ARASH DEV AHLAWAT

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EDUCATION

- **Indian Institute of Technology Bombay, Mumbai** — *Jul 2023 – Present*
  Bachelor of Technology Majoring in **Engineering Physics** — *CPI: 8.13 / 10*
  Minor in **Artificial Intelligence and Data Science** — *CPI: 10.00 / 10*
- **Delhi Public School, Karnal (CBSE)** — *Apr 2021 – Mar 2023*
  Class XII (Intermediate) — *93.80%*
- **St. Theresa's Convent School, Karnal (CBSE)** — *Apr 2019 – Mar 2021*
  Class X (Matriculation) — *96.80%*

SCHOLASTIC ACHIEVEMENTS

- Secured **99.90** percentile in the Joint Entrance Examination (JEE) - Main among **1.1 million+** candidates [2023]
- Attained AIR **1655** in the Joint Entrance Examination (JEE) - Advanced among **0.18 million+** candidates [2023]
- Attained an AIR of **426** in the **Kishor Vaigyanik Protsahan Yojana (KVPY)** Scholarship, out of **50k+** students [2022]
- Secured an AIR of **111** in the esteemed **IISER** Aptitude Test **(IAT)**, among over **34k+** candidates nationwide [2023]
- Received a **Certificate of Merit** in the prestigious Indian Olympian Qualifier in Mathematics **(IOQM)** [2022-23]
- Awarded Certificate of Merit as state topper **top 1%** in the National Standard Examination in Physics **(NSEP)** [2022]

KEY PROJECTS

Binary Black Holes from Scratch [May 2023 - Jul 2023]

Krittika Summer Project | Krittika - The Astronomy Club, IIT Bombay

- Analyzed binary system interactions such as **Roche lobe overflow**, stellar mergers and **common envelope evolution**
- Simulated **100,000+** stellar structures and **Compact Binary Objects**(binary black holes/neutron stars) using Compact Object Mergers: Population Astrophysics and Statistics **(COMPAS)** a rapid stellar/binary population synthesis code
- Parallelized simulations via splitting runs through batch processing, reducing large-scale runtime by **90%**
- Illustrated stellar evolution and compact object formation using scatter plots, **HR diagrams**, and **chirp mass** distribution
- Investigated the evolution of **gravitational wave** emissions from binary systems, rigorously comparing simulated data to real observations from **LIGO-Virgo**, and iteratively adjusting parameters to achieve accurate matches of **29%**

Song Classification using Machine Learning [Oct 2024 Nov 2024]

Course Project | DS203: Programming in Data Science | Instructor: ***Prof. Vinay Kulkarni***

- Built a **CNN-RNN** based audio classifier using the **PyTorch** library to identify song patterns from feature vectors
- Reconstructed Mel-frequency cepstral coefficient **MFCC** files into **.wav** audio for manual classification and validation
- Analyzed **116** MFCC samples using heatmaps, **PCA**, scatter plots, and elbow curves to study feature distribution
- Constructed a custom-labeled dataset of **180** external songs, achieving a model training accuracy of over **90%**
- Trained the model with an NVIDIA P100 GPU, using the **Adam optimizer** and **Cross-Entropy** loss functions

How to Train Your Dinosaur [Nov 2024 - Dec 2024]

Course Project | PH227: AI and Data Science | Instructor: ***Prof. Alok Shukla***

- Developed a clone of the Chrome T-Rex game using **Pygame** , incorporating personalized hand-drawn sprite animations
- Collected gameplay data by logging 6 key features (e.g., **time**, **object distance**, **object height**) in **CSV** format
- Trained a **Convolutional Neural Network (CNN)** on the collected data and integrated it with a **Reinforcement Learning** system using **Genetic Algorithms**, evolving over **50** generations to achieve a peak score of **40,000+**
- Managed a collaborative **GitHub** repository for version control and seamless coordination across the development team

RAVEDM 4X4X4 [Programmable LED Cube with Dynamic Visualizations] [Apr 2025 - Present]

Course Project | PH222: Digital Electronics and Microprocessors | Course Instructor: ***Pradeep Sarin***

- Designed and built a fully-functional 4x4x4 **LED cube** using **shift registers, Arduino MEGA** , and a layered circuit design
- Developed visually dynamic 3D light animations in the **Arduino IDE**, including **firefly synchronization** using the **Kuramoto model** and **wave propagation** effects driven by distance-based mathematical functions
- Implemented efficient **state-machine logic** and **multiplexing** using Pulse Width Modulation(**PWM**) for smooth animation
- Achieved smooth 3D animations of up to **80 FPS** using **70 μs** per-LED PWM and real-time multiplexing across **64** LEDs
- Integrated **microphone input** to perform real-time audio visualization, with **beat detection** and amplitude control

Personal Website Development [May 2025 - Present]

Self Project | Front-End Development with a creative UI design

- Created a personal website using **GitHub Pages** to display my portfolio and projects with an **artsy**, street-inspired design
- Employed **HTML**, **CSS**, and **JavaScript** for developing interactive features and achieving **mobile-responsive** functionality
- Customized an **interactive UI** reflecting personal branding while balancing between **creative expression** and usability
- Integrated version control using **Git**, organized code for modularity and enhanced site efficiency using **code refactoring**

OTHER PROJECTS

Stop-Motion Animation [Mar 2023 - Apr 2023]
Course Project | DS109: Introduction to Design | Course Instructor: ***Swati Agarwal***

- Created a stop motion animation by illustrating over **50 detailed sketches**, showcasing strong artistic skills
- Utilized a range of software tools, including **Adobe Premiere Pro**, along with various online resources, to compile, edit, and refine the animation, showcasing advanced proficiency in **video editing** and post-production workflows

Customised Linux Desktop Configuration [May 2025 - July 2025]
Self Project | | Custom Dotfile Configuration for Personalised Experience

- Configured an **Arch Linux** environment with **Hyprland compositor**, tailored for performance and aesthetic consistency
- Implemented **dynamic theming** using **pywal**, integrating it across terminal, VS Code, Firefox, Eww bar, and **Glava**
- Customized window management behavior, gaps, animations, and keybindings for an efficient tiling experience
- Automated environment setup using **shell scripts and dotfile versioning** with Git for seamless portability
- Integrated media tools like **spotify-player**, and real-time audio visualizations with **GLava** synced to system theming

Universal Testing Machine [Sep 2023 - Nov 2023]
Course Project | MS101: Introduction to MakerSpace | Course Instructor: ***Prof. Joseph John, Prof. Krishna Jonnalagadda***

- Worked in a team of 6 to build a **Universal Testing Machine** from scratch, measuring the **tensile strength** of materials by stretching them to the breaking point and using **Arduino** to record the **stress vs strain** curve
- Used tools such as **dremel**, **lathe** to create a **functional semi-automated machine** after designing through AutoCAD
- Utilized software such as **Fracktory**, and **LaserCAD** in order to optimise our project and ensure high-end performance
- Designed a **horizontal UTM** system, recognized as one of the best mechanical designs in the course for its **minimalist** approach and **efficiency**, eliminating the need to account for gravitational factors

Dynamic Obstacle-Avoiding Gesture-Guided Operator 1.0 (DOGGO 1.0) [Dec 2024 - Feb 2025]
Electronics and Robotics Club | IIT Bombay

- Designed a quadruped robots mechanical structure with dog-like leg geometry using **SolidWorks**
- Simulated motion and leg coordination using **ROS Gazebo**, refining inverse kinematics and locomotion strategies
- Implemented a camera-based gesture recognition system using **OpenCV** to interpret human hand gestures in real-time
- Developed **reinforcement learning algorithms** enabling the robot to **autonomously** adapt to navigate dynamic terrain
- Manufactured and Assembled **3D-printed parts**, electrical components, connected **actuators** and sensors for control and implemented basic coding for standing and walking, ensuring motor control and sensor feedback are functional

Remote Controlled Bot XLR8 [Sep 2023]
Electronics and Robotics Club | Institute Technical Council

- Collaborated in a four-member team to design an RC bot and successfully navigate a competition-grade obstacle course
- Built a wireless **gyroscopic controller** using the **MPU-6050** and connected it to the bot via **ESP-32 microcontroller**
- Integrated **L298N motor driver** with bot's drive system using **PWM-based speed control** for precise maneuvering

POSITIONS OF RESPONSIBILITY

Convener | *Krittika - The Astronomy Club* | *IIT Bombay* [Apr 2024 - Mar 2025]
Selected among **8** out of **150+** applicants to promote **Astronomy** among a strong community containing **12, 000+** students and staff

- Developed proficiency in processing astrophotographs using **Siril**, and **GIMP**, gained hands-on experience to use **Dobsonian** and **Equatorial** Telescopes and created a detailed inventory for the astronomical observatory under construction
- Planned and led a **2-day** astronomy trip to **Udaipur** and **Mount Abu**, visiting the **PRL** Solar and Infrared Observatories; also organized a stargazing camp to **Bhandardara**, successfully managing **50+** participants across both events
- Coordinated a **3-day** Astrophotography Exhibition on **National Space Day 2024**, promoting public engagement in astronomy; also conducted an **Introduction to Astrophotography Workshop** during **PG Tech Week**
- Ideated, planned and organized **Astromania** - The Annual Astronomy Quiz, which was attended by **150+** students
- Headed the design team, responsible for creating designs for**club merchandise** such as t-shirts and hoodies through software like **Illustrator** and **Figma**; created one of the most viewed posts on the official club page with **10k+** views
- Built a comprehensive module on **Photometry** and delivered a lecture on **Distance Ladder** under the LS program

Football Coordinator | *Aavhan - Sports Fest* | *IIT Bombay* [Feb 2023 - Mar 2023]

- Experienced organizing a large-scale tournament overseeing schedules, team **coordination**, and match **logistics**
- Improved **communication** and **negotiation skills** by securing multiple college participation throughout **Maharashtra**
- Enhanced **leadership** by coordinating volunteers to ensure smooth execution while fostering a competitive environment

TECHNICAL SKILLS

Programming Languages	Python (Numpy, Matplotlib, Sklearn, Scipy, Pytorch, Pygames), C/C++, HTML, CSS, JS
Softwares	Git, Solidworks, AutoCAD, LaserCAD, Fracktory, VSC, Jupyter, Adobe Illustrator, GIMP, Siril, Starnet++, ROS Gazebo, Open CV, LaTeX,
Others	Adobe Fresco, Figma, Kittl, Op-Amps, Digital Storage Oscilloscopes, MOSFETs, Krita

KEY COURSES

Physics	Classical Mechanics, Thermal Physics, Oscillations and Waves, Physics Lab, Statistical Mechanics, Quantum Mechanics 1, ElectroMagnetic Theory, General Physics Lab
Computer Science	Computer Programming and Utilization, Programming for Data Science, AI and Data Science
Electronics	Makerspace, Analog Electronics, Digital Electronics and Microprocessors
Mathematics	Calculus, Linear Algebra, Differential Equations, Complex Analysis and Integral Transforms
Miscellaneous	Introduction to Design, Introduction to Psychology, Economics, Biology, Design Thinking, Computational Multinomics, Decision Analyisis & Game Theory

EXTRA-CURRICULAR ACTIVITIES

Football	• Secured the **Silver Medal** in the **Institute Football League 202324**	[2024]
	• Won the **Gold Medal** with **Hostel 16A** in the **Freshiesta Tournament 2023**	[2023]
	• Represented **Hostel 5** as a core team member in the **Inter-Hostel General Championship**	[2025]
	• Emerged as **Champion** in the institute-wide **FIFA Open**, competing against **30+** participants	[2025]
	• Completed a year-long intermediate football course under the **National Sports Organization**	[2024]
	• Underwent one year of training with the **Karnal District Football Team**	[2019]
Others	• Participated in the Aavhan Half Marathon, completing **21 KM** in less than **150 minutes**	[2023]
	• Secured **3rd place** in the annual Chemistry Quiz Competition - **Heisenberg**	[2023]