VISHAL SRIVASTAVA

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SUMMARY

SciML researcher and engineer with 9+ years of experience at the intersection of computational science and machine learning. Specialist in developing data-driven surrogate models, physics-constrained neural network architectures, and generalizable model augmentations for multi-physics simulations. Proven track record building end-to-end frameworks that blend conventional PDE solvers with deep learning to deliver production-quality improvements in predictive accuracy. Actively contributing to a GPU-native CFD solver and familiar with the NVIDIA PhysicsNeMo ecosystem.

TECHNICAL SKILLS

- Languages & Paradigms: Python, C/C++, FORTRAN | MPI/OpenMP (distributed), CUDA (GPU-accelerated), modular and object-oriented programming, AI-accelerated development (Claude Code, Cursor)
- ML Frameworks: PyTorch (with DDP), PhysicsNeMo | FNOs/AFNOs, DeepONets, MeshGraphNets, PINNs, CNNs, diffusion models, implicit neural representations
- Scientific Computing: PETSc, SU2, METIS/ParMETIS, ADOL-C, CoDiPack, DAKOTA | Nonlinear PDE solvers, adjoint methods, inverse problems
- Visualization & Data: ParaView, PyVista, Tecplot, Matplotlib, Plotly | pandas, NumPy, Numba
- Infrastructure: Docker, Git, Linux/HPC clusters, multi-node GPU training

EDUCATION

University of Michigan, Ann Arbor 2016 – 2022
PhD, Aerospace Engineering | GPA: 4.0/4.0
Thesis: *Generalizable Data-driven Model Augmentations Using Learning and Inference Assisted by Feature-space Engineering*
Advisor: Prof. Karthik Duraisamy (Computational Aerosciences Laboratory)

Indian Institute of Technology, Kanpur 2012 – 2016
B.Tech., Aerospace Engineering | GPA: 9.5/10.0
General Proficiency Medal — Best academic performance in graduating class (Aerospace Engineering)

PROFESSIONAL EXPERIENCE

Flexcompute Watertown, MA
Senior Scientist Oct 2025 – Present

- Developing/improving features for the upcoming GeometryAI tool within our flagship CFD solver Flow360
- Developing adaptive surrogate architectures that leverage active learning for design and control algorithms
- Contributing to development, testing, and code review across a large-scale production codebase with CI/CD workflows

NASA Langley Research Center (via contractors) Hampton, VA
Aerospace Engineer, Senior — Analytical Mechanics Associates Jan 2024 – Oct 2025
Engineer, Staff — Analytical Mechanics Associates Jun 2023 – Dec 2023
Research Engineer I — National Institute of Aerospace Jul 2022 – May 2023

- Developed generalizable data-driven turbulence model augmentations for RANS simulations, improving predictive accuracy for separation and reattachment across multiple flow regimes
- Built ML-based surrogate models using DeepONets, CNNs, and autoencoders to accelerate boundary-layer transition predictions, reducing computational cost by orders of magnitude vs. high-fidelity approaches
- Validated augmented models on benchmark configurations of engineering interest in collaboration with NASA Langley researchers; published at AIAA SciTech and ERCOFTAC ETMM14
- Applied DeepONet-assisted optimization to surface topography design for transition delay in Mach 4.5 boundary layers, demonstrating multi-physics and cross-domain applicability of surrogate methods

University of Michigan, Ann Arbor Ann Arbor, MI
Postdoctoral Fellow / Graduate Research Assistant Aug 2016 – Jul 2022

- Designed and built end-to-end computational frameworks integrating nonlinear PDE solvers, algorithmic differentiation (adjoint-driven inverse problems), and neural networks in a seamless manner

- Developed model-consistent inference and learning approaches enabling generalizable improvements in predictive accuracy with minimal training data; published in Physical Review Fluids
- Extended a physics-constrained integrated inference and machine learning framework to fuel cell modeling (published in Computational Mechanics), demonstrating cross-domain applicability to energy systems
- Quantified structural uncertainties in fluid flow models for robust design optimization under epistemic uncertainties; applied to aircraft engine nozzle design (published at the AIAA SciTech Forum)

PUBLICATIONS

- **Srivastava & Duraisamy (2021).** Generalizable physics-constrained modeling using learning and inference assisted by feature-space engineering. *Physical Review Fluids, 6(12), 124602.*
- **Srivastava, Sulzer, Mohtat, Siegel & Duraisamy (2023).** A non-intrusive approach for physics-constrained learning with application to fuel cell modeling. *Computational Mechanics, 72(2), 411–430.*
- **Srivastava, Rumsey, Coleman & Wang (2024).** On Generalizably Improving RANS Predictions of Flow Separation and Reattachment. *AIAA SciTech 2024.*
- **Hildebrand, Srivastava, Zaki & Choudhari (2023).** DeepONet-Assisted Optimization of Surface Topography for Transition Delay in a Mach 4.5 Boundary Layer. *ERCOFTAC ETMM14.*
- **Hildebrand, Choudhari, Venkatachari & Srivastava (2023).** Recent progress on RANS-based transition model verification. *ERCOFTAC ETMM14.*
- **Choudhari, Beyak, Hildebrand, Li, Vogel, Paredes, Srivastava & Venkatachari (2024).** Transition modeling in support of CFD Vision 2030 — Highlights of recent efforts at the NASA Langley Research Center. *34th Congress of the International Council of the Aeronautical Sciences (ICAS), Florence.*
- **Srivastava & Duraisamy (2022).** Towards a generalizable data-driven approach to predict separation-induced transition. *12th International Symposium on Turbulence and Shear Flow Phenomena (TSFP12).*
- **Srivastava & Duraisamy (2018).** Aerodynamic design of aircraft engine nozzles with consideration of model form uncertainties. *2018 AIAA Non-Deterministic Approaches Conference (AIAA SciTech Forum).*

BOOK CHAPTERS

- **Duraisamy & Srivastava (2025).** Machine learning augmented modeling of turbulence. *In Data Driven Analysis and Modeling of Turbulent Flows, pp. 311–354, Academic Press.*

INVITED TALKS / GUEST LECTURES

- Data-driven Improvements in RANS Predictions for Reattachment of Separated Flows. *137th NIA CFD Seminar, National Institute of Aerospace, Hampton, VA (2025)*
- An Introduction to Machine Learning for Turbulence Modeling. *MAE298: Fundamentals of Turbulence Modeling (Dr. Camli Badrya), UC Davis (2024)*
- Developing Data-Augmented Turbulence Models using Field Inversion and Machine Learning. *120th NIA CFD Seminar, National Institute of Aerospace, Hampton, VA (2019)*