

Arnav Dhiman

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EDUCATION

Greenfingers Global School

High School Diploma - Maths, Physics, Chemistry, Economics and English

- 90%, Grade XI (CBSE); ranked top 1% of class

Navi Mumbai, India

Apr. 2025 - Apr. 2027

Ryan International School

High School up to 10th Grade (ICSE)

- 96.2%, ICSE Class X (Best of 5).
- 87%, ICSE Class IX (Best of 5).

Navi Mumbai, India

Apr. 2022 - Apr. 2025

RESEARCH AND PUBLICATIONS

Independent Researcher

Feb. 2025 –Present

Multiple Papers

- Paper 1: Saddle Escape Efficiency: Introducing a Novel Metric and Revealing Its Criterion-Dependence in Non-Convex Landscapes. *Accepted to IEEE INDISCON 2026, ICCAI 2026, Filed a Patent*
- Paper 2: InterpretableSELFFormer: Biologically Validated Gene Importance for Spatial Transcriptomics Reconstruction from scRNA-seq *Accepted to IEEE iCGNIS 2026 (full paper) and IEEE CIBCB (short paper)*
- Paper 3: Why Do Single-Cell Foundation Models Lose to the Mean? A Diagnostic Study of Perturbation Prediction Failure Modes *IEEE CIBCB (short paper)*
- Paper 4: Multimodal Deep Learning for Breast Cancer Subtype Classification Using Histopathology and Biomarker Data *Accepted to IEEE ICEC2NT 2026*
- Paper 5: Detecting Distributional Shift via Local Neuron Activation Rates *Presented at the Young Asians Conference in Singapore*
- Paper 6: Entanglement Entropy Scaling and Matrix Product States Simulability of Quantum Algorithms *Presented at BeyondQuantum Research Fair 2026*
- Paper 7: Kaan: Acoustic Grain Pest Detection Without Dedicated Hardware *Written under Mentorship of Dr. Eric Sakk*
- Paper 8: Do Foundation Models Outperform Lightweight CNNs in Breast Cancer Histopathology Classification? *Published in IJFMR*
- Paper 9:Analysing the Riemann Hypothesis and the Approach to Solve It Through Zeta Function Analysis and Quantum-Inspired Random Matrix Theory *Published in One Young India Website*
- Paper 10: How Close Can a Chromatic Root Get to One? *Published in Euler Circle Online Repository and Expositio*

PATENTS

Indian Utility Patent Filed

May 2026

Application No. 202621067166

- *Computer-Implemented System and Method for Efficient Machine Learning Training via Runtime Optimizer Switching*, an extension of the Saddle Escape Efficiency research; covers a system for dynamically switching optimizers at runtime based on loss landscape geometry to improve training efficiency in non-convex settings

Indian Design Patent Filed

Sep 2026

Application No. 518377-001

- *Handheld Medical Screening Device* (Orb variant) – ornamental design registration covering the shape and configuration of a spherical-bodied handheld screening device, filed separately from the related provisional patent covering its underlying function

Indian Design Patent Filed

Sep 2026

Application No. 518386-001

- *Handheld Medical Screening Device* (Pen variant) – ornamental design registration covering the shape and configuration of an elongate wand-shaped handheld screening device

INDUSTRY EXPERIENCE

Reviewer @Neurips AI4Good Workshop

August 2026

AI4GOOD Workshop @ NeurIPS 2026

- Nominated by program chairs as "a respected researcher in the area." Peer-reviewing AI-for-good research submissions through OpenReview.

Engineering Intern

May 2026 - July 2026

SkyFlux

- Built a natural language search system enabling non-technical users to query parts data conversationally with typo tolerance and a safety refusal path for out-of-domain queries; stress-tested across 11 queries with documented failure mode analysis
- Developed AI-powered endpoints generating plain-English risk summaries for aviation parts using LLMs; verified zero hallucination rate across all test cases
- Implemented a 3-stage data normalization pipeline (exact match → format normalization → character substitution) reconciling messy multi-vendor records into canonical parts with automated confidence scoring and human review flagging
- Added STEP-to-GLB file conversion endpoint using OpenCASCADE bindings for browser-based 3D CAD model viewing
- Built Nodal Data Clusters as an independent side project: a D3 force-directed network visualizing aviation parts data, clustering vendor listings into canonical parts, mapping supply chain relationships, and auto-flagging concentration risks
- Built and shipped a FastAPI backend from scratch for an aviation supply chain intelligence platform in active pilot partnerships with industry companies, covering a unified 25-field schema across parts, suppliers, and campaign data

Internship

Nov 2025 – Dec 2025

Mentored by Gautham Muthukumar, Principal Product Manager Azure AI, Intuit

- Built a hybrid Neural Network and SVM model for fake news detection and social sentiment analysis under direct mentorship; achieved 99.954% classification accuracy
- Received "Strong" ratings across all 7 evaluated competencies including Conceptual Understanding, Problem Solving, Research & Analysis, and Professional Conduct
- Awarded a formal Letter of Recommendation highlighting mathematical intuition, first-principles thinking, and readiness for advanced AI research

FELLOWSHIPS & ACADEMIC PROGRAMS

Researcher

July 2026 – August 2026

Indigo IRIS Research Program

- Awarded a full scholarship (\$4,200) to conduct research under the mentorship of Dr. Eric Sakk (Professor at Morgan State University, Cornell PhD)
- Research focused on designing low-cost acoustic AI models for farmers, utilizing CNNs and other approaches, released as open source under the Apache 2.0 license.
- Research available at <https://github.com/arnavd371/Project-Kaan>
- Wrote a 20 page paper and presented it to an audience of 10+ people.

Research Fellow

May 2026 – July 2026

Young Asians Fellowship

- Selected among the top 100 applicants internationally for a global interdisciplinary fellowship backed by Emergent Ventures.
- Attended a fully funded in-person summit in Singapore, representing the STEM track
- Awarded 3rd Place for research in the STEM track.
- Conducted research on Metabolic Neural Networks - a novel form of neural network that prunes itself based on activation rolling rate, removing non-contributing neurons to preserve memory and storage

Beyond Quantum

Feb. 2026 - May. 2026

Thinking Beyond Education

- Selected from 434 applicants (14% acceptance rate) for a 12-week international programme covering Quantum Computing, Quantum Mechanics, Quantum Mathematics, and research skills. Completed a supervised research project and presented at the BeyondQuantum Research Fair.

- Mentored by David Chudozilov, Technical University of Munich
- Paper: Entanglement Entropy Scaling and Matrix Product States Simulability of Quantum Algorithms
- Presented in the Beyond Quantum Research fair to an audience of 30+ Student Researchers. To be Published in the proceedings of the Beyond Quantum Research Fair.

Apprentice

June 2026 – July 2026

Independent Research and Paper Writing (IRPW) Euler Circle

- Took an undergraduate-level course on independent research and paper writing in mathematics under Dr. Simon Rubinstein-Salzedo.
- Wrote a 20-page graduate-level paper in graph theory focused on graph colorings: How Close Can a Chromatic Root Get to One?
- Presented my Paper to an audience of 40+ people.
- Paper available at Available at: <https://simonrs.com/eulercircle/irpw2026/papers.html>

Participant

June 2026 – July 2026

Program in Algorithmic and Combinatorial Thinking (PACT) | University of Pennsylvania

- Attended intensive 5-week theoretical computer science program run by Prof. Rajiv Gandhi (Rutgers/UPenn, ACM-SIGACT Distinguished Service Award 2022), partially supported by the National Science Foundation
- Covered discrete mathematics, graph theory, combinatorics, probability theory, and asymptotic analysis with guest lecturer from Princeton.

Junior Academy Member

2024 – 2025

New York Academy of Sciences (NYAS)

- Completed two research projects: a hybrid Clinical Decision Support System (CDSS) integrating a rule-based clinical safety engine with an ML model to evaluate medication safety, and a solar systems research project

Makerspace Winter Workshop Participant

Dec 2025 – Jan 2026

IIT Bombay

- Attended on-campus programme at IIT Bombay covering CAD design, 3D printing, laser fabrication, ESP32 programming, IoT automation, sensor integration, and smart control systems
- Capstone project: developed an Autonomous Chocolate Dispensing Bot

Scholar (Full Scholarship)

Feb 2026

Harvard Project for Asian and International Relations (HPAIR) Virtual Conference 2026

- Attended on full scholarship awarded as Most Impactful Team at HSIS 2025; Attended Harvard HPAIR VCONF

Delegate

Aug 2025

Harvard Sustainability Impact Summit (HSIS) 2025 | HPAIR & MU20 School of Opportunity

- Competed across five structured rounds (Exposition, Campaign, Crucible, Policy Formation) in the Zero Hunger (SDG 2) track at FLAME University, Pune
- Won the Most Impactful Team Award, the top recognition at the conference, earning a full scholarship to Harvard HPAIR 2026

LEADERSHIP & ENTREPRENEURSHIP

Founder and Executive Director

July 2025 – Present

Aethra | aethra.co.in | arnav@aethra.co.in

- Founded and scaled Aethra, an interdisciplinary events, community, and research organisation built on a single conviction: the most important work never stays inside one discipline; every event structurally enforces a pairing of two fields, not a theme bolted on
- Led a core team of 42 across 7 programmes (Ideathon, Moonshot, Hackathon, Vibeathon, Pitchathon, Brandathon, and Gamethon) reaching 2,340+ participants across 84 countries with \$45,752+ in prizes distributed
- Built a research arm supporting interdisciplinary work in AI safety, computational biology, climate systems, and foundations of mathematics, connecting researchers with mentors, publication support, and peer review
- Secured \$45,752+ in sponsorship and prize funding across all events, and maintain an active Discord community connecting participants between programmes
- Shipped 699 real projects across all 7 events, with 254 participants (13%) returning across two or more programmes

Finalist & Best Presentation Award – Product Logic Lab

September 2025

ISB VentureVerse | Indian School of Business Hyderabad & MU20 School of Opportunity

- Selected for India's first high-impact entrepreneurship challenge exclusively for high school students, co-created by MU20 School of Opportunity and ISB's I-Venture Immersive (IVI), hosted at ISB Hyderabad
- Competed across three tracks over three days: Product Development, Marketing Strategy, and Financial Modelling, with impromptu challenges and a final pitch to a panel of founders, investors, and ISB alumni
- Awarded Best Presentation in the Product Logic Lab, recognised for outstanding pitch quality, product reasoning, and presentation under pressure among competing high school teams

HONORS & AWARDS

Grantee	April 2026
<i>Emergent Ventures Mercatus Center, George Mason University</i>	
• Awarded \$1,500 competitive grant for independent self-directed research in machine learning and mathematics; one of very few high school students globally to receive this grant	
Team India Representative	April 2026
<i>International Conference of Young Scientists (ICYS) 2026 New Delhi</i>	
• One of the teams selected to represent India at the official world championship of research papers for students aged 14-18, with 30+ years of history and 7,500+ alumni across 20+ countries • Awarded Bronze (Oral Presentation) and 2nd Place (Poster Presentation) for <i>Saddle Escape Efficiency</i>	
Gold Award – Nationals & Regionals	February 2026
<i>Indian Science and Engineering Fair (INSEF) Science Society of India</i>	
• Won Gold at both Regional and National levels; selected as one of three teams to represent India at Genius Olympiad 2026	
Finalist	February 2026
<i>Genius Olympiad Terra Science and Education, Rochester New York</i>	
• Selected through INSEF national pathway as one of India's three representatives; Science category accepted 679 from 1,311 submissions	
Shortlisted – Round 2	August 2026
<i>S.T. Yau High School Science Award (Asia) Initiated by Fields Medalist Prof. Shing-Tung Yau</i>	
• Co-organised by Hong Kong Academy of Sciences, YMSC Tsinghua University, and CUHK; historical awardees admitted to Harvard, MIT, Yale, Princeton, and Tsinghua	
Finalist	April 2026
<i>International Greenwich Olympiad (IGO) North London Grammar School, London</i>	
• Selected as finalist across 15 categories including AI, Engineering, Computer Sciences, and Health Sciences	
Platinum Division Gold Certified Score	January 2026
<i>USA Computing Olympiad (USACO)</i>	
• Reached Platinum division, the highest tier in USACO, the premier competitive programming competition in the United States; holds a Gold certified score, used by top CS programs globally as a signal of exceptional algorithmic problem-solving ability	
Gold Award	January 2026
<i>CREST Awards British Science Association</i>	
• Awarded the highest tier of the CREST Awards, managed by the British Science Association, UK's largest STEM project award scheme; requires 70+ hours of independent open-ended STEM investigation meeting at least 11 of 15 rigorous criteria, assessed by a CREST assessor; funded by UK Research and Innovation (UKRI) and the James Weir Foundation	
Essay Shortlist - Science and Technology Category	May 2026
<i>John Locke Institute Essay Competition</i>	
• Shortlisted in one of the most prestigious international essay competitions for high school students, judged by Oxford and Cambridge academics across Philosophy, Politics, Economics, History, Psychology, and Law	
3rd Place, Research in STEM	June 2026
<i>Young Asians Fellowship Young Asians Organisation</i>	
• Awarded 3rd place for research on Metabolic Neural Networks, presented at the fully funded summit in Singapore	
Cause Champion	Dec 2024
<i>Impact Guru Foundation</i>	
• Ranked #2 in school for mobilizing 30,000+ INR through social impact fundraising campaigns; recognized for social impact fundraising leadership	

TECHNICAL SKILLS

Languages: Python, C++, Julia, Wolfram Language

ML Frameworks: PyTorch, TensorFlow, JAX

Libraries: HuggingFace Transformers, scikit-learn, NumPy, pandas, Matplotlib, SciPy

Tools: Git, GitHub, LaTeX, Overleaf, Mathematica, MATLAB, Docker

Research: Experiment design, ablation studies, statistical analysis, academic writing