ADITYA PHOPALE

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Personal Website

CAREER OBJECTIVE

I aim to merge data-driven modeling with traditional numerical approaches to better understand and predict complex fluid flow dynamics. Through the application of machine learning techniques, I seek to develop models that can accelerate simulations and enhance accuracy compared to current state-of-the-art methods.

EDUCATION

Technical University of Munich *October 2021 - September 2024*
M.Sc. (Hons.), in Computational Science and Engineering,
Bavarian Graduate School of Computational Engineering Overall Grade: 1.5/1

Relevant courses: Scientific Computing, Numerical Programming, Parallel Programming, Lattice Boltzmann method, Turbulent Flow Simulation on HPC Systems, CFD Lab Transcripts

Birla Institute of Technology and Science, Goa *August 2017 - May 2021*
Department of Mechanical Engineering Overall Grade: 9.16/10

EXPERIENCE

Siemens Digital Industries Software May 2023 - April 2024
Working Student

- Conducted research in scientific machine learning as part of my Master's thesis.
- Employed sampled neural networks with domain decomposition to solve partial differential equations.

Numeric Systems GmbH Oct 2022 - April 2023
Working Student

- Executed benchmark CFD cases on Pacefish software.
- Validated results from the software with the wind tunnel experiments.

TECHNICAL SKILLS

Programming Language	C++, Python, Julia, MATLAB
DL frameworks	Pytorch
Version Control	Git
Parallel standards	OpenMP, MPI
Analysis	Tecplot, Paraview

HONOURS AND AWARDS

Bavarian Graduate School of Computational Engineering

Selected for the honours program of Masters in Computational Science and Engineering at the Technical University of Munich. (https://www.bgce.de/)

PROJECTS

Using neural networks with domain decomposition to solve partial differential equations (Masters Thesis @TUM & Siemens) Thesis presentation and Thesis report

- Implemented a method known as ELM to solve partial differential equations using a randomized neural network.
- Focused on improving solution accuracy in my thesis by employing better initialization techniques for neural networks, specifically utilizing the Sampling Where It Matters (SWIM) method and domain decomposition.
- Acquired valuable experience through collaboration on a research problem with industry.

Domain decomposition to accelerate learning of Physics Informed Neural Network (PINN) (Seminar course @TUM) Seminar paper

- Replicated a paper implementing Finite Basis Physics-Informed Neural Network (FBPINN). link
- Implemented overlapping subdomains to solve partial differential equations using Physics-Informed Neural Networks.
- Computed the final solution through additive schwarz domain decomposition.

Improve Building Efficiency for a Better Future (BGCE @TUM & Siemens) Github

- Collaborated with a team to develop an application to enhance building energy efficiency.
- Created a building's thermal model and heating control based on user-provided floor plans.
- Contributed to this project as part of the honors program at BGCE, supervised by Siemens.

Simulating Free Surface Flows using Marker and Cell method (CFD Lab @TUM) Github

- Developed an object-oriented 2D parallel CFD solver in C++ for solving incompressible Navier-Stokes equations using Finite Difference Method (FDM).
- Extended the solver to support free surface flows utilizing the Marker and Cell Method, successfully simulating dam break and tank sloshing scenarios.

Entropically Damped Artificial Compressibility using Compact finite-difference schemes (Undergraduate Thesis @BITS) Thesis report

- Utilized the EDAC technique to obtain solutions for the Navier-Stokes equation, bypassing the pressure Poisson equation by implementing a pressure-evolving equation.
- Extended the existing Fortran codebase for the Rayleigh-Bénard Convection Problem, adding new functionalities and improving performance.

ONLINE COURSES AND CERTIFICATES

Simulation and Modelling of natural processes; Neural Networks and Deep Learning; Improving Deep Neural Networks; Statistical Thermodynamics; Computers, Waves, Simulations