read literature on applications of **Persistent Homology** in **Human Gait Analysis** for disease classification, **Consensus** on simplicial complexes, **Path Planning**, Topological Mapping using **Swarm Robots**

Key Projects

Learned Instrinsic Rewards for Robotic Manipulation
Spring '22

Guide: Prof. Shivaram Kalyanakrishnan | Advances in Intelligent and Learning Agents- Course Project — *IIT Bombay*

- Investigated the use of **learned intrinsic rewards** in sparse reward environments like robotic manipulation tasks
- Proposed a new intrinsic reward formulation for goal-based tasks separating goal-dependent and independent rewards
- Tested our system against standard baselines such as **Hindsight Experience Replay(HER)**, **Twin Delayed Deep Deterministic Policy Gradients (TD3)** with different exploration bonus schemes such as **RND**, **SMiRL**

Post-hoc Out-of-Distribution Detection
Spring '22

Guide: Prof. Sunita Sarawagi | Advanced Machine Learning Course Project — *IIT Bombay*

- Analyzed **Energy-based models** using different scoring functions for out-of-distribution detection in a given dataset
- Proposed a **novel scoring function** based on the **Dirichlet distribution** that outperforms the energy score consistently across different datasets and metrics like **FPR95, AUROC, AUPR**, justified with a theoretical proof

Seam Carving for Content - Aware Image Resizing *Autumn '21*

Guide: Prof. Ajit Rajwade | Digital Image Processing Course Project *IIT Bombay*

- Implemented seam carving algorithm for resizing an image without cropping it or distorting its contents
- Utilized 2 different approaches using **Dynamic Programming** and **Graph Cuts** to find the optimal seam
- Developed several applications such as object removal, content amplification, video retargeting in **MATLAB**

Compressive Sensing over Graph Structures *Spring '21*

Guide: Prof. Ajit Rajwade | Advanced Image Processing Course Project *IIT Bombay*

- Implemented the **DICeNod** algorithm for identifying nodes with **highest information flow** in **social networks** using **compressive sensing** without full knowledge of the network topological structure
- Verified and elucidated the recovery guarantees of the **Sparse Centrality Vector** from the proposed **Sensing Matrix** using properties of **Lossless Bipartite Expander Graph** by writing **formal proofs**

Software Subsystem | IITB Mars Rover Team *June '20 - Jan '22*

A cross functional team of students which designs and fabricates a semi-autonomous rover for the University Rover Challenge, an international robotics competition conducted by The Mars Society annually in Utah, USA

- Impemented various **Image Processing** algorithms to detect **AR tags** from live video feed of the rover
- Developed an **Android Client** for receiving Rover measurements using **Robotic Operating System** framework
- The team ranked **4th** in the **Indian Rover Design Challenge 2020** among 28 teams from 7 different countries

Core Developer | Developer's Community IITB *June '20 - June '21*

Community of developers responsible for maintaining/developing software for applications within the institute

Hostel Room Management Portal *September '20*

- Developed the backend **REST API** of a centralized portal for Hostel Coordination Unit of IITB for easy management and tracking status of hostel room allotments for **10000+** students within the institute
- Deployed the backend using **Django REST framework** and frontend using **Angular** as a part of 3 membered team

Math Image to Latex Conversion *May '20*

Institute Technical Summer Project *IIT Bombay*

- Designed and developed an application which **solves definite integrals** from handwritten camera images
- Implemented an End-to-End **Sequence Model** with a **CNN based Encoder** and an **RNN based Decoder** to predict LaTeX sequences of math expressions from its image
- Proposed a **Parsing Algorithm** for extraction of syntax information from relative coordinates of expressions
- Deployed the **API** for the application using **Flask** micro web framework on **cloud**

Positions of Responsibility

Department Academic Mentor *May '21 - May '22*

Department Academic Mentorship Programme *IIT Bombay*

- Part of 35-member team, selected from **86 applicants** on the basis of **interview** and extensive **peer review**
- Mentoring **6 sophomores** to help them with academic issues, time management and extra-curricular endeavours

Teaching Assistant

- **Foundations of Intelligent and Learning Agents** - CS747 | Prof. Shivaram Kalyankrishnan *(Autumn '22)*
- **Quantum Physics and Applications** - PH107 | Prof. Shankaranarayanan S *(Spring '22)*

Technical Skills

Languages	C/C++, Python, MATLAB, VHDL, MIPS Assembly
Softwares/Packages	Pytorch, Tensorflow, Android, Django, Arduino IDE, LaTeX, ROS, OpenCV, AWS

Key Courses Undertaken

EE	Stochastic Control, Communication Systems, Control Systems, Analog Circuits, Digital Systems, Signal Processing, Probability and Random Processes, Microprocessors, Electronic Devices
CSE	Game Theory*, Advances in Intelligent and Learning Agents, Advanced Machine Learning, Advanced Image Processing, Digital Image Processing, Data Structures and Algorithms, Computer Networks, Foundations of Intelligent and Learning Agents, Introduction to Machine Learning
Mathematics	Optimization*, Calculus, Differential Equations, Linear Algebra, Complex Analysis

**to be completed by Dec '22*

Extracurriculars

- Volunteered as a one-to-one **mentor** to school students during the **COVID-19 pandemic crisis**
- Completed one year long course in **National Sports Organisation in Football, 2019-2020**
- Ranked **4th** in **Football General Championship 2020** representing Hostel 16, IITB
- **1st Dan Black Belt** in **Karate**, with 5+ years of professional training in **Shito-Ryu** form
- Received **2 Silver Medals** in **All India Seiko Kai Karate Do Championship** in Kumite and Kata events
- Professionally trained **Pianist** in **Western Classical Music**
- Secured **1st** position in state in ALOHA Abacus and Mental Arithmetic Competition