

# Shashwat Patnaik

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## EDUCATION

### University of Michigan

Ann Arbor, MI

*Master of Science in Aerospace Engineering*

May 2024

GPA: 4.00 / 4.00 Coursework: Computational Fluid Dynamics, Turbulent Flows, Flight and Trajectory Optimization, Multidisciplinary Design Optimization, Thermal Engineering, Heat and Mass Transfer.

### Delhi Technological University

Delhi, India

*Bachelor of Technology in Mechanical Engineering*

June 2022

Coursework: Fluid System, Design of Machine Elements, Kinematic and Dynamic of Machines, Mechanics of Solid

## SKILLS

CAD:	SolidWorks (CSWP), Catia V5, Fusion 360, Auto-desk Inventor
Simulation and Analysis Software:	ANSYS, Simulink, OpenFOAM, STAR-CCM+, OpenMDO
Language and Analysis:	Python, MATLAB, C++, Valgrind, OpenMPI, and PX4

## WORK EXPERIENCE

### DTU Altair

Delhi, IN

*Lead Mechanical Engineer*

August 2019- July 2022

- Increased lift by 20% for a small-scale satellite's payload wing, through MATLAB and XFOIL optimization for CANSAT 2021.
- Led the development of deployment mechanisms, overseeing 3D/2D design and integration of complex sub-assemblies and systems.
- Coordinated 5-6 members in various competitions to create robots for micro-autonomous robots and UAVs.

### Maruti Suzuki India Limited

Delhi, IN

*Mechanical Engineering Intern*

May 2019- July 2019

- Conducted failure analysis on 20 automotive components, identified root causes, and implemented prevention methods; reduced component failure rate by 10%.
- Analyzed fracture features and created a comprehensive database mapping the topography of fracture surfaces to root causes; improved failure prediction accuracy by 8%.

### DTU Super Mileage Vehicle

Delhi, IN

*Aerodynamics Lead-Engineer*

August 2018– December 2018

- Designed and developed the vehicle's outer chassis and shell using SolidWorks, and ANSYS, reducing weight by 27%.
- Integrated two-cylinder engine and transmission to meet competition requirements.

## PROJECT EXPERIENCE

### Analysis of Composite Wishbone Structure (Upper-A Arm)

Delhi, IN

- Conducted FEA analysis of a wishbone structure using the predicted fatigue life cycle of carbon fiber 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.

### Optimization of mono-blade pods to exhibit unconventional descent mechanism (DOI)

Ann Arbor, MI

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

### First and second-order finite volume solver to simulate flow over the multi-element airfoil

Ann Arbor, MI

- 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.

### Aerodynamic shape optimization of small unmanned aerial vehicles

Ann Arbor, MI

- 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.

## RESEARCH EXPERIENCE

### DCE Advance Fluid Dynamics Lab

Delhi, IN

- 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%.