Gaurav **Gupta**

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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): 8.21/10
- 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 AISSCE 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

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.

Open-Source Contributions

Incompact3D

CFD, Fortran

High-order finite difference flow solver — *GitHub*

- 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.

PyMech

CFD, Python, NEK5000

A Python software suite for NEK5000 and SIMSON — *GitHub*

- Improving the in-built open_dataset function to support unstructured datasets produced using NEK5000.
- Used for post-processing of high-fidelity simulation data using NEK5000.

TurbCourse

CFD, Python, NEK5000

A course in Turbulence simulation — *GitHub*

- Improved the performance of POD and DMD modules for high-fidelity simulation data using NEK5000.
- Added capability for conducting frequency analysis of the POD modes.
- Uses PyMech for reading/writing of NEK5000 data.

IIST-Beamer-Template

LaTeX, Beamer

A Beamer template for IIST students — *GitHub, Overleaf*

- Created a minimal and simple beamer template for IIST students.
- It provides a structured and visually appealing way to create presentations that meet academic and professional standards.

Projects

Aerodynamics of Avian Tails
CFD, Fortran, Python

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 2D-DNS simulations were conducted using NEK5000.
- RANS-assisted 3D DNS were conducted using SU2 and NEK5000.

Design and development of a Loitering Munition
Aircraft Design, Python

AE412: Aerospace Vehicle Design — *Aug 2024 - Nov 2024*

- 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.

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 maintainence 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, SU2, 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

Base and Exponent Prediction in Mathematical Expressions using Multi-Output CNN — *arXiv*

Salam, Md. Laraib, Balsaraf, Akash S., **Gupta, Gaurav** — *2024*

Determining surface tension of various liquids and shear modulus of paper using crumpling effect — *Journal of Emerging Investigators*

Gupta, Gaurav, Salam, Md. Laraib — *2021*

Formation and sticking of air bubbles in water in d-block containers. — *Journal of Emerging Investigators*

Gupta, Gaurav, Salam, Md. Laraib — *2021*

Certificates

Ongoing **High Performance Computing**, IIT Bombay and NPTEL
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

Conscientia, IIST — *Thiruvananthapuram, India*

Chief Coordinator — *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 — *Thiruvananthapuram, India*

Website Coordinator — *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 — *Thiruvananthapuram, India*

Student Member & Student Coordinator — *Mar. 2022 - Nov. 2023*

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