Kanak Agarwal

kanakagarwalaero@gmail.com | LinkedIn | GitHub | Website

EDUCATION

INDIAN INSTITUTE OF TECHNOLOGY, MADRAS | M.Tech

2025 - Present | Chennai, India

- Computational Engineering, Computational Fluid Dynamics Stream
- Research Assistant at the Theoretical Computational Fluid Dynamics (TCFD) Laboratory, Department of Aerospace Engineering, IITM.

MANIPAL INSTITUTE OF TECHNOLOGY | B.Tech

2021 - 2025 | Manipal, India

- Major in Aeronautical Engineering, Minor Specialization in Aerodynamics
- CGPA: 8.56/10.00

LALAJI MEMORIAL OMEGA INTERNATIONAL SCHOOL | Class 12 (CBSE)

2021 | Chennai, India

- Major in Computer Science
- Grade: 91.20%

RESEARCH INTERESTS

- Computational Fluid Dynamics (CFD)
- High Performance Computing (HPC)
- Aerodynamics
- Turbulent Flows
- Vorticity Dynamics
- Supersonic & Hypersonic Flows

PUBLICATIONS

- Praveen Kumar, V., **Agarwal, K.**, Sameen, A., and Thara Reshma, I. V., "Flow Regimes in the Evolution of a Hot Buoyant Vortex Dipole," Physics of Fluids, Vol. 36, No. 12, 2024, p. 123633. `https://doi.org/10.1063/5.0244160`
- Suhas, K. S., Krishna, R., **Agarwal, K.** and Murugaiah, M., "A MATLAB GUI-Based Approach to Wing Design and Aerodynamic Performance Evaluation", AIP Conference Proceedings [*Under Review*]
- **Agarwal, K.**, Vijaykrishnan, V., Mohanty, D., and Murugaiah, M., "A Comprehensive Dataset of the Aerodynamic and Geometric Coefficients of Airfoils in the Public Domain", Data, Vol. 9, No. 5, 2024, p. 64. `https://doi.org/10.3390/data9050064`

CONFERENCES

- MATLAB-Enhanced Wing Design and Aerodynamic Modeling, Symposium on Applied Aerodynamics and Design of Aerospace Vehicles (SAROD), Thiruvanthanapuram, India, Dec 2024. [*Poster Presentation*]
- A MATLAB GUI-Based Approach to Wing Design and Performance Evaluation, International Conference on Futuristic Advances in Mechatronics Engineering (ICFAMEAD), Pune, India, Oct 2024. [*Oral Presentation*]

ACHIEVEMENTS

ICFAMEAD 2024

Oct 2024 | Pune, India

- Awarded best paper out of 40 papers in the Design Engineering Track at the International Conference on Futuristic Advances in Mechatronics Engineering for Aerospace and Defence (ICFAMEAD) 2024.

NACDEC VII

Aug 2023 | Bangalore, India

- Achieved 2^{nd} position out of 45 teams in the National Aerospace Conceptual Design Competition (NACDeC) organised in collaboration with the Indian Space Research Organisation (ISRO).

ICCMEH 2023

Aug 2023 | Manipal, India

- Achieved 3^{rd} rank for our submission to the CFD competition held as a part of the International Conference on Computational Methods on Engineering & Health Sciences (ICCMEH) 2023.

SAE AERO DESIGN

Mar 2023 | Lakeland, USA

- Achieved 2^{nd} place in the design report category and 4^{th} overall in the micro class of the SAE Aero Design East 2023 held at Lakeland, Florida, USA.

PAPER PRESENTATION

Dec 2022 | Manipal, India

- Awarded the 1^{st} prize in the Paper Presentation event as part of the Tech Tatva '22.
- Presented a research paper on the viability of Methane as a fuel for liquid rocket engines.

RESEARCH EXPERIENCE

BUOYANT VORTEX DIPOLES & RINGS

Dec 2023 - Present | Chennai, India

- Studying the temporal evolution of Buoyant Vortex Dipoles & Rings at the Theoretical and Computational Fluid Dynamics Laboratory (TCFD) at the Indian Institute of Technology (IIT), Madras, India, under the guidance of Dr. A Sameen.
- Derived the governing equations in the non-dimensional form with the Oberbeck-Boussinesq approximation and implemented them using pseudo-spectral methods in Dedalus, an open-source Python-based framework.

DATASET OF AIRFOIL COEFFICIENTS

Jul 2022 - Apr 2024 | Manipal, India

- Developed a robust, automated, and scalable CFD framework under the guidance of Dr. Manikandan Murugiah at the Manipal Institute of Technology, Manipal, India.
- Generated a dataset of aerodynamic and geometric coefficients of 2900 airfoils in the public domain using OpenFOAM, Shell Scripting, and MATLAB.
- Achieved a 21X speedup using the process-parallelized approach and custom Bash scripts.

MATLAB-ENHANCED WING DESIGN

Dec 2023 - Feb 2024 | Manipal, India

- Developed a MATLAB-based framework and GUI application for the efficient design of intricate wing surfaces under the guidance of Dr. Manikandan Murugiah at the Manipal Institute of Technology, Manipal, India.
- Automated the creation of '.stl' files for wings of various dimensions, allowing for the integration of customizable geometrical features such as twist, taper, dihedral, and sweep.
- Added support for multiple NACA airfoil series, extending it to both the CST and PARSEC parameterization methods.

SKILLS

TECHNICAL

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

OTHER

- Expert communication and presentation skills.

OTHER PROJECTS

NACDEC VII

Sep 2023 - Sep 2024 | Manipal, India

- Achieved 2^{nd} position out of 45 teams in the National Aerospace Conceptual Design Competition (NACDeC) organized in collaboration with the Indian Space Research Organisation (ISRO).

- Conducted an extensive literature review and developed Martian Solar Irradiance and Reference Atmosphere models.
- Designed and developed a 70*kg* solar-powered UAV for the study of the Martian Planetary Boundary Layer (0-100 *m*), capable of performing 20 sorties in a sol.

STATIC STABILITY ANALYSIS

Oct 2023 | Manipal, India

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

CFD COMPETITION (ICCMEH 2023)

Jul 2023 - Aug 2023 | Manipal, India

- Achieved 3^{rd} place in the CFD competition held on the sidelines of the International Conference on Computational Methods on Engineering & Health Sciences (ICCMEH 2023).
- Optimized the NACA 4412 airfoil for the specified operating conditions.
- Implemented a genetic algorithm using the CST coefficients coupled with XFOIL in MATLAB.
- Conducted a parametric sweep analysis in Ansys Fluent to validate the results obtained.

PERFORMANCE ANALYSIS

Feb 2023 - May 2023 | Manipal, India

- Conducted a detailed performance analysis of the Airbus A380-800M implemented in MATLAB as a part of my coursework in the academic year 2022-23 (Flight Mechanics - FM) at the Manipal Institute of Technology, Manipal, India.

OTHER EXPERIENCE

RESEARCH SOCIETY MIT | Co-Expertise Head

Jun 2022 - Sep 2024 | Manipal, India

- Led the aerospace, aeronautics, and material sciences domains as the co-expertise head during the AY 2023-24.
- Conducted a comprehensive taskphase to introduce the new members to the domain and various topics of potential research.

IE AEROSPACE | Advisory Board Member

Dec 2021 - Sep 2024 | Manipal, India

- Contributed to the day-to-day operation of the club as an advisory board member during the AY 2023-24.
- Designed graphics for social media handles, conducted multiple technical and non-technical events, and hosted several guest lectures.

MANO AIRCRAFT PRIVATE LIMITED | Intern

Jun 2023 | Coimbatore, India

- Learnt and applied several composite manufacturing techniques.
- Manufactured high-quality carbon fiber composite parts.
- Developed a Python script to automate the pre-composite manufacturing processes.
- Conducted a market survey as part of a market analysis.

AEROMIT | Junior Aerodynamics Engineer

Dec 2021 - Apr 2023 | Manipal, India

- Created detailed technical documentation for the design and construction of various RC aircraft.
- Designed RC aircraft adhering to mission requirements based on fundamental aerodynamic principles.
- Achieved 2^{nd} in the design report category and 4^{th} overall in the micro class of the SAE Aero Design East 2023 held at Lakeland, USA.