Shashwat Patnaik

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🌐 **Portfolio:** https://brownauro2520.github.io/shashwatpatnaik.github.io

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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 life cycle of deployment mechanisms, overseeing the design, integration, testing, and of complex sub-assemblies and systems, improving structural rigidity by 7% and ensuring seamless integration.
• Developed micro-autonomous robots and UAVs, integrating actuators and electromechanical systems, and used SAP PLM to reduce development and review cycles by 15%.
• Prototyped micro-robots and satellites using 3D printing, cutting development and fabrication time by 25%.

Mechanical Engineering Intern

Maruti Suzuki India Limited [May 2019 – Jul 2019]

City: Delhi | **Country:** India

• Executed failure analysis on 20 automotive components, using design review with design of experiments (DOE) to identify root causes and implement preventive measures, reducing component failure rate by 10%, based on quantification metrics.
• Conducted material fracture analysis and developed a comprehensive database for failure topography mapping, enhancing the predictive accuracy of component lifespan by 8%, and contributing to R&D efforts.

Aerodynamics engineer

DTU Super Mileage Vehicle [Aug 2018 – Dec 2018]

City: Delhi | **Country:** India

• Designed vehicle chassis, prepared engineering drawings, and developed manufacturing processes, including building fixtures, to ensure precision; reduced weight by 27% while maintaining structural strength.
• Created CAD models in SolidWorks to design mechanical systems and vehicle aerodynamic components, decreasing drag coefficient by 0.05 through fluid simulation (Computational Fluid Dynamic) and wind tunnel testing.
• Coordinated with the powertrain team on mechanical and thermal analysis, optimizing design and achieving a 15% cost reduction.

PROJECTS

[Aug 2023 – Feb 2024]
Aerodynamic shape optimization of small unmanned aerial vehicles
- Integrated gradient-based optimizer IPOPT with OpenMDO for fuselage shape optimization, adaptable to any payload; employed Free Form Deformation (FFD) and adjoints for derivatives within ADflow, increasing aerodynamic efficiency by 15%.

[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, Siemens NX, SpaceClaim

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

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

LANGUAGE SKILLS

English - Native speaker

German - Beginner