Shashwat Patnaik

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ABOUT ME

As a graduate student at the University of Michigan, I have developed expertise in various aerospace disciplines, including Computational Fluid Dynamics (CFD), Finite Element Analysis (FEA), and thermal modeling. My experience extends to numerical modeling, where I have worked extensively with C++ and Python in Linux environments. I am particularly passionate about Multidisciplinary Optimization, leveraging my technical skills to optimize complex aerospace systems across multiple engineering domains.

EDUCATION AND TRAINING

Master of Science in Aerospace Engineering

University of Michigan [Aug 2022 – May 2024]

City: Ann Arbor | **Country:** United States

Bachelor of Technology in Mechanical Engineering

Delhi Technological University [Aug 2018 – Jun 2022]

City: Delhi | **Country:** India

WORK EXPERIENCE

Lead Mechanical Engineer

DTU Altair [Aug 2019 – Jun 2022]

City: Delhi | **Country:** India

- Engineered a small-scale satellite's payload wing, enhancing lift by 20% through MATLAB and XFOIL optimization.
- Managed full lifecycle of deployment mechanisms using Siemens Teamcenter and ENOVIA, overseeing design, integration, and testing, reducing development time by 30%.
- Led a team of 6 engineers in developing and validating micro-autonomous robots and UAVs, using Autodesk Fusion Lifecycle and SAP PLM to improve collaboration and cut development and review cycles by 15%.

Mechanical Engineering Intern

Maruti Suzuki India Limited [May 2019 – Jul 2019]

City: Delhi | **Country:** India

- Conducted failure analysis on 20 automotive components using design of experiments (DOE) to identify root causes and implement preventive measures, reducing the component failure rate by 10%.
- Developed and maintained a comprehensive failure analysis database, improving failure prediction accuracy by 8%.

Aerodynamics engineer

DTU Super Mileage Vehicle [Aug 2018 – Dec 2018]

City: Delhi | **Country:** India

- Designed vehicle chassis and shell in SolidWorks, conducted flow simulation and wind tunnel testing, and performed structural analysis in ANSYS, reducing weight by 27%.
- Executed structural and thermal analysis in ANSYS, ensuring compliance with client's performance requirements.
- Partnered with the powertrain team on mechanical and thermal analysis, optimizing the design to contribute to a 15% reduction in costs and ensuring project success within budget and timeline constraints.

PROJECTS

[Aug 2023 – Feb 2024]

Aerodynamic shape optimization of small unmanned aerial vehicles

- Implemented non-gradient optimizer (IPOPT) using OpenMDO for the shape of the fuselage, adaptable to any payload, utilizing Free Form Deformation (FFD) and adjoints for derivatives within ADFlow.

[Jan 2023 – Jul 2023]

First and second-order finite volume and discontinuous Galerkin solver

- Programmed adjoint-based mesh adaptation and local mesh refinement, and developed functions for the LCD limiter.
- Developed first and second-order Finite Element Method (FEM) and Finite Volume Method (FVM) to simulate compressible flow over the multi-element airfoil using SSP-RK2 with local time stepping.

[Jan 2021 – Jun 2021]

Analysis of Composite Wishbone Structure (Upper-A Arm)

- Conducted FEA (CAE) fatigue analysis of a wishbone structure using carbon fiber's predicted fatigue life cycle and the Goodman correction method for mean stress correction.
- Analyzed compressive, bending, and buckling loads, improving fatigue life cycle by 1000 times and doubling the fatigue safety factor compared to traditional aluminum wishbones for Formula Student.

PUBLICATIONS

[2022]

Design Optimization of Monoblade Autorotating Pods to Exhibit an Unconventional Descent Technique Using Glauert's Modeling

- The coefficient of power as a cost function was optimized by 28% in MATLAB by using an element-based computational method.
- Designed a 6-DOF dynamic model of the pod through SIMULINK to reduce drift in all axes by ~10%

RESEARCH EXPERIENCE

[2020 - 2022]

Advance Fluid Dynamics Lab

- Established a RANS framework in OpenFOAM to exhibit the viability of riblets on nozzles to delay separation.
- Computed fluctuations in kinetic energy and wall shear stress of the flow, demonstrating riblets create higher momentum at near-wall flow, delaying the separation by 11%.

[2020 - 2022]

Computational Aerosciences Laboratory

- Implemented a PDF stochastic Lagrangian model using the Generalized Langevin Model and quadratic 2-stage least square regression method to model turbulent channel flow.

TECHNICAL SKILLS

CAD - SolidWorks (CSWP Certification), Catia V5, Fusion 360, Auto-desk Inventor, SpaceClaim

Simulation Software - ANSYS, Simulink, OpenFOAM, StarCCM+, OpenMDO, HyperMesh, Icepack

Coding Language - Python, MATLAB, C++, Valgrind, Openmpi, Openmp, GIT, Linux, Cuda

LANGUAGE SKILLS

English - Native speaker

German - Beginner