Jeyanth Varshan B S

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Skills

Aerodynamics/CFD: OpenFOAM, ANSYS Fluent, OpenVSP
Programming: Python, MATLAB, C, Linux/Bash Scripting
Mechanical/CAD: Creo Parametric, SolidWorks, ANSYS Mechanical, CalculiX

Experience

CSIR - National Aerospace Laboratories (NAL) Jul 2026 – Present
System Engineering Research Intern Bengaluru, India

- Developed a transient Fluid-Structure Interaction (FSI) workflow coupling OpenFOAM fluid solvers with CalculiX structural FEA via preCICE.
- Extended the framework to model piezoelectric transducers and implemented closed-loop control routines for structural vibration suppression.
- Simulating flow-induced aeroelastic vibrations of vortex generators inside Boundary Layer Ingestion (BLI) ducts to evaluate dynamic structural responses.

CSIR - National Aerospace Laboratories (NAL) May 2025 – Jul 2025
System Engineering Research Intern Bengaluru, India

- Built an aero-structural workflow for conceptual Blended Wing Body (BWB) aircraft design, integrating OpenVSP, VSPAERO, FreeCAD, and CalculiX.
- Automated pressure distribution mapping from panel-method aerodynamic simulations onto FreeCAD/CalculiX shell meshes using Python for static structural and modal analysis.
- Established a parametric framework for early-stage aircraft feasibility assessments, streamlining geometry generation, aerodynamic analysis, and structural evaluation.

Projects

Aeroelastic Vibration of Vortex Generators in Boundary Layer Ingestion Ducts Sep 2026 – Present

- Executed RANS CFD simulations over an airframe section in OpenFOAM ($k-\omega$ SST, cfMesh) to extract boundary layer profiles and mapped them as non-uniform inlet conditions for BLI duct secondary flow and separation analysis.
- Developing a coupled FSI framework for vortex generator arrays within BLI ducts to quantify flow-induced vibrations, total pressure recovery factor, and distortion coefficient.

Piezoelectric Robust Control of Flow-Induced Vibrations using FSI Simulation Jul 2026 – Sep 2026

- Formulated a piezoelectric active vibration control framework combining FE structural modeling, modal reduction, and μ-synthesis, integrated with an augmented Kalman filter in MATLAB/Simulink for disturbance estimation.
- Established a preCICE-based coupling architecture connecting OpenFOAM and CalculiX via Python wrappers to evaluate multi-physics interface dynamics for closed-loop FSI integration.

Image-Based Analysis to Quantify Membrane Mechanics of Vesicles Jul 2025 – Present

- Developed an automated Python pipeline to segment confocal microscopy z-stacks (`.czi`) of DOPC and GPMV vesicles, reconstructing accurate 3D membrane surface meshes.
- Authored C++ solver routines for membrane energy minimization to extract equilibrium curvature, preferred area, and volume, validating the workflow via synthetic image stacks across varied SNRs and mesh independence checks.

Publications

Fluid-Structure Interactions Studies of a Blended Wing Body Aircraft using Free and Open-Source Software based Hybrid-Fidelity Framework (DOI) Sep 2026
Organized by: International Conference on Mechanics, Materials and Mechatronics (ICM^3 2026), Mahindra University.

Education

Birla Institute of Technology and Science, Pilani – Hyderabad Campus Aug 2023 – Present
B.E. Mechanical Engineering (CGPA: 9.43/10) Hyderabad, India
Courses: Fluid Mechanics, Principles of Aerodynamics, Mechanisms and Machines, Computer-Aided Design, Aircraft Propulsion, Aircraft Structures, Design of Machine Elements, Applied Thermodynamics, Heat Transfer