Pradyumnan Raghuveeran

in [LinkedIn](#) | ⚙ [GitHub](#)

EDUCATION

Indian Institute of Technology Madras   *('22 -'26, Expected)*
  B.Tech in Aerospace Engineering + Option to extend to M.Tech in Data Science   ***Grade:** 9.80/10.0*

BVM Global Bollineni Hillside Senior Secondary School, Chennai   *('22)*
  NIOS Class XII (Physics, Chemistry, Maths, Computer Science, English)   ***Grade:** 94.2 %*

BVM Global Bollineni Hillside Senior Secondary School, Chennai   *('20)*
  CBSE Class X   ***Grade:** 96.8 %*

PUBLICATIONS AND CONFERENCES

- **Co-author:** "An Adaptive sampling based touching ball approach for the Voronoi diagram of spheres" *Submitted to Computer-Aided Design*, 2025.
- Poster to be presented at the **International Symposium on Tropical Meteorology (INTROMET 2025)**, Pune, India — *November 2025*.
- Oral presentation accepted at the **25th Conference on Artificial Intelligence for Environmental Science**, 106th **AMS Annual Meeting**, Houston, USA — *January 2026*.

RESEARCH EXPERIENCE

Dynamic Sampling of Points for Faster Voronoi Diagram Construction   *(Jan '25 - Present)*
Advisor: Prof. M Ramanathan | Principal Investigator, Advanced Geometric Computing Lab

- Engineered an $\mathcal{O}(n)$ **algorithm to perform dynamic sampling of points** on 3 dimensional spheres
- Deployed CGAL[1] along with my **algorithms in C++ to construct Voronoi diagrams of spheres**
- **Manuscript under review** at the Computer-Aided Design journal

Developing GNNs[2] for Rainfall Stability Prediction Across India (GitHub Repository)   *(Oct '24 - Present)*
Advisor: Prof. R. I. Sujith | Institute Professor, Indian Institute of Technology Madras
Advisor: Dr. Gaurav Chopra | Assistant Professor, Indian Institute of Technology Delhi

- Developing a **GNN[3] pipeline** to model long-range dependencies in **complex, correlated time-series datasets**
- Applying **GNNs to predict rainfall stability** across India in **27k+ locations** for better disaster management
- Focusing on **forecasting stability and latent interactions**, using techniques aligned with **graph signal processing**

Utilising DSMC[4] Methods to Model Rarefied Gas Flow (GitHub Repository)   *(May '24 - Jan '25)*
Advisor: Prof. Meheboob Alam | Engineering Mechanics Unit, JNCASR

- Worked on **simulating high Knudsen number flows** over various geometries using DSMC methods
- Utilized SPARTA[5] to simulate flows and **find the lift force on it in Martian atmospheric conditions**
- **Curated an extensive repository** of Martian atmospheric properties obtained **over the last 50 years** from various Mars missions for verifying simulations

Studying Unsteady-Shock Boundary Layer Interactions   *(Apr '24 - Sep '24)*
Advisor: Dr. T M Muruganandam | National Centre for Combustion Research and Development

- Designed an **experimental wedge mechanism** to create unsteady shocks at a frequency of **over 40 Hz**
- Studying the **interaction of shocks and boundary layer** separation bubbles using **optical diagnostics**
- Performing **CFD and FEA[6] of the experimental apparatus** and its interaction with Mach 2 flow

PROFESSIONAL EXPERIENCE

Mechanical Engineering Internship   *(Apr '23 - Oct '23)*
Company: Krishaka | Mechanical Engineering Module

- **Worked jointly with agricultural scientists** to understand current transplanting methods used by machines
- **Crafted a mechanism to dig and transplant paddy crops in one motion** along multiple rows simultaneously
- Developed a **CAD[7] model** for an **autonomous electric vehicle** for paddy and groundnut crop agriculture

---

[1] Computational Geometry Algorithms Library   [3] Graph Neural Networks   [5] Stochastic PArallel Rarefied-gas Time-accurate Analyzer   [6] Finite Element Analysis   [7] Computer Aided Design

KEY PROJECTS

Project Hydrochurn | Portable Water Filtration Bottle *(Apr '24 - Jul '24)*

- Ideated on a portable water filtration system that utilises **coarse filters along with a UV filtration system**
- Designed a crank mechanism to enable **on-the fly power generation** to work without batteries
- Utilized Fusion360 for **CAD modeling the device, the mechanisms and the electronics**
- Finished as **National Runner Up** in the James Dyson Challenge 2024

Path Tracer in C++ *(Apr '24 - May '24)*

- Implemented an algorithm in C++ to **generate high quality path traced images** of various settings (GitHub Repository)
- **Parallelized the code** to enable faster processing and lower run-times, useful for **generating large images**
- Enables options for the **user to define custom scenes** for which high quality path traced images will be generated

SRAD[8] Hybrid Rocket Engine | Advisor : Prof. PA Ramakrishna *(Sep '23 - Apr '24)*

- Engineered **India's first SRAD hybrid rocket** engine with liquid nitrous oxide as oxidiser
- Secured **1st place in Asia** and **21st worldwide** in Spaceport America Cup 2023
- Collaborated with the Propulsion and Combustion laboratory to perform **static firing tests**
- Created a python code to execute NASA[9] CEA[10], **collecting data about 60 times faster** than before

DiceForge Pseudo Random Number Generator *(Jan '24 - Apr '24)*

- Spearheaded a team of 11 to **code a Pseudo Random Number Generator library in C++** (GitHub repository)
- Programmed a library that is ∼**8 times faster than the standard C++** implementation and ∼**210% faster than the standard C** implementation while also passing all standard **Dieharder tests**
- Implemented **heuristic curve fitting algorithms** that converge to ∼5% in the first iteration

Control Algorithms for PEGs[11] *(May '23 - Mar '24)*

- Modeled an **inverted pendulum stabilizer** mathematically and compared with standard RL[12] techniques
- **Developed a game theoretic LQR[13] control algorithm** to solve multi-agent PEGs
- **Compressed input information without losses by about 3 times** using payoff scalars to encode vectorial information
- Implemented various **algorithms to solve multi-agent PEGs** programmatically using python

Hybrid VTOL[14] Drone (Project ICU, Aero Club) *(Jun '23 - Mar '24)*

- **Designed and built a Hybrid VTOL drone** for surveillance purposes as a structural engineer
- Utilized Fusion 360 for **CAD** and Ansys for **FEA of various structural components**
- Performed **in house 3D-printing** to produce **light-weight ribs and motor mounts** for the drone
- Successfully implemented a design for the **drone weighing 500g with a payload of 1.5kg**

COURSE PROJECTS

Quantization and Pruning of Mobilenet V2 (GitHub repository) *(Sep '25 - Oct '25)*
Course : Systems Engineering for Deep Learning (CS6886)

- Trained the Mobilenet V2 model on the CIFAR 10 dataset to achieve an **accuracy of over 90%**
- **Pruned and fine-tuned the model** iteratively to obtain a compression of 3.3×
- **Quantized the 32 bit weights** to a smaller representation to further reduce model size

Credit Card Fraud Detection Using Machine Learning (GitHub repository) *(Aug '25 - Sep '25)*
Course : Data Analytics Laboratory (DA5401)

- Designed and tuned a machine learning model to **detect credit card fraudulent transactions**
- Performed **class balancing** of the dataset using **Gaussian Mixture Models**

2D Steady-State Diffusion Solver in MATLAB (GitHub repository) *(Aug '25 - Sep '25)*
Course : Foundations of Computational Fluid Dynamics (AM5630)

- Wrote a **highly modular and fast diffusion solver** in MATLAB utilizing Gauss-Seidel iteration
- Solved a **variety of problems and benchmarked the results**, checking for mesh independence and convergence

---

[9] National Aeronautics and Space Administration   [10] Chemical Equilibrium Applications   [12] Reinforcement Learning   [13] Linear Quadratic Regulator

[Generation of 3D Convex Hull](#) (GitHub repository) *(Sep '24 - Oct '24)*
Course : Algorithms in Computational Geometry (ED5310)

- Wrote a C++ program to generate the **convex hull of any set of points in 3D** using an incremental paradigm
- Achieved a **next-to the best possible run-time complexity** of $O(n^2)$ for arbitrarily large inputs

[Triangulation of an Arbitrary Polygon](#) (GitHub repository) *(Aug '24 - Sep '24)*
Course : Algorithms in Computational Geometry (ED5310)

- Wrote a C++ program to **triangulate any arbitrary polygon in** $O(n^2)$
- Compared the run-times with that of CGAL[15] triangulation algorithms

KEY COURSES AND SKILLS

Key Courses *(Jul '22 - Oct '25)*

- Mathematical Foundations of Data Science (DA5000)
- Foundations of Machine Learning (DA5400)
- Machine Learning Practice (OB2208)
- Data Drive Modeling of Aerospace Systems (AS5401)
- Linear Algebra (MA2031)
- Systems Engineering for Deep Learning (CS6886)
- Scientific Computing (ID2090)
- Foundations of Computational Fluid Dynamics (AM5630)
- Algorithms in Computational Geometry (ED5310)

Programming & Skills *(Jul '22 - May '25)*

- **Programming Languages:** Python (PyTorch and TensorFlow), MATLAB, C++, SageMath, GNU Octave, Bash
- **Software:** Fusion360, Ansys, ANSYS Fluent, LaTeX, MS Office Suite, NASA CEA, XFOIL, XFLR5

ACHIEVEMENTS

- Secured **National Runner-Up** in the James Dyson Award for development of project Hydrochurn. *('24)*
- Awarded the **Summer Research Fellowship 2022** by JNCASR[16] among 63 students nationwide *('24)*
- Achieved **1st place in Asia** and **21st worldwide** at the Spaceport America Cup 2023 with Team Abhyuday. *('24)*
- Secured **10.0/10.0 GPA** in Semesters 2, 3 and 5 *('23)*
- Secured **top 0.45%** in JEE[17] Main and **top 0.28%** in JEE Advanced among ∼**1 million students** in India *('22)*
- Secured **AIR[18] 143** in IISER Aptitude Test 2022 with a **full score in physics** *('22)*
- Scored **5/5** in **AP[19] Physics C: Mechanics** and **AP Calculus BC** and **1490/1600 in SAT[20]** *('22)*
- Secured **AIR[21] 1** in Chemistry and **AIR 392** in Physics in NSTSE[22] *('19)*
- Awarded **ASSET Talent Scholar** for **exemplary performance** in ASSET Talent Search 2017-18 *('18)*
- Reached the **National Finals** for **Google Code to Learn** for programming a 2 player game *('16)*
- **FIDE rated classical chess player** with a rating of 1443 *('16)*

EXTRA-CURRICULAR ACTIVITIES

- **Head of the Mathematics Club**, encouraging the students of IITM to pursue math in novel and intuitive ways
- FIDE rated classical chess player
- As a **Student Mentor**, provided guidance and support to a group of newly admitted students
- **Trained violinist** in both Carnatic and Classical styles of play
- Selected among few freshmen for the Basketball training camp as part of NSO[23]