PRANAV BAHL

pbahl@umich.edu : Ann Arbor - Michigan, United States

UK experience highlighted in Red color.

EDUCATION

Master's Degree (MS), Aerospace Engineering (Concentration: Computational and Data Sciences)
University of Michigan, Ann Arbor, Michigan, United States — Aug 2024 - Dec 2025
Rackham Graduate Fellowship

MSc, Advanced Computational Methods for Aeronautics, Flow management and Fluid-Structure Interaction
Imperial College London, London, United Kingdom — Oct 2022 - Oct 2023

Grade: Coursework (45 ECTS) ***Distinction*** | Research thesis (45 ECTS) - ***Distinction***

Thesis: Quantum machine learning (QGRUs & QLSTMs) for high-dimensional chaotic dynamical systems.

- Bench-marking of Quantum enhanced recurrent neural networks (QLSTMs & QGRUs) parameterized and developed via Variational quantum circuits (VQCs) for approximating periodic functions.
- Robust hyper-parameter optimization of the Gated recurrent neural networks (LSTMs & GRUs) via recycle validation and bayesian optimization for chaotic dynamical systems (Lorenz 63' and Lorenz 96' model).

Bachelor of Technology, Mechanical Engineering
Delhi Technological University, Delhi, India — Aug 2017 - Aug 2021
Grade: 8.8 gpa (Out of 10) - Top 15% of class (250 students)
Thesis: State-estimation via Deep Learning : A reduced order modelling approach

EXPERIENCE

Artificial Intelligence and Multiphysics Simulations Lab — Jun 2025 - Present
University of Michigan, Nuclear Engineering Department — *Ann Arbor, Michigan, US*

- Conducting Star-CCM+ CFD simulations of Nuclear reactors for training and validation of various AI/ML deep learning models.

Computational Autonomy Group — August 2024 - May 2025
University of Michigan, Aerospace Engineering Department — *Ann Arbor, Michigan, US*

- Using Tensor train (TT) tensor network latent spaces to train **Gated-recurrent neural networks** [LSTMs, GRUs and RNNs] conditioned on actions for generative modelling of Atari games.
- Implemented Deep Reinforcement Learning (DQN) algorithm to generate various experiences level of atari games via Opengym AI to train generative models.
- Using Hierarchal tucker (HT) tensor network latent spaces to train **Conditional latent diffusion models** [LDM Architecture and DDPM architecture] conditioned on actions for generative modelling of Atari games.

Computational Software Internship — April 2024 - Aug 2024
Schlumberger Information Solutions (SIS) - SLB — *Abingdon, Oxfordshire, England*

- Parameter estimation of low fidelity reservoir simulation models via Particle swarm optimization (PSO) and Uncertainity quantification.
- Parallelization of optimization algorithms via python multi-processing.
- History matching (Bayesian Inference based Data assimilation) of the reservoir simulation and on-site measurements via Ensemble Kalman filters (EnKFs), Ensemble square root kalman filters (EnSRKFs) and Ensemble Smoother MDA (ESMDA).

Research Internship Mar 2021 - Oct 2021
Carnegie Mellon University *Pennsylvania, USA*

- Carried out 2D CFD simulations on OpenFOAM for various laminar and turbulent flow cases and validated the numerical results with the experimental data from the literature. **[Published paper - Physics of fluids]**
- Conceptualized a 3D U-Net based data driven reduced order model (ROM) to preserve and evolve unsteady fluid dynamics which was bench-marked on five data sets. (Turbulent channel flow, Vortex Shedding and SST)

Summer Fellowship (SFRP-2020) Jun 2020 - Aug 2020
IIT Delhi *Delhi, India*

- Developed a state estimation architecture where real-time sequential sensor data is mapped to the ROM state space using Long Short-Term Memory based recurrent neural network to capture the temporal dynamics.**[Published paper - Journal of Computational Physics]**
- Performed and validated CFD simulation for unsteady 2D laminar flow around circular cylinder at multiple Reynolds' number on OpenFOAM and post-processed dataset using MATLAB script, also extracted meteorological data (Sea Surface Temperature, Air Temp., Humidity etc.) from netCDF files using OPeNDAP.

Internship May 2019 - Jul 2019
Forbes Marshall, IIT Madras Research Park *Chennai, India*

- Modelling, simulation and verification of model spray formation from a single hole fuel injector via OpenFOAM.

Unmanned Aerial Systems Nov 2018 - April 2020
Delhi Technological University *Delhi, India*

- Improved the aerodynamic efficiency (Lift/Drag Ratio) of VTOL-UAV by introducing C-curve wing-lets by 10%, thereby enhancing the crashworthiness of the system. Developed a 3D CAD model of the UAV on Solidworks.
- Carried out 3D CFD Simulations using K-omega turbulence model to evaluate the Coefficient of lift and Coefficient of drag of the VTOL-UAV. Numerical experiments were performed on ANSYS Fluent and OpenFOAM.
- Spearheaded a multidisciplinary team of 25 members to develop indigenous UAVs for defense and commercial applications. Conducted test flights using exhaustive checklists ensuring rapid development of the final system.

JOURNAL PUBLICATIONS

Total Citations: 134 | Google Scholar Link

- Pant, Pranshu, Ruchit Doshi, **Pranav Bahl**, and Amir Barati Farimani. "Deep learning for reduced order modelling and efficient temporal evolution of fluid simulations." **Physics of Fluids** 33, no. 10 (2021): 107101.
- Kumar, Yash, **Pranav Bahl**, and Souvik Chakraborty. "State estimation with limited sensors–A deep learning based approach." **Journal of Computational Physics** 457 (2022): 111081.

SKILLS

Programming :	Python (Optimized tensor libraries : PyTorch & TensorFlow, Qiskit, NumPy, SciPy Pandas, matplotlib, pandas, Optuna, scikit-learn), Overleaf/LATEX, C/C++, Fortran
CFD/CAD Software :	ANSYS Fluent, STAR-CCM+, OpenFOAM, SolidWorks, Nektar++
Other Tools :	MATLAB, Microsoft Office (Excel & Powerpoint), Unix/Linux, SQL

LEADERSHIP

- **Class Representative:** MSc, Aeronautics Department, Imperial College London

  Collecting feedback and communicating student concerns with the faculty at Aeronautics Department.

- **President:** American Society of Mechanical Engineers, DTU Chapter

  Organized E-Fest and various workshops on OpenFOAM.