Siva Viknesh

Email | Mobile | Google Scholar | LinkedIn | GitHub | Website

Passionate about developing **Hybrid Physics–ML frameworks**, integrating data-driven and physics models for spatio-temporal modeling tasks and extracting interpretable insights from data, with both scientific rigor and practical impact.

EDUCATION

Ph.D., Mechanical Engineering, **The University of Utah**, Utah, USA — Aug 2022 – Present
Towards Interpretable & Differentiable Machine Learning for Fluid Flows — CPI : 3.89/4
Advisor: **Dr. Amir Arzani**

M.S., Aerospace Engineering, **Indian Institute of Technology Kanpur**, India — Jan 2018 – May 2020
Control of separated flow on a Symmetric Airfoil by Pitching Oscillation — CPI : 8.33/10
Advisor: **Dr. Kamal Poddar** & **Dr. Tapan K. Sengupta**

B.E., Aeronautical Engineering, **Anna University**, Tamilnadu, India — Aug 2012 – May 2016
Numerical Simulation of Fluid Flow over a Rectangular Wing - Wingtip Slots — CPI : 8.30/10
Advisor: **Dr. Shanmugaraja M**

WORK EXPERIENCE

Graduate Student, Los Alamos National Laboratory, New Mexico, USA — May 2025 – Present
- **Statistical Shape Modeling** — ML pipeline for DEM terrain modeling applied to wildfire containment.

Graduate Research Assistant, SCI Institute, University of Utah, Utah, USA — Aug 2022 – Present
- **Differentiable FEM PDE solvers,** for solving thin boundary layers & inferring unknown parameters from data.
- **Differentiable Autoencoding Neural Operator**, integrating Operator learning 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.
- **Inverse PINN framework** for inferring unknown transient boundary conditions for patient-specific artery flows.

Aerodynamics Engineer, The ePlane Company, IIT Madras, Chennai, India — Sep 2021 – Aug 2022
- **Led a transdisciplinary aerodynamic project**, coordinating teams – **CFD, experiments, and external partners**.
- **FVM solver template** for 3D **URANS MRF simulations**, reducing the validation error of $\sim 30\%$.
- **Custom UDF programs** to generate unsteady boundary conditions for **dynamic stability derivatives** calculations.

Senior Research Associate, Aerospace Engineering Dept., IIT Kanpur, India — Jan 2021 – Aug 2021
- Simultaneous Time-resolved PIV and Pressure Measurements on Pitching Airfoils.
- **Mentored** master's and undergraduate students in their thesis research involving experimental measurements.

Associate – Content Development, BYJU'S, Bengaluru, India — Aug 2020 – Jan 2021
- Developed Mathematics content for the high school syllabus.

Student Research Associate, Aerospace Engineering Dept., IIT Kanpur, India — Jan 2018 – Jul 2020
- Developed a **2D DNS/LES compressible PDE solver** using MPI-Fortran.
- **Unsteady Pressure**, **Hot-wire**, and **Time-resolved PIV** measurements on oscillating wings.

CFD Engineer, FlowXplore - CAE Associates, Coimbatore, India — May 2016 – Nov 2017
- **RANS simulations** of Wind Turbines using the MRF technique.

TECHNICAL SKILLS

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

JOURNAL PUBLICATIONS

- **Differentiable Autoencoding Neural Operator for Interpretable and Integrable Latent Space Modeling**, **S. Viknesh**, A. Arzani, Submitted, 2025.
- **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.
- **ADAM-SINDy: An Efficient Optimization Framework for Parameterized Nonlinear Dynamical System Identification**, **S. Viknesh**, Y. Tatari, C. Christenson, A. Arzani, **Phys. Rev. Research**, (close to acceptance) 2025.
- **Role of flow topology in wind-driven wildfire propagation**, **S. Viknesh**, A. Tohidi, F. Afghah, R. Stoll, A. Arzani, **Physics of Fluids**, May 2025.
- **Active control of separated flow on a symmetric airfoil by pitching oscillation**, **S. Viknesh**, K. Poddar, **Physics of Fluids**, August 2021.
- **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, **Phys. Rev. E**, Jan 2019.

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.
- Inter-department **Chess Champion & Badminton Runner** – 2013-2015.