Siva Viknesh Portfolio Website

Contact Information
Scientific Computing & Imaging Institute,
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Research Interests
Scientific Machine Learning, Computational Fluid Mechanics, Unsteady Aerodynamics, Wildfire Dynamics

Education

University of Utah, Salt Lake City, Utah, USA

Ph.D., Mechanical Engineering, **CPI: 3.88/4** 08/2022 – 05/2026 (Expected)

Advisor: Dr. Amirhossein Arzani

- *Towards Interpretable & Differentiable Machine Learning for Fluid Flows*

Indian Institute of Technology Kanpur, India

M.S., Aerospace Engineering (Aerodynamics), **CPI: 8.33/10** 01/2018 – 07/2020

Advisor: Dr. Kamal Poddar & Dr. Tapan K. Sengupta

- *Control of Separated Flow on a Symmetric Airfoil by Pitching Oscillation*

Anna University, Chennai, India

B.E., Aeronautical Engineering, **CPI: 8.30/10** 08/2012 – 05/2016

Advisor: Dr. Shanmugaraja M

- *Numerical Simulation of Fluid Flow over a Rectangular Wing – Wingtip Slots*

Work Experience

Graduate Student Researcher 05/2025 – Present

CAI-2 Group, Los Alamos National Laboratory, New Mexico, USA

- **Statistical Shape Modeling** of DEM terrains for Wildfire simulations.

Graduate Research Assistant 08/2022 – Present

SCI Institute, University of Utah, Utah, USA

- **Differentiable Autoencoding Neural Operator** combining mesh-invariant dimensionality reduction with differentiable PDE solvers.
- **GPU-accelerated 2D Wildfire Transport PDE solver**, leveraging CUDA and Finite Difference Method.
- **ADAM-SINDy**, a differentiable optimization framework for Nonlinear Dynamical System Identification.

Aerodynamics Engineer 09/2021 – 08/2022

The ePlane Company, IIT Madras, Chennai, India

- Formulated an **FVM solver template** for 3D **URANS MRF simulations**, reducing validation error by $\sim 30\%$.
- Developed **Custom UDF programs**, generate unsteady freestream conditions for calculating **dynamic stability derivatives**.

Senior Research Associate 01/2021 – 08/2021

Department of Aerospace Engineering, IIT Kanpur, India

Associate – Content Development 08/2020 – 01/2021

BYJU'S, Bengaluru, India

Student Research Associate 01/2018 – 07/2020
Department of Aerospace Engineering, IIT Kanpur, India

- Implemented **2D - Orthogonal grid generation** in Fortran.
- Developed a **2D DNS/LES compressible PDE solver** using MPI-Fortran.
- Built a **Data-Driven Unsteady Aerodynamic Model** based on Fourier basis.
- Wrote MATLAB scripts to evaluate the **Spectral Resolution of numerical derivative schemes**.
- Performed **Unsteady Pressure**, **Hot-wire** and **Time-resolved PIV** measurements on oscillating wings.

CFD Engineer 05/2016 – 11/2017
FlowXplore - CAE Associates, Coimbatore, India

Publications

1. **Differentiable Autoencoding Neural Operator for Interpretable and Integrable Latent Space Modeling**, **S. Viknesh**, A. Arzani, Submitted, 2025.
2. **Data-Driven System Identification in Cancer Systems Biology: A Multiscale Modeling Approach to Melanoma**, C. Christenson, **S. Viknesh**, R. Judson-Torres, A. Arzani, Submitted, 2025.
3. **ADAM-SINDy: An Efficient Optimization Framework for Parameterized Nonlinear Dynamical System Identification**, **S. Viknesh**, Y. Tatari, C. Christenson, A. Arzani, Submitted, 2025.
4. **Role of flow topology in wind-driven wildfire propagation**, **S. Viknesh**, A. Tohidi, F. Afghah, R. Stoll, A. Arzani, **Physics of Fluids**, May 2025.
5. **Active control of separated flow on a symmetric airfoil by pitching oscillation**, **S. Viknesh**, K. Poddar, **Physics of Fluids**, August 2021.
6. **Grid sensitivity and role of error in computing a lid-driven cavity problem**, V. K. Suman, **S. Viknesh**, M. K. Tekriwal, S. Bhaumik, T. K. Sengupta, **Physical Review E**, Jan 2019.

Technical Skills

- PyTorch
- CuPy
- NI LabVIEW
- MPI Fortran
- GPU/CPU solvers
- MATLAB

Teaching Experience

ME EN 2450 – Numerical Methods for Engineering Systems Fall 2024
Instructor: Dr. Rob Stoll, University of Utah

AE 698A – Intro to Virtual Instrumentation Spring 2020
Instructor: Dr. Kamal Poddar, IIT Kanpur

AE 351A – Experiments in Aerospace Engineering I Fall 2019
Instructor: Dr. Dehobam Das, IIT Kanpur

AE 698A – Intro to Virtual Instrumentation Spring 2019
Instructor: Dr. Kamal Poddar, IIT Kanpur

Activities & Achievements

- Reviewed research papers for the **Physics of Fluids** journal.
- **President & Admin**, Tamil Club at IIT Kanpur (Jan 2019 – Sep 2021).
- Awarded a **Full Scholarship** for pursuing the M.S. program at IIT Kanpur.
- Achieved All India Rank **141** & **540** in GATE AE 2017 and 2016.
- Secured **Undergraduate University Rank 38** across Tamil Nadu state.
- **Inter-department Chess Champion** – 2013-2015.
- **Inter-department Badminton Runner** – 2014 & 2015.