

Faiq Shahbaz

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EDUCATION

National University of Sciences & Technology (NUST)

Islamabad, Pakistan

Master of Science in Computational Science & Engineering

Sep. 2023 – Present

- **CGPA:** 3.50
- **Courses:** Advanced Fluid Mechanics, CFD-I, CFD-II, 3D Geometric Modeling and Reconstruction, Computational Linear Algebra & Optimization, Applied Mathematics, Data Analysis & Statistics, High Performance Computing for Computational Engineering.
- **Thesis:** CFD based Design and Optimization of Ducted Wind Turbine using OpenFoam

Institute of Space Technology (IST)

Islamabad, Pakistan

Bachelor of Science in Aerospace Engineering

Sep. 2018 – Jul. 2022

- **Majors:** Aerodynamics & CFD
- **Thesis:** Design & Analysis of Airborne Wind Energy (AWE) System

EXPERIENCE

Research Associate

July 2024 – Present

Computational Aeronautics Lab (CAL), SINES, NUST

Islamabad, Pakistan

- Design and development of a small-scale ducted wind turbine specifically for low wind speeds in urban environments, focusing on aerodynamic optimization and performance enhancement.
- Conduct a CFD-based optimization study using DAFoam with a blade-resolved RANS solver, implementing a gradient-based optimization approach to navigate the high-dimensional design space of blade and duct geometries.
- Perform higher-fidelity unsteady RANS simulations to re-evaluate and validate the final turbine design, ensuring maximized efficiency of energy extraction.

Trainee

June 2024 – Sept. 2024

Dense Fusion

Islamabad, Pakistan

- Utilized PETSc for developing and implementing numerical algorithms, including the formulation and coding of solvers for various equations.
- Engaged in the development and customization of OpenFOAM solvers, utilizing MPI to enhance computational capabilities for high-performance applications.
- Created and implemented various Transport equations code in Python, Modified code to run with MPI for parallel computing and conducted various tests, such as scalability assessments, to ensure code stability.
- Collaborated with two professors from KAUST University to prepare comprehensive materials for upcoming workshops, focusing on advanced computational methods and solver development.

Intern

Nov. 2021 – Jan. 2022

Aviation Training Hub

Islamabad, Pakistan

- Facilitated the troubleshooting and diagnosis of mechanical issues on aircraft, effectively coordinating with team members to enhance problem-solving processes and optimize technical solutions.
- Led collaborative efforts with a team of engineers to streamline operations within the maintenance department, showcasing strong leadership, communication, and teamwork skills to ensure efficient workflow.

Intern

Aug. 2021 – Sep. 2021

Pakistan Aeronautical Complex

Kamra, Pakistan

- Acquired a comprehensive understanding of the aircraft manufacturing process, including the assembly and installation of components and systems, enabling effective oversight and improvement of production workflows.
- Fostered collaboration among various organizational departments, emphasizing the importance of cross-functional teamwork in achieving operational efficiency and enhancing project outcomes.

TECHNICAL SKILLS

Languages: Python, C, C++, MATLAB

Developer Tools: PETSc, Git, Docker, Linux, Visual Studio, PyCharm, LaTeX

Softwares: OpenFoam, DAFoam, ANSYS Fluent, ICEM, CATIA, Blender, Qblade, Simulink, STAR CCM+, javafoil, Dymola, Advance Aircraft Analysis (AAA), Raymer Design Software (RDS), DATCOM, OpenVSP, Microsoft Office

Soft Skills: Time Management, Teamwork, Problem-solving, Documentation

PROJECTS

Analysis of Laminar Flow in a Channel | *MATLAB*

- Simulated 2D steady, incompressible laminar flow in a channel using Calc-BFC and Matlab.
- Analyzed developing and fully developed flow regions by plotting velocity profiles, wall shear stress, and vorticity.
- Performed eigenvalue and eigenvector analysis of the viscous stress tensor, including flow dissipation and temperature rise.
- Utilized a 199 x 28 computational grid to process DNS data and visualize key flow characteristics across the channel.

Analysis of Turbulent Two Dimensional Hill Flow | *MATLAB, STAR CCM+*

- Simulated 2D hill flow in STAR-CCM+, utilizing multiple turbulence models (e.g., AKN k-epsilon) for flow behavior assessment.
- Analyzed simulation results against experimental data, focusing on pressure drop, recirculation zones, and skin friction.
- Developed MATLAB scripts for post-processing simulation data, generating velocity profiles, pressure distribution, and vorticity contours.

Numerical Simulation of Channel Flow and Cavity Flow Using the Navier–Stokes Equations | *Python*

- Developed a Python-based solver to simulate incompressible flow using the Navier–Stokes equations.
- Implemented finite difference methods for discretizing and solving 2D flow problems (channel flow/cavity flow).
- Optimized code for efficient computation, focusing on flow behavior under varying boundary conditions.

Simulation of 2D Advection-Diffusion Equation Using MPI in Python | *Python, MPI*

- Developed a parallelized Python code utilizing MPI to solve the 2D advection-diffusion equation, optimizing performance through distributed computing.
- Conducted performance evaluations and visualizations of simulation results using Matplotlib, producing contour plots to analyze the spatial distribution of the solution.

ORGANIZATIONAL & MANAGERIAL SKILLS

Space Society IST <i>Director</i>	2020-2022
International Conference on Aerospace Science and Engineering (ICASE) <i>Manager</i>	2020
IST Youth Carnival (IYC) <i>Manager</i>	2020
World Space Week <i>Manager</i>	2019