Pradyumnan Raghuveeran

LinkedIn | GitHub | Website | Email: ae22b009@smail.iitm.ac.in

Education

Indian Institute of Technology Madras *('22 -'26, Expected)*
Bachelor of Technology in Aerospace Engineering ***Grade:*** *9.80/10.0*

Publications and Conferences

- **Pradyumnan Raghuveeran**, Gaurav Chopra, Ajay Bankar, R I Sujith (2025, November 18-20). *Graph Neural Network Based Rainfall Stability Prediction Over India Using Precipitation Gauge Data* [Poster Presentation]. International Symposium on Tropical Meteorology 2025, Pune, India.
- **Pradyumnan Raghuveeran**, Gaurav Chopra, Ajay Bankar, R I Sujith (2026, January 25-29). *Graph Neural Networks for Predicting Rainfall Stability Over India* [Oral Presentation]. 25th Conference on Artificial Intelligence for Environmental Science, 106th AMS Annual Meeting, Houston, TX.
- Sasinas Alias Haritha Z A, Manoj Kumar Mukundan, Amrisha Srivastava, **Pradyumnan Raghuveeran**, Yegneswaran R V, & Ramanathan Muthuganapathy (2025). *An adaptive sampling–based touching ball approach for the Voronoi diagram of spheres.* Manuscript submitted for publication in Computer-Aided Design.

Research Experience

Adaptive Sampling of Points for Faster Voronoi Diagram Construction *(Jan '25 - Present)*

Advisor: Prof. M Ramanathan | Principal Investigator, Advanced Geometric Computing Lab, IITM

- Engineered an $\mathcal{O}(n)$ **adaptive sampling algorithm** for 3 dimensional spheres to capture neighborhood information.
- Deployed CGAL along with my **algorithms in C++ to construct Voronoi diagrams of spheres** in quadratic time.

Developing GNNs 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 pipeline** to model long term dependencies in **complex precipitation time-series datasets**.
- Applying **GNNs to predict rainfall stability** across India in **27k+ locations** for better disaster management.

Utilising DSMC Methods to Model Rarefied Gas Flow (GitHub Repository) *(May '24 - Jan '25)*

Advisor: Prof. Meheboob Alam | Engineering Mechanics Unit, JNCASR

- Utilized SPARTA to simulate flows and **find the lift force on various bodies in Martian atmospheric conditions**.
- **Curated an extensive repository** of Martian atmospheric properties **from the last 50 years** of Mars missions.

Studying Unsteady-Shock Boundary Layer Interactions *(Apr '24 - Sep '24)*

Advisor: Dr. T M Muruganandam | National Centre for Combustion Research and Development, IITM

- Designed and tested an **experimental wedge mechanism** to create unsteady shocks at a frequency of **over 40 Hz**.
- Studied the **interaction of shocks and boundary layer** separation bubbles using techniques in **optical diagnostics**.

Mechanical Engineering Internship *(Apr '23 - Oct '23)*

Company: Krishaka

- **Crafted a mechanism to dig and transplant paddy crops in one motion** along multiple rows simultaneously.
- Developed a **CAD model** for an **autonomous electric vehicle** for paddy and groundnut crop agriculture.

Technical Projects

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

- Designed a portable water filtration system that utilizes **a UV filtration system with on-the-fly power generation**.
- Finished as **National Runner Up** in the James Dyson Challenge 2024 amongst all submissions in the India region.

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

- Engineered **India's first SRAD hybrid rocket** engine with liquid nitrous oxide as oxidizer and paraffin as the fuel.
- Secured **1st place in Asia** and **21st worldwide** in Spaceport America Cup 2023, a premier rocketry competition.

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 C**.

Quantization and Pruning of Mobilenet V2 (GitHub repository) *(Sep '25 - Oct '25)*

Course : Systems Engineering for Deep Learning (CS6886)

- Successfully trained the Mobilenet V2 model on the CIFAR-10 dataset, achieving a **validation accuracy of ∼90%**.
- **Pruned, fine-tuned the model and quantized the weights to 8 bits** iteratively to obtain a compression of 3.3×.

Credit Card Fraud Detection Using Machine Learning (GitHub repository) *(Aug '25 - Sep '25)*

Course : Data Analytics Laboratory (DA5401)

- Developed and tuned a classifier to **detect credit card fraudulent transactions** amongst European cardholders.
- Performed **class balancing** of the dataset using **Gaussian Mixture Models and SMOTE** and compared the results.

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 solver** for 2D steady diffusion in MATLAB utilizing Gauss-Seidel iteration.
- Solved a **variety of problems and benchmarked the results**, verifying mesh independence and convergence.

Key Courses and Skills

Teaching Assistantships: Signals and Systems; Algorithms in Computational Geometry;

Key Courses

Computational Sciences: Introduction to Scientific Computing; Algorithms in Computational Geometry; Foundations of Computational Fluid Dynamics;

AI and ML: Foundations of Machine Learning; Machine Learning Practice; Data Analytics Lab; Systems Engineering for Deep Learning; Data Driven Modeling of Aerospace Systems and Complex Fluid Flows;

Mathematics: Mathematical Foundations of Data Science; Linear Algebra; Differential Equations; Complex Analysis; Series and Matrices; Functions of Several Variables;

Programming & Skills

- **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.
- Awarded the **Summer Research Fellowship 2022** by JNCASR among 63 students nationwide
- Achieved **1st place in Asia** and **21st worldwide** at the Spaceport America Cup 2023 with Team Abhyuday.
- Secured **top 0.45%** in JEE Main and **top 0.28%** in JEE Advanced among **∼1 million students** in India
- **FIDE rated classical chess player** with a rating of 1443

Extra-Curricular Activities

- **Head of the Mathematics Club**, encouraging the students of IITM to pursue math in novel and intuitive ways
- 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