Sujal Dave

sujal.dave@schulich.ucalgary.ca | | | |

Education

University of Calgary *Canada*

PhD Mechanical Engineering (GPA:4.0/4.0) *May 2021 - Jul 2025*

- Advisor: Dr. Artem Korobenko
- Advancing the in-house wind turbine simulation tool for faster and accurate wind farm simulations using ALM for environmental flows. Investigating the role of atmospheric stratification on wind turbine wake in different layouts.
- Developed and integrated projection-based reduced-order modeling utility for in-house fluid flow solver written using **FORTRAN** and **OpenMPI** for turbulent flow simulations. Developing neural network based efficiency enhancement for reduced order models using **PyTorch** and **Tensorflow**. Exploring non-intrusive techniques like DMD and PINNs.
- Consistent use of **HPC** clusters available locally (ARC UCalgary) and nationally (Digital Research Alliance of Canada) to run simulations ranging from few thousand elements to couple million elements. Employed remote visualization techniques.
- Utilized a range of specialized software tools, including **ANSA** and **Rhino** for complex meshing, **VisIt** and **ParaView** for CFD post-processing and **MATLAB** and **Python** for data analysis.

Scuola Internazionale Superiore di Studi Avanzati (SISSA) *Italy*

Research Exchange Student *Mar 2023 - Aug 2023*

- Advisor: Dr. Gianluigi Rozza
- Conducted collaborative research with leading researchers through the Mitacs Globalink research award. Acquired in-depth knowledge of reduced order modeling methodologies and implemented a reduced order modeling framework.
- Explored interdisciplinary research topics on applied mathematics with peers in the field of uncertainity quantification (UQ), scientific machine-learning (SciML) and fractional calculus among others.
- Attended seminars and courses from established professors and learnt basic concepts of new and upcoming simulation tools like **RBniCS** and **PINA**.

KTH Royal University *Sweden*

Summer School on Physics-informed Neural Networks *Jun 2023*

- Teachers: Dr. Geoge Em Karniadakis & Dr. Khemraj Shukla
- Completed a two-week intensive summer school on Physics-Informed Neural Networks (PINNs) at KTH Royal Institute of Technology, earning **5 ECTS credits (or 125 study hours)**. Gained hands-on experience with TensorFlow, PyTorch, and **JAX**, with applications to scientific machine learning and PDEs.
- Collaborated with international researchers, resulting in a conference paper and poster presentation at an AI-focused workshop on differential equations in science.
- Developed advanced skills in implementing PINNs for various applications, including UQ and multi-GPU training, utilizing tools like **DeepXDE** and NVIDIA **Modulus**.

North Carolina State University *United States of America*

MS (Thesis) Mechanical Engineering (GPA:3.9/4.0) *Aug 2018 - Dec 2020*

- Advisor: Dr. Clement Kleinstreuer
- Developed a hybrid Computational Fluid-Particle Dynamics (CFPD) and Physiologically Based Pharmacokinetic (PBPK) model to predict drug transfer from the nasal cavity to the bloodstream.
- Demonstrated high accuracy of the model with a deviation of less than 7% from in vivo data for various corticosteroids, providing robust predictions for drug absorption and plasma concentrations.
- Explored the impact of drug solubility and partition coefficients on plasma concentration, showcasing the model's ability to inform nasal drug formulation and dosage optimization.
- Conducted simulations by successfully integrating fluid-particle dynamics with pharmacokinetics for patient-specific intranasal drug delivery analysis.
- Utilized specialized software tools, including **OpenFOAM** as a CFD solver and **ANSYS-ICEM** to mesh nasal and lung geometries.

Institue of Technology, Nirma University *India*

B.Tech Mechanical Engineering (GPA:8/10) *Aug 2014 - May 2018*

- Minor in Finance
- Undergrad research advisor: Dr. Sanjay Jain
- Advanced the low-speed wind tunnel at the university by installing new smoke visualization techniques.
- Conducted computational based research as undergrad final project on the topic "Design and efficiency of centrifugal compressor" and presented at the university-level conference organized by Taylor & Francis.
- Utilized specialized software tools **ANSYS-Fluent** and **ANSYS-CFX** for computing flow field of a centrifugal pump.

Professional Experience

	Multiphysics Developer Intern, BosonQ Psi (BQP) Private Ltd.
Mar-Apr 2021	Conducted foundational research on applying quantum computing techniques to linear solvers for CFD simulations and developed a finite element utility from scratch for linear elasticity applications.
	CFD Summer Intern, Ingersoll Rand (India) Ltd.
May-Jun 2017	Gained hands-on experience in CFD using ANSYS to mesh and simulate internal flow within a centrifugal compressor and optimized compressor performance by using wet compression technology.
	Mechanical Engineering Intern, Reliance Industries Ltd.
Dec 2016	Assisted in the maintenance of a planetary gear pump and an induced draft cooling tower, gaining practical skills in the mechanical workshop.

Publications

Published

Dave S, Korobenko A. 2025. Consistent reduced order modeling for wind turbine wakes using variational multiscale method and actuator line model. *Computer Methods in Applied Mechanics and Engineering.*

Dave S, Korobenko A. 2025. Predicting smooth body flow separation with finite-element-based variational multiscale formulation. *Computational Mechanics.*

Jnini A, Goordoyal H, **Dave S**, Korobenko A, Vella F, Fraser K. 2024. Physics-constrained DeepONet for surrogate CFD models: a curved bachward-facing step case. *ICLR 2024 workshop on AI4DifferentialEquations in Science.*

Dave S, Korobenko A. 2023. Modelling smooth-body flow separation with variational multiscale method, finite elements and weakly enforced Dirichlet boundary conditions. *14^{th} International ERCOFTAC symposium on engineering turbulence modeling and measurements.*

Larsson J, Bermejo-Moreno I, Garmann D, Rizzetta D, Baurle R, Mukha T, Toosi S, Schlatter P, Brehm C, Ganju S, Kahraman AB, van Noordt W, Wang ZJ, Duan Z, Blind M, Beck A, **Dave S**, Korobenko A, Strasser W, Zangeneh R, Guzik S, Walters S, Galbraith MC. 2023. Summary of the smooth body separation test case at the 2022 high fidelity CFD verification workshop. *2022 AIAA SciTech Forum and Exposition.*

Dave S, Kleinstreuer C, Chari S. 2022. An effective pbpk model predicting dissolved drug transfer from a representative nasal cavity to the blood stream. *Journal of Aerosol Science.*

In Prep

Dave S, Korobenko A. Reduced order modeling for multiple wind turbine wakes.

Regmi A, **Dave S**, Korobenko A. Wind turbine wake simulations for stratified flows with variational multiscale method and actuator line method

Scholarships & Awards

2025	**Departmental Conference Award**, MME Department, University of Calgary	*CA$ 750*
2024	**Alka and Sanjeev Khanna Graduate Scholarship**, MME Department, University of Calgary	*CA$ 10,000*
	Departmental Conference Award, MME Department, University of Calgary	*CA$ 500*
	Travel Award, Canadian Association for Computational Science and Engineering (CACSE)	*CA$ 750*
2023	**Eyes High International Doctoral Scholarship**, University of Calgary	*CA$ 15,000*
	Mitacs Globalink Research Award, Mitacs Canada	*CA$ 6,000*
2021	**Alka and Sanjeev Khanna Graduate Scholarship**, MME Department, University of Calgary	*CA$ 10,000*

Conference Presentations

Dave S, Korobenko A. 2025. ROM-VMS formulation for environmental flows and wind energy applications. 3^{rd} IACM Digital Twins in Engineering Conference (DTE 2025), Paris, France.

Dave S, Korobenko A. 2024. Reduced order modeling of wind turbines using variational multiscale method. Canadian Wind Energy Research Network (CWERN) Fall 2024 Meeting, Calgary, Canada.

Dave S, Korobenko A. 2024. Projection-based model order reduction of environmental flows using FEM-based variational multiscale method. 16^{th} World Congress on Computational Mechanics (WCCM), Vancouver, Canada.

Dave S, Korobenko A. 2024. Projection-based model order reduction of turbulent flows. Mechanical and Manufacturing Graduate Student Conference, Calgary, Canada.

Dave S, Korobenko A. 2024. Physics-constrained DeepONet for surrogate CFD models: a curved bachward-facing step case. Poster Presentation at ICLR 2024 Workshop on AI4DifferentialEquations in Science, Vienna, Austria.

Dave S, Korobenko A. 2023. Modeling smooth-body flow separation with variational multiscale method, finite elements and weakly enforced Dirichlet boundary conditions. 14^{th} International ERCOFTAC symposium on engineering turbulence modeling and measurements, Barcelona, Spain.

Dave S, Korobenko A. 2023. Variational multiscale framework with Isogeometric analysis for smooth body flow separation in aerospace and environmental applications. 1^{st} International Conference on Math 2 Product (M2P), Taormina, Italy.

Dave S, Korobenko A. 2023. Reduced order modeling with variational multiscale method. 22^{nd} Computational Fluids Conference (CFC), Cannes, France.

Dave S, Korobenko A. 2022. Predicting smooth body flow separation using isogeometric analysis and variational multi-scale method. 10^{th} International Conference on Isogeometric Analysis (IGA), Banff, Canada.

Dave S, Korobenko A. 2022. Application of variational multiscale methods and weakly enforced Dirichlet boundary condition for smooth-body separation. 1^{st} High-Fidelity CFD Workshop at AIAA SciTech 2022, San Diego, USA.

Dave S, Korobenko A. 2022. Predicting smooth body flow separation using variational multiscale method and weak-Dirichlet boundary conditions. Mechanical and Manufacturing Graduate Student Conference, Calgary, Canada.

Teaching Experience

Winter 2025	**Computational Fluid Dynamics**, Teaching Assistant (*taught ANSA & OpenFOAM*)
Fall 2024	**Aerodynamics**, Teaching Assistant (*taught ANSYS-Fluent*)
Winter 2024	**Computational Fluid Dynamics**, Teaching Assistant (*taught ANSA & OpenFOAM*)
Fall 2023	**Finite Element Method**, Teaching Assistant (*taught ANSA*)
Fall 2022	**Aerodynamics**, Teaching Assistant (*taught ANSYS-Fluent*)
Winter 2022	**Fundamental of Fluid Mechanics**, Teaching Assistant
Spring 2020	**Foundations of Fluid Dynamics**, Grading Assistant

Mentoring

2025 **Ciara Browne**, Undergraduate Student, University of Toronto
2024-2025 **Manal Chaudhry**, Undergraduate Student, University of Calgary
2024-2025 **Olivia Ikeri**, Undergraduate Student, University of Calgary
2024-2025 **April Bushrod**, Undergraduate Student, University of Calgary
2024 **Hannah Blakeley**, Undergraduate Student, University of Calgary

Outreach & Professional Development

Service and Outreach

2023-2024 **Women in Science and Engineering (WISE) Research Night**, Research Ambassador
2016-2017 **Mechanical Engineering Student Association (MESA)**, General Secretary
2015 **Make A Difference (MAD) NGO**, Volunteer