HASSAAN IDREES

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About Me

I am a mechanical engineer and current PhD researcher specializing in the application of Physics-Informed Neural Networks (PINNs) to complex problems in computational mechanics, including impact dynamics, fluid flow, and energy systems. I have hands-on experience with CAD modeling (SolidWorks), engineering simulations (ANSYS, OpenFOAM), and AI-based modeling tools (PyTorch, PINNs), which I've applied to both academic research and real-world engineering projects.

Work Experience

Scuola IMT Alti Studi Lucca | https://www.imtlucca.it/ |Italy
PhD Researcher in Computational Mechanics | 2023- In Progress
Affiliated with Multi-Scale Analysis of Materials (MUSAM) Laboratory | https://musam.imtlucca.it/
Advisor: Professor Marco Paggi
Research Area: Applications of Physics Informed Neural Networks (PINNs) in computational mechanics.

- Developed a robust PINN framework in Python (PyTorch) to solve highly nonlinear PDEs arising from hail impact simulations on solar panels, achieving results that aligned closely with both experimental and numerical models.
- Contributed over 100 hours as a technical tutor, providing in-class support and assisting faculty in the delivery of technical coursework.
- Elected student representative (2024–2026) to the Joint Student-Teacher Board (JSTB), serving as a bridge between students and administration to address academic challenges and enhance the learning environment.

Center for Intelligent Systems and Network Research (CISNR) Peshawar | https://cisnr.com/ | Pakistan
Assistant Manager / Assistant Trainer | *April 2023 – December 2023*

- Led production oversight for over 200 IoT-based SCADA devices, including systems for water management (AquaCure), streetlight automation, transformer monitoring (ElectroCure), digital electricity meters, and fuel management.
- Supervised end-to-end manufacturing, final testing, and on-site installation of smart devices in 10+ cities across Pakistan, enabling automation and reducing electricity, fuel, and labor-related inefficiencies.
- Collaborated with GIZ (Germany) to digitally transform municipal operations, conducting training sessions in 20+ cities to upskill municipal staff and promote adoption of smart infrastructure.
- Partnered with Google in the digitalization of electric meters in Kalam, Pakistan, deploying internet-connected in-house meters that significantly reduced power losses through real-time energy monitoring and control.
- Conducted comprehensive training programs for municipal workers and officers, creating tailored content to support the smooth integration and operation of SCADA technology in field environments.
- Played a key role in organizational impact by helping municipalities cut operational costs, minimize manual errors, and transition to data-driven infrastructure through smart device deployment.

National University of Science and Technology (NUST) | https://sines.nust.edu.pk/aims-lab/ | Pakistan
Research Assistant in Artificial Intelligence for Mechanical Systems (AIMS) Lab at NUST. | *Nov 2021 – Dec 2022*

- Led research on numerical and experimental methods for water desalination, using OpenFOAM to simulate fluid flow through porous media, which contributed to the publication of two Q1-ranked journal papers.
- Delivered hands-on training as a CFD OpenFOAM Workshop Trainer at SMME, NUST, engaging students, faculty, industry, and industry personnel on the role of open-source software in engineering applications.
- Served as Teaching Assistant for a graduate-level course in Computational Fluid Dynamics and Heat Transfer, leading lectures and guiding students in practical simulations such as lid-driven cavity flow, multiphase flow, meshing with BlockMesh, visualization in ParaView, and parallel processing in OpenFOAM.

- Organized and led a series of national seminars across 4 cities and 7 universities, presenting the transformative role of AI in Mechanical Engineering to over 200 final-year students, researchers, and faculty, sparking significant academic interest in computational methods and intelligent systems.

Education

Scuola IMT Alti Studi Lucca | https://www.imtlucca.it/ |Italy
PhD in Computational Mechanics | 2023- In Progress
Research Topic: Applications of Physics Informed Neural Networks (PINNs) in computational mechanics.
Advisor: Dr. Marco Paggi | https://www.imtlucca.it/it/marco.paggi
Courses: CFD, Contact and Fracture Mechanics, Reduced Order Modelling. Introduction to Machine Learning

National University of Science and Technology (NUST) | https://nust.edu.pk/ |Pakistan
Master of Science (Mechanical Engineering) | 2020-2023
Research Topic: Numerical Investigation of flow around a multiple slotted cylinder
Supervisor: Dr. Muhammad Sajid | https://people.ucd.ie/muhammad.sajid
Courses: CFD I, CFD II, Advanced Fluid Mechanics, IC Engines

University of Engineering and Technology (UET), Peshawar | https://www.uetpeshawar.edu.pk/ |Pakistan
Bachelor of Science (Mechanical Engineering) | 2016-2020
Research Topic: Estimating carbon footprint and devising a decarbonization plan for UET Peshawar
Supervisor: Dr. M. A. Irfan Mufti | https://www.kent.edu/trumbull/mechanical-engineering-technology-aas
Courses*:* CAD, Fluid Mechanics, Heat and Mass Transfer, Thermodynamics, Automatic Controls

Internship Experience

LalPir and PakGen Power Limited | http://www.lalpir.com/ |Pakistan
An internship in a Thermal Power Plant aimed to develop an understanding of powerplant and the reduction of emissions.
Mechanical Engineering Intern | Aug 2021 - Sep 2021

- Developed understanding of a power plant and its components such as Boiler, Turbine, Balance of Plant, and Condenser. Techniques related to control plant emissions were also studied.
- Worked with site engineers and staff in startup of the plant and in its basic maintenance.

Pak Electron Limited (PEL) | https://pel.com.pk/ | Pakistan
A virtual internship programme aimed to develop corporate skills among fresh graduates and students.
Mechanical Engineering Intern | Sep 2020 – Oct 2020

- Learned different concepts regarding lean manufacturing, inventory management and quality management.
- Completed an online session BLOOM, which was aimed to develop corporate skills such as time management, leadership, and teamwork.

Impact Research Lab UET Peshawar | https://www.uetpeshawar.edu.pk/ |Pakistan
Assisted in ongoing research on impact testing of shale rocks.
Research Intern | July 2019 – September 2019

- Worked under the direct supervision of Prof. Dr. M. A. Irfan (Dean, UET Peshawar) at the Research Impact Lab, Department of Mechanical Engineering.
- Conducted high-strain rate testing using the Hopkinson Pressure Bar, and gained hands-on experience with strain gauges, oscilloscopes, and experimental data analysis.

Pakistan Locomotive Factory Risalpur | Pakistan
Experienced design and rebuilding process of a locomotive and its parts along with its maintenance.
Mechanical Engineering Intern | August 2018 – September 2018

- Gained hands-on exposure to the design and development of locomotive components, including gearboxes, shafts, and structural elements.
- Observed and learned CNC machining processes, including operation of CNC turret lathes and CNC pipe bending machines.

Pakistan Aeronautical Complex | https://pac.org.pk/ |Kamra, Pakistan
Understanding of various processes involved in Rebuilding and Maintenance of Mirage Aircraft and final assembly of JF17 thunder jet.
Mechanical Engineering Intern | July 2018

- Observed core rebuilding and maintenance operations of Mirage aircraft, focusing on structural and system-level processes.
- Gained exposure to quality control protocols and standards at the Mirage Rebuild Factory.
- Experienced the final assembly of the JF-17 Thunder jet, a Pakistan-China joint defense manufacturing project.

Additional Skills

- ***Machine Learning & AI:*** *PyTorch, SciML*
- ***Numerical Simulations:*** *OpenFOAM (Advanced), ANSYS (Intermediate), MATLAB (Intermediate)*
- ***Programming:*** *Python, MATLAB, C++*
- ***Engineering Software:*** *CAD (Intermediate), Microsoft Excel/PowerPoint*
- ***Interests:*** Book Reading (Fiction, Self Help Guides), Playing and watching volleyball
- ***Soft Skills:*** Teamwork, Communication, Time Management.
- ***Languages:*** English, Urdu, Pashto.

Honors and Awards

Online Courses Peshawar, Pakistan

- Master Solidworks 2015 - 3D CAD using real-world examples (2025)
- SolidWorks SURFACING Fundamentals (2025)
- Mastering ANSYS CFD Level 1 -Udemy (2020)
- Pro Engineer CREO Fundamental 3D Design Course -*Udemy* (2020)
- A Hands-on Introduction to Engineering Simulations- edX – Cornell University (2019)

Publications

- **Idrees, H**., Ali, S., Sajid, M., Rashid, M., Khawaja, F.I., Ali, Z., Anwar, M.N. Techno-Economic Analysis of Vacuum Membrane Distillation for Seawater Desalination. Membranes 2023, 13, 339. https://doi.org/10.3390/membranes13030339
- Shoukat, G., **Idrees, H**., Sajid, M. et al. Numerical analysis of permeate flux in reverse osmosis by varying strand geometry. Sci Rep 12, 16636 (2022). https://doi.org/10.1038/s41598-022-20469-0