

KUNAL SACHDEVA

(919) 000-0000 ♦ Raleigh, NC ♦ email@ncsu.edu ♦ linkedin.com/in/your-profile

EDUCATION

MS (Thesis) in Mechanical Engineering, North Carolina State University, Raleigh, NC Expected May 2025 Coursework: Foundations of Fluid Dynamics, Fluid Dynamics of Combustion I and II, Convective Heat Transfer, Advanced Dynamics, Computational Fluid Mechanics, and Applied Machine Learning. **GPA: 4.0/4.0**

Bachelor of Aerospace Engineering, Punjab Engineering College, Chandigarh, India 2019 - 2023 Coursework: Aerodynamics, Aircraft Structural Analysis and Performance, Compressible Fluid Flows, Aircraft Propulsion, Gas Dynamics, and Computational Fluid Dynamics. **GPA: 3.6/4.0**

SKILLS

| | |
|----------------------------------|---|
| Programming | MATLAB, Python, C++, C |
| CAD | SolidWorks, CATIA, AutoCAD |
| Fluid/Structural Analysis | ANSYS Fluent, ANSYS Workbench, Pointwise, Tecplot, HPC, Linux |

EXPERIENCE

Research Assistant - Computational Combustion & Energy Sciences Lab, NCSU May 2024 - Present

- Conducting MS Thesis research on a high-fidelity, open-source reactive CFD code, PeleLMex, leveraging HPC and Linux for large-scale simulations. Implementing adaptive mesh refinement (AMR) and embedded boundary (EB) geometry treatment to enhance simulation accuracy and efficiency.
- Working with an operator splitting approach within PeleLMex to separate transport and reaction processes, optimizing the overall performance of reactive simulations.
- Integrating a Deep Operator Network into PeleLMex to replace the traditional stiff ODE solvers used for reaction integration, leveraging the DeepONet's ability to efficiently predict reaction outcomes, significantly reducing the computational time and resources utilization by 75-80%.

Research Assistant - Hasti Research Lab, NCSU Jan 2024 - May 2024

- Developed a comprehensive understanding of electrowetting principles, studying the underlying physics and mathematical equations. Utilized ANSYS Fluent's VOF-CSF method to capture the two-phase flow dynamics between the droplet and the surrounding air under both Direct and Alternate currents.
- Programmed a User-Defined Function (UDF) to model the Dynamic Contact Angle between the water-air interface and the solid wall, in accordance with the Molecular Kinetic Theory.
- Verified the results using the experimental data and analysed the temporal changes in the droplet characteristics (interfacial shape and contact radius) with the changes in the current magnitude and frequency.

Research Intern - IIT Kharagpur, India Feb 2022 - July 2022

- Engaged in research on Scramjet engines, focusing on the aero-thermodynamics of transverse jet injection in supersonic turbulent crossflow. Performed CFD simulations on HPC resources using ANSYS Fluent, generated computational grids with Pointwise, and utilized Tecplot and MATLAB for data post-processing and analysis.
- Conducted parametric studies by varying the geometry and crossflow parameters, such as pressure ratio and incoming Mach number, to perform comparative analyses.
- Generated intriguing results pertaining to the Sonic line angle, Separation shock angle, and fuel penetration with changes in different flow-field parameters.

ACHIEVEMENTS

Secured an All-India Rank of **86 out of 4726 candidates** in GATE (Graduate Aptitude Test in Engineering) in Aerospace Engineering 2022. The GATE exam is a countrywide examination for students applying for masters programs in Science and Engineering in India.