

# Gaurav Gupta

SENIOR UNDERGRADUATE, AEROSPACE ENGINEERING

Indian Institute of Space Science and Technology, Thiruvananthapuram

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## Summary

A senior undergraduate student majoring in aerospace engineering at IIST, I'm focused on bio-inspired flight, aerodynamics, and control systems. My research blends nature's ingenuity with cutting-edge aerospace technologies. Motivated to learn new skills and take on challenges, I have strong expertise in aerodynamics, computational fluid dynamics, programming, and aircraft design. Additionally, I excel in leadership, teamwork, and management, driving innovative and collaborative project outcomes.

## Education

### Indian Institute of Space Science and Technology

Thiruvananthapuram, India

B.TECH. IN AEROSPACE ENGINEERING

Dec. 2021 - Present

- Current Cumulative Grade Point Average (CGPA): 8.07/10
- Relevant coursework: Aerodynamics, Computational Fluid Dynamics, Aircraft Design, Flight Dynamics & Control, Optimization Techniques, Astrobiology
- Relevant Labs: Aerodynamics Lab, Modelling and Simulation Lab, Flight Mechanics Lab, Propulsion Lab, and Programming
- Extracurricular Activities: Aeroclub, Conscientia and Basketball

### Kendriya Vidyalaya No.1 AFS Kalaikunda

Kharagpur, India

HIGH SCHOOL (XI & XII)

Jul. 2019 - May. 2021

- Graduated as the topper of school with 97.4% in the CBSE AISSE examination.
- Served as the School Vice Captian and School Captain in XI and XII grade respectively.
- Courses: Mathematics, Physics, Chemisty, Computer Science, and English.

### Kendriya Vidyalaya No.1 AFS Kalaikunda

Kharagpur, India

AISSE (XTH BOARD)

Apr. 2018 - May. 2019

- Graduated as the topper of school with 98.8% in the CBSE AISSE examination.
- Rank 1 in West Medinipur district and Rank 4 in West Bengal state.

## Engineering Research Experience

### Incompact3D

GitHub

OPEN-SOURCE CONTRIBUTOR

Jul. 2024 - Present

- Developed a fortran subroutine to calculate lift and drag forces for a 3D immersed body simulations using Incompact3D.
- Working on improving the performance of importing STL files for high-fidelity simulations using Incompact3D.

### Indian Institute of Technology, Kharagpur

Kharagpur, India

RESEARCH INTERN

Mar. 2023 - Present

- Investigating the aerodynamics of birds through computational methods with implementation in aircraft design.
- Conducted high-fidelity DNS on HPC (Paramshakti and Virgo) using Incompact3D and NEK5000.
- Pursued under the guidance of Dr. Sandeep Saha, IIT KGP and Dr. Manu KV, IIST.

## Projects

### Design and development of a Loitering Munition

Aircraft Design, Python

AE412: AEROSPACE VEHICLE DESIGN

Aug 2024 - Present

- A low-cost loitering munition with a payload capacity of 2 KG is being designed and developed.
- Undertaken conceptual and preliminary design of the loitering munition.

### Aerodynamics of Avian Tails

CFD, Fortran, Python, FreeFEM++

RESEARCH INTERNSHIP

Mar 2023 - Present

- High-fidelity simulations were conducted to understand the role of avian tail in gliding flight.
- The Common Swift was modelled and DNS simulations were conducted using NEK5000.
- Developed a FreeFEM++ based Euler equation solver to study the inviscid flow around birds.

### Development of 3D Force calculation subroutine for Incompact3D

CFD, Fortran, HPC

IIT KHARAGPUR

May 2024

- A fortran subroutine was developed to enable 3D forces calculation in Incompact3D, a finite difference solver for N-S equations.
- The subroutine was developed and merged with the original code as an open-source contribution on GitHub.
- Open-source and available on GitHub.

## FreeFEM-Euler

CFD, FreeFEM++, GMSH

IIT KHARAGPUR

Jun. 2024

- An incompressible flow solver based on Artificial Compressibility Method was developed using FreeFEM++.
- The code is capable of solving 2D and 3D problems based on in-built FreeFEM++ and GMSH meshes.
- Open-source and available on GitHub.

## UHF/VHF Standalone Antenna Mast Retraction Mechanism

Mechanisms, CAD

SSPACE LABS

Dec. 2022

- The institute's SSPACE Labs have been using an UHF/VHF Standalone antenna for establishing communication with the INSPIRESAT-1 satellite.
- A retraction mechanism for the antenna was designed such that it can be retracted easily for maintenance purposes.

## Performance Analysis of Boeing C17 Globemaster

Aircraft Performance

AE111: INTRODUCTION TO AEROSPACE ENGINEERING

Feb. 2022

- The performance of C17 Globemaster was analyzed in this project.
- The various performance parameters presented by the manufacturer and experimentally tested by operators were analysed using theoretical analysis.

## Thrust Vectoring Nozzles of Sukhoi Su30-MKI

Mechanisms, CAD

AE131: BASIC ENGINEERING LAB

Feb. 2022

- The mechanism of the Thrust Vectoring Nozzles of Sukhoi Su-30 MKI was studied under this project as mechanical report.
- A CAD model of the mechanism was also made in Fusion 360 and it was simulated.

## Skills

### Modelling and Computer Aided Design

DS Solidworks, DS Catia, Autodesk Fusion 360, Autodesk Autocad, Blender

### Computational Fluid Dynamics

Incompact3D, NEK5000, Ansys Fluent, XFLR5, GMSH, Coreform Cubit, Paraview, HPC

### Programming

Python, MATLAB, FreeFEM++, Fortran, Julia, C++, LaTeX, Linux, GitHub

### Creative

Adobe Illustrator, Inkscape and Powerpoint

### Soft Skills

Passionate, Hardworking, Determined, Motivated, Punctual, Organized, Focused

### Language

English, Hindi, Bengali

## Honors & Awards

### INTERNATIONAL AWARDS

#### Scientist of the Future 2020, Moscow State University

Online

4TH PLACE

2020

- Represented India in the competition in the Physics and Astronomy category.
- Our work titled *Formation and sticking of air bubbles in water in d-block containers* was awarded 4th position.
- Later, the work was published in the Journal of Emerging Investigators.

#### Beamline for School, CERN

Online

TEAM INDIA

2021

- Represented India in the competition and proposed a physics problem to be performed on the Beamline setup.
- Our group had proposed an idea to study the physics of semi-conductors with electron and positron.

### DOMESTIC AWARDS

#### Young Scientist India

Chennai, India

FINALIST

2021

- Presented a concept of a wearable device based on flex sensor as accessibility aid for differently abled people.
- The idea was selected as a finalist in the competition.

#### Central Board of Secondary Education

Delhi, India

CERTIFICATE OF MERIT (AISSCE)

2021

- Awarded in grade XII for outstanding performance in the AISSCE examination with 100% score in English.

#### Central Board of Secondary Education

Delhi, India

CERTIFICATE OF MERIT (AISSE)

2019

- Awarded in grade X for outstanding performance in the AISSE examination with 100% score in Science, Social Science and Mathematics.

#### Government of West Bengal

Kolkata, India

CERTIFICATE OF MERIT

2019

- Awarded by honorable Chief Minister, Government of West Bengal for outstanding performance in AISSE board.
- Achieved 4th position in state of West Bengal.

## Publications

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### Base and Exponent Prediction in Mathematical Expressions using Multi-Output CNN

SALAM, MD. LARAIB, BALSARAF, AKASH S., GUPTA, GAURAV

arXiv

2024

### Determining surface tension of various liquids and shear modulus of paper using crumpling effect

GUPTA, GAURAV, SALAM, MD. LARAIB

Journal of Emerging Investigators

2021

### Formation and sticking of air bubbles in water in d-block containers.

GUPTA, GAURAV, SALAM, MD. LARAIB

Journal of Emerging Investigators

2021

## Certificates

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Dec, 2022 **Machine Learning with Python (Honors)**, IBM and Coursera

Oct, 2022 **Design of Fixed Wing Unmanned Aerial Vehicle (Topper)**, IIT Kanpur and NPTEL

Nov, 2022 **Aircraft Design**, IIT Bombay and NPTEL

May, 2022 **Mastering Programming with MATLAB**, Vanderbilt University and Coursera

## Leadership and Extracurricular

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### Conscientia, IIST

CHIEF COORDINATOR

Thiruvananthapuram, India

Mar. 2023 - Nov. 2023

- Organized and managed the 14th edition of IIST's technical and astronomical festival, Conscientia, from September 22nd to 25th, 2023.
- Conducted competitions and workshops, attracting over 1,000 student participants from across India.
- Oversaw a budget of approximately 22 lakhs, generating a profit of 4 lakhs.

### Conscientia, IIST

WEBSITE COORDINATOR

Thiruvananthapuram, India

Aug. 2022 - Nov. 2022

- Developed and managed the website of 13th edition of IIST's technical and astronomical festival, Conscientia 2023.
- Designed the front-end of the website using Vanilla and Django.

### AeroClub, IIST

STUDENT MEMBER & STUDENT COORDINATOR

Thiruvananthapuram, India

Mar. 2022 - Nov. 2023

- Designed and built fixed-wing and rotor-based model aircrafts.
- Conducted workshops on "UAV Design" for school students with a practical glider building session.
- Conducted sessions for junior members of the club on UAV Design including glider and water-rocket design competitions.