Gulzar Ali

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Research Interest

Aspiring computational scientist with expertise in fluid mechanics, machine learning, and numerical modeling, seeking to contribute to cutting-edge research in CFD-ML integration.

Education

National University of Sciences and Technology (NUST) Islamabad, Pakistan
Master of Science in Computational Science and Engineering (CSE)
CGPA: 3.4/4.00
Courses: Computing for CSE, Computational Linear Algebra, Applied Mathematics, Advanced Partial Differential Equations, Applied Machine Learning, Data Analysis and Statistics

University of Engineering and Technology (UET) Lahore, Pakistan
Bachelor of Science in Mechanical Engineering

Publications

Ali, G., Khalid, E., Khan, H., & Mushtaq, A. **"CNN-Based Surrogate Model for Rapid Prediction of Flow Fields in Early-Stage Urban Design and Planning."** *5th International Conference on Digital Futures and Transformative Technologies (ICoDT2)*, Islamabad, Pakistan, (To Appear in IEEE Xplore Proceedings, 2025).

Experience

CFD Support Engineer March 2025 – Present
Forbmax
- Developing CFD cases for HPC Frameworks tailored for Clients
- Providing CFD Consultancy for R&D in Academia and Industry

Research Assistant Jan. 2025 – Present
Super Computing Lab
- Investigating Deep Reinforcement Learning methods for RANS closure models
- Improving RANS Simulation for Cold-Wall Hypersonic Flows

Research Assistant Jan. 2025 – Present
Computational Aeronautics Lab
- Development of surrogate model for rapid prediction of urban flows
- Investigating PINNs for mean flow reconstruction for Hill-flow Problem

CFD Applications Developer Jun. 2024 – Oct. 2024
DenseFusion and Redstart Technology Solutions
- Development and optimization of scalable CFD applications
- Hands-on training and problem-solving sessions

Projects

PINNs Framework for Physics Equations | *Python, PyTorch*
- Developed a Physics-Informed Neural Network (PINN) to solve partial differential equations, ensuring physical consistency in data-driven models.

CNN for Flow Approximation on Benchmark CFD Cases | *ANSYS, PyTorch*
- Implemented Convolutional Neural Networks to approximate fluid flow fields, reducing computation time compared to traditional solvers.

Surrogate Model for Rapid Prediction of Urban Flows | *Python, PyTorch*
- Created a deep learning surrogate model for real-time wind comfort and urban flow analysis.

CFD-DL Hybrid Thermal Model For Hotspot Mitigation | *ANSYS, Python*

- Coupled Computational Fluid Dynamics with Deep Learning to predict and mitigate thermal hotspots in electronic cooling systems.

Fluid Flow Simulation in Porous Media | *COMSOL*

- Conducted numerical simulations to analyze pressure drop and permeability within complex porous structures.

Technical Skills

Languages: Python, C/C++, MATLAB
Software's and Operating Systems: ANSYS, COMSOL Multiphysics, OpenFOAM, Linux/Ubuntu
Developer Tools: Git, Docker, Visual Studio Code, PyCharm
Libraries: Pandas, NumPy, Matplotlib, PyTorch, mpi4py, keras

Certifications

- **Developing Scalable CFD Applications Powered by HPC** | *Densefusion* Oct. 2024
- **The Data Science Boot Camp 2022**| *365datascience* Sept. 2022

References

Dr. Rooh Khurram Staff Scientist
Core Labs: KAUST Supercomputing Lab *Saudi Arabia*

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- **Email:** rooh.khurram@kaust.edu.sa

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School of Interdisciplinary Engineering & Sciences (SINES), NUST *Islamabad, PK*

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