Pranshu Vyas

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Profile

A Mechanical Engineer with experience in Aerodynamics for a variety of applications such as Turbine blade design, Hyperloop pod design, and Hypercar bodywork. Well versed in using and developing CFD tools, owing to internship experiences that involved developing computational software for companies and research labs. Enjoys working on challenging and new problems and adopts creative methods to reach better solutions.

Education

Cranfield University, MSc in Advanced Motorsport Engineering — Oct 2024 – Present

- **Modules:** Motorsport Powertrains (83%), Motorsport Electronics and Data Acquisition (77%), Motorsport Vehicle Dynamics (90%), Motorsport Aerodynamics, Motorsport Structures, CFD for Motorsport (77%)
- **Group Design Project:** Hydrogen-Fuelled Le Mans Hypercar Challenger for 2028

Birla Institute of Technology and Science Pilani, BE in Mechanical Engineering — Nov 2020 – Aug 2024

- **Relevant Coursework:** Fluid Mechanics, Partial Differential Equations, Principles of Aerodynamics, Aircraft Propulsion, Vibrations and Control
- **Individual Thesis:** Developing an Immersed Boundary Method Based Program Along with Turbulence Models to Simulate FSI Problems
- **Overall Grade:** 8.05/10.0 (First Class)

Experience/Projects

Aerodynamics of a Hydrogen-fuelled Hypercar, Group Design Project, Cranfield — March 2025 – May 2025

- Designed & optimised the bodywork of an H2 fuelled Le Mans Hypercar for the World Endurance Championship using CAD (surfacing), resulting design produced an average of 720 kg downforce during cornering conditions.
- Ideated unique front & rear wing designs, and enhanced floor performance by optimising camber, length and profiles of various floor turning vanes and diffuser strakes after analysing results from CFD simulations.
- Validated CFD simulations with benchmark wind tunnel tests & grid convergence studies, overall car design was awarded the 'Most Credible Engineering Solution' by Racecar Engineering.

Wind Tunnel Experiments for DrivAer Geometry, Aerodynamics Course, Cranfield — Dec 2024

- Assisted in conducting wind tunnel experiments of a 35% scaled DrivAer geometry with different configurations of front splitter, rear wing, Gurney flap and diffuser.
- Analysed data from limited wind tunnel runs and identified optimal setup for the final run, providing an average aerodynamic efficiency of 0.9, max downforce coefficient of 0.30 while achieving target aero balance of 40/60%.

Research Intern & Bachelor's Thesis, The Lab. of Fluid Dynamics and Technical Flows, Otto-von-Guericke University, Magdeburg, Germany — July 2023 - Aug 2024

- Developed software for simulating flow past arbitrary moving geometries, by implementing the direct-forcing Immersed Boundary Method (IBM) and integrating it with the lab's inhouse LBM based Multiphysics software.
- Incorporated Smagorinsky turbulence models with the LBM code, by modifying collision models making the software capable of running Large Eddy Simulations (LES) in highly turbulent flow regimes.
- Parallelised the developed IBM code, using MPI to distribute simulation domain amongst multiple CPU cores, providing High Performance Computing capabilities to the software.
- Performed LES simulations of a rotating Darrieus tidal turbine with various blade shapes, using the developed IB-LBM software. Power coefficient results from the software matched experimental water tunnel tests.

Analysing Vibrations of a Racecar in Ground Effect, BITS Pilani, India — March 2023 - July 2023

- Analysed response of a model racecar in ground effect to variations in downforce and ride height by developing half-car and quarter car suspension models on Simulink, resulting in a better suspension tuning method.

- Incorporated CFD data of the vehicle into Simulink model and evaluated suspension parameters to ensure maximum vehicle grip, resulting work was presented in the 50th National Conference on Fluid Mechanics and Fluid Power (FMFP 2023).

Shape Optimization of a Hyperloop pod using Genetic Algorithm, BITS Pilani March 2023 - July 2023

- Performed Aerodynamic shape optimization of a hyperloop pod to minimize drag using a genetic algorithm based program that resulted in 15% lower aerodynamic losses while travelling in a tunnel.
- Modelled the pod surface using 4th order Bezier curves and coupled the genetic algorithm code to a developed inviscid compressible flow fluid solver, resulting in lower computational times.
- Obtained practical and realizable geometries by implementing physical constraints like the Kantrowitz limit and geometrical constraints on the Bezier curve parameters, resulting work was presented at the 50th National FMFP.

Method Of Characteristics for Nozzle Design, GitHub, BITS Pilani Aug 2022 - Jan 2023

- Developed a code using the Method of Characteristics to numerically solve certain hyperbolic partial differential equations such as the 2D velocity potential equation for compressible flows.
- Demonstrated use on designing nozzles for supersonic flows, arriving at best nozzle contours to ensure optimum expansion of exhaust and maximum thrust for a given exit Mach number of 3.0.

Subsonic Wind Tunnel Design using CFD, BITS Pilani Jan 2023 - May 2023

- Finalised the specifications of the wind tunnel by analysing the various applications to be tested. Designed CAD models of the specified wind tunnel capable of a peak inlet velocity of 50m/s in a 1.5m X 1.5m test section.
- Selected a polynomial curve profile (5th order Bell & Mehta) for the contraction section of the wind tunnel by conducting literature reviews and analysing results from CFD simulations, resulting design is being used for the construction of the facility at BITS Hyderabad campus.

Multiphysics Developer Intern, BosonQ Psi, Remote Nov 2021 - May 2022

- Integrated user inputs with solver code by developing functions and classes to read Json files and edit required variables, covering the pre-processing aspects of the company's first FEM based Multiphysics software.
- Benchmarked developed software by performing structural & heat transfer simulations, assisted in debugging by analysing reasons for compile, runtime and result based errors, ensuring complete software validation.

Student Engineering Teams

Team Lead (22-23), Mechanical Systems Engineer (21-22), Hyperloop India July 2021 – July 2023
Student team focussed on designing and building Hyperloop pod prototypes

- Led a 40-member team to design a 1/3rd scale hyperloop pod prototype with top speeds up to 180 kmph, responsibilities included design ideation, project planning and design validation.
- Designed a Linear Induction Motor based propulsion system for the pod, by performing electromagnetic simulations and validating results with published data, resulting motor produced 1.2kN thrust.
- Final pod design was selected for demonstration round at European Hyperloop Week 2023 and was also presented at the National Academy of Indian Railways.

Powertrain Lead (22-23), Powertrain Engineer(21-22), Team Vulcan Jan 2021 – July 2023
Student team that builds All Terrain Vehicles and participates in SAE BAJA

- Decided and calculated key parameters(gradeability, acceleration, top speed, gear ratios etc.) of the vehicle and evaluated different drivetrain layouts to deliver good off-road performance with low cost of roughly 1.4k GBP.
- Performed hand calculations to size gears, shafts, bearings and gearbox & differential casings for various loading conditions while considering fatigue life, supplemented the calculations through FEA.

Skills, Interests and Extracurricular Activities

Languages/HPC Tools : C, C++, Python, MATLAB, CUDA, MPI

Software/Tools (Simulations): SolidWorks, Ansys (Mechanical & Fluent), COMSOL, MATLAB, Simulink

Individual Interests : Enjoys playing tennis, cricket, and football (played competitively during school).