Kanak Agarwal

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EDUCATION

MANIPAL INSTITUTE OF TECHNOLOGY | B.Tech Aeronautical Engineering
2021 - Present | Manipal, Karnataka, India
Expected Year of Graduation: 2025
CGPA: 8.40

LALAJI MEMORIAL OMEGA INTERNATIONAL SCHOOL | Class 12 (CBSE), CS Major
2021 | Chennai, Tamil Nadu, India
Grade: 91.2%

LALAJI MEMORIAL OMEGA INTERNATIONAL SCHOOL | Class 10 (CBSE)
2019 | Chennai, Tamil Nadu, India
Grade: 90.4%

PUBLICATIONS

DNS OF BOUYANT VORTEX DIPOLES (MANUSCRIPT UNDER PREPARATION)

This paper corresponds to my research internship under Dr. A Sameen at the Indian Institute of Technology (IIT), Madras. This paper explores the evolution of a Buoyant Vortex Dipole using pseudo-spectral methods and addresses the varied effects of Ra, Pr and Re. We intend to submit this paper to the journal "Physics of Fluids".

MATLAB-ENHANCED WING DESIGN AND AERODYNAMIC MODELING (UNDER REVIEW)

This paper corresponds to my research project with the same title. The extended abstract of this paper has been submitted to the 10th Symposium on Applied Aerodynamics and Design of Aerospace Vehicles & SPICES Workshop organised by the Indian Space Research Organisation (ISRO) and is currently under review.

A MATLAB GUI-BASED APPROACH TO WING DESIGN AND AERODYNAMIC PERFORMANCE EVALUATION (ACCEPTED)

This study presents a MATLAB-based application developed for the preliminary design and aerodynamic analysis of varying wing geometries using the NACA 4 and 5-digit series airfoils. The full paper has been submitted to the International Conference on Futuristic Advances in Mechatronics Engineering for Aerospace and Defence (ICFAMEAD-2024) and has been accepted.

A COMPREHENSIVE DATASET OF THE AERODYNAMIC AND GEOMETRIC COEFFICIENTS OF AIRFOILS IN THE PUBLIC DOMAIN

The dataset of the aerodynamic and geometric coefficients of 2900 airfoils obtained using the automated CFD framework developed was published by the MDPI Data Journal. The paper can be accessed here.

RESEARCH EXPERIENCE

STUDY OF VORTEX RINGS (IITM)

December 2023 - Present | Chennai, Tamil Nadu, India

I am currently working on a research project under Dr. A Sameen at the Indian Institute of Technology (IIT), Madras, on analysing vortex rings using pseudo-spectral methods implemented in Dedalus, an open-source Python-based framework built specifically for spectral analyses.

APPLICATION BASED AIRFOIL GENERATION

July 2022 - Present | Manipal, Karnataka, India

I am currently working on a research project under Dr. Manikandan Murugiah to develop a Computational Model for application-based airfoil generation. We have automated the CFD process, and the data collection stage of the research project has been completed. We are currently developing the AI model.

MATLAB-ENHANCED WING DESIGN AND AERODYNAMIC MODELING

December 2023 - February 2024 | Manipal, Karnataka, India

This research project was done under Dr. Manikandan Murugiah and aimed to develop a MATLAB-based framework for efficiently designing intricate wing surfaces, offering an alternative to the cumbersome and skill-intensive CAD software processes.

RESEARCH INTERESTS

- Aerodynamics
- Aircraft Design
- Multiphase Flows
- Fluid-Structure Interaction
- Supersonic and Hypersonic Flows
- Computational Fluid Dynamics (CFD)
- Turbulent Flows and Turbulence Modeling

OTHER PROJECTS

NATIONAL AEROSPACE CONCEPTUAL DESIGN COMPETITION (NACDEC)

September 2023 - Present | Manipal, Karnataka, India

I am currently participating in the seventh edition of the National Aerospace Conceptual Design Competition (NACDeC - VII). The problem statement for this edition is the conceptual design and sizing of a Martian Unmanned Aerial Vehicle (UAV) with an all-up weight of 70 kg for atmospheric exploration close to Mar's surface. A feasible UAV design will be presented after carefully considering different configurations and commercially available technologies. We have cleared the first and second rounds of the competition and are currently awaiting the results of the third round.

STATIC STABILITY ANALYSIS OF THE CESSNA T-37

October 2023 | Manipal, Karnataka, India

I carried out a detailed static stability analysis of the Cessna T-37 as a part of my coursework in the academic year 2023-24 (Flight Dynamics - FD) at the Manipal Institute of Technology, Manipal, Karnataka, India.

CFD COMPETITION (ICCMEH 2023)

July 2023 - August 2023 | Manipal, Karnataka, India

I participated in the CFD competition organised as a part of ICCMEH 2023. The problem statement dealt with the optimisation of the NACA 4412 airfoil for maximum aerodynamic efficiency constrained to the specified operating conditions and several shape constraints. We secured the third rank and were commended on the quality of our work.

PERFORMANCE ANALYSIS OF THE AIRBUS A380-800M

February 2023 - May 2023 | Manipal, Karnataka, India

I carried out a detailed performance analysis of the Airbus A380-800M as a part of my coursework in the academic year 2022-23 (Flight Mechanics - FM) at the Manipal Institute of Technology, Manipal, Karnataka, India. My professor praised the quality of the report.

CLASS SHAPE TRANSFORMATION (CST) PARAMETRIZATION TECHNIQUE

September 2022 - October 2022 | Manipal, Karnataka, India

I wrote a report on the Class Shape Transformation (CST) Parametrization Technique carried out on 15 aerofoils as a part of my coursework in the academic year 2022-23 (Introduction to Aerospace Engineering - IAE) at the Manipal Institute of Technology, Manipal, Karnataka, India.

E-SHOPPING PLATFORM

2021 | Chennai, Tamil Nadu, India

Successfully developed a CLI-based E-shopping interface using Python and MySQL as a part of my Class 12 final project.

SKILLS

TECHNICAL

- C
- Python
- MATLAB
- LaTeX
- HTML
- XML
- MySQL
- OpenFOAM
- ParaView
- Ansys
- COMSOL
- XFLR5
- XFOIL
- Linux
- Solidworks
- Fusion360
- AutoCAD
- CATIA
- 3DExperience
- OpenVSP
- Simulink
- Photoshop
- Illustrator
- Lightroom
- Canva
- Microsoft Office
- High Performance Computing (HPC)
- Tecplot360
- PBS
- Slurm
- Git & GitHub
- XMGrace
- Shell Scripting
- OpenMPI

OTHER

- Expert communication and presentation skills.

OTHER EXPERIENCE

RESEARCH SOCIETY MIT | Co-Expertise Head

September 2023 - Present | Manipal, Karnataka, India

The Research Society MIT is Manipal's official student research body that works on an array of research projects, covering a broad span of fields, from artificial intelligence and robotics to nanotechnology and immunology. I am the co-expertise head of the aerospace, aeronautics, and material sciences domains.

IE AEROSPACE | Advisory Board Member

September 2023 - Present | Manipal, Karnataka, India

IE Aerospace is a students' chapter affiliated with the Institution of Engineers, India. Their mission is to spread awareness about the booming field of aerospace engineering.

MANO AIRCRAFT PRIVATE LIMITED | Intern

June 2023 | Coimbatore, Tamil Nadu, India

Learnt and applied several composite manufacturing techniques during my internship. Further, I developed a Python script to automate the pre-composite manufacturing processes. I also created a market survey outreach form as part of a market analysis.

AEROMIT | Junior Aerodynamics Engineer

December 2021 - April 2023 | Manipal, Karnataka, India

AeroMIT is the official aeromodelling and aerial robotics team of the Manipal Academy Of Higher Education. I was part of the Aerodynamics subsystem at AeroMIT, and my responsibilities included writing the design reports for competitions and designing RC aircraft based on aerodynamic principles.

ROYAL AERONAUTICAL SOCIETY | Student Affliate
February 2023 - Present | Manipal, Karnataka, India

The Royal Aeronautical Society is the world's only professional body dedicated to the entire aerospace community. Established in 1866 to further the art, science, and engineering of aeronautics, the Society has been at the forefront of aerospace ever since.

ARTICLES | Author
December 2021 – Present | Manipal, Karnataka, India

I regularly write multiple technical and non-technical articles for the DefenceXP and ManipalBlog websites.

SCOPA | Speaker
February 2020 - March 2020 | Chennai, Tamil Nadu, India

I was one of the key speakers at the Student Conference on the Paris Agreement (SCoPA), where my school represented India. I spoke on a global platform about India's climate issues and what we are doing to mitigate these problems.

NATIONAL CADET CORPS | Cadet
June 2017 - April 2019 | Chennai, Tamil Nadu, India

I was part of the NCC unit at my school. Actively participated in various camps, rallies, and social awareness drives. I was awarded the NCC A Certificate at the end of my tenure.

OMEGAMUN | Speaker
March 2018 - Apr 2018 | Chennai, Tamil Nadu, India

I represented Canada in the Model United Nations (MUN) conducted by Lalaji Memorial Omega International School. The topic of the MUN was whether Weapons of Mass Destruction (WMD) should be banned. All the countries reached a consensus, and a resolution was drafted.

ACHIEVEMENTS

ICCMEH 2023
August 2023 | Manipal, Karnataka, India

We secured the third rank for our submission to the CFD competition held as a part of ICCMEH 2023.

SAE AERO DESIGN
March 2023 | Lakeland, Florida, USA

I participated in the SAE Aero Design East 2023 held at Lakeland, Florida, USA, as a part of my tenure at AeroMIT. We were awarded second place for the Design Report and secured fourth rank overall.

PAPER PRESENTATION
December 2022 | Manipal, Karnataka, India

I was awarded the first prize in the Paper Presentation event as part of the Tech Tatva '22. I presented a research paper on the viability of Methane as a fuel for liquid rocket engines.

HEARTFULNESS ESSAY EVENT
2019 & 2020 | Chennai, Tamil Nadu, India

I participated in the Heartfulness Essay event organised in partnership with the United Nations Information Centre for India and Bhutan (UNIC) and received an honourable mention for one of the top ten entries in my state.