

# THIVIN ANANDH

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[thivinanandh.github.io](https://thivinanandh.github.io) | [Github](#) | [LinkedIn](#) | [Google Scholar](#)

[Stack Overflow](#) | [Scicomp Stack Exchange](#)

## OVERVIEW

**PhD** in computational and Datasciences from the Indian Institute of Science (IISc) Bangalore, specializing in Scientific Machine Learning (SciML), Finite Element Methods, and High Performance Computing (HPC) with 5+ publications in top journals. Passionate about developing efficient and scalable algorithms that combine modern ML techniques with HPC to solve complex problems in physics.

## EXPERIENCE

**TOTAL: 2 YEARS 5 MONTHS**

- Data Scientist** Bangalore, India  
*Zenteiq AI Tech* Oct 2024 - Present
  - Developing Action Models for Scientific ML for solving PDE's using PINNs and Neural Operators
- Software Engineer** Chennai, India  
*Accenture India Pvt Ltd.* Jun 2015 - Jul 2017
  - Developed automated testing routines for financial products at First Data
  - Awarded: ACE Gold Standard Team award (Accenture's highest recognition); Exide Innovator Award (for automation initiative saving client \$3K/annum)

## EDUCATION

- Ph.D. in Computational and Data Sciences | Advisor: Prof. Sashikumaar Ganesan** CGPA: 8.0/10  
*Indian Institute of Science, Bangalore, India* 2018 - 2024
  - Thesis: "Improving hp-Variational Physics-Informed Neural Networks: A Tensor-driven Framework for Complex Geometries, and Singularly Perturbed and Fluid Flow Problems"
  - Worked on Industry Collaboration projects with ITC Research India (HPC), Shell Research India (SciML).
- Bachelor of Engineering (Mechanical)** GPA: 8.6/10  
*Anna University, Chennai, India* 2011 - 2015
  - Gold Medalist for overall best outgoing student (2011-2015 batch)

## PUBLICATIONS

### Journal Articles

- T. Anandh et. al, "Improving hp-Variational Physics-Informed Neural Networks for Steady-State Convection-Dominated Problems." *Computer Methods in Applied Mechanics and Engineering (CMAME)*, 2024 [[A](#)] [[G](#)] [[S](#)]
- T. Anandh et. al, "FastVPINNs: Tensor-Driven Acceleration of VPINNs for Complex Geometries." *SIAM Journal on Scientific Computing (SIAM-SISC)*, Accepted for Publication, 2024 [[A](#)] [[G](#)] [[S](#)]
- T. Anandh et. al, "FastVPINNs: An efficient tensor-based Python library for solving partial differential equations using hp-Variational Physics Informed Neural Networks." *Journal of Open Source Software*, 2024 [[A](#)] [[G](#)] [[S](#)]
- T. Anandh et. al, "An efficient hp-Variational Physics Informed Neural Network framework for Incompressible Navier-Stokes equations." *arXiv preprint*, 2024 [[A](#)] [[G](#)] [[S](#)]
- S. M. Joshi, T. Anandh, B. Teja, S. Ganesan, "On the choice of hyper-parameters of artificial neural networks for stabilized finite element schemes." *International Journal of Advances in Engineering Sciences and Applied Mathematics*, 2021 [[A](#)] [[S](#)]
- S. Ganesan, D. Subramani, T. Anandh, D. Ghose, G. R. Babu, "Ensemble forecast of COVID-19 in Karnataka for vulnerability assessment and policy interventions." *medRxiv preprint*, 2021 [[A](#)] [[S](#)]

### Conference Proceedings

- T. Anandh et. al, "Fast and Efficient hp-Variational PINNS framework for solving the Incompressible Navier-Stokes equations." *International Conference on Computational Fluid Dynamics (ICCFD-12)*, Kobe, Japan, 2024 [[A](#)]
- T. Anandh et. al, "GPU-Accelerated FEM-Based Lagrangian Particle Tracking Framework for Human Air Pathway." *ParCFD-2024, University Club Bonn, Germany*, 2024 [[S](#)]

- S. M. Joshi, T. Anandh, S. Ganesan, "A Deep Learning Simulation Framework for Building Digital Twins of Wind Farms: Concepts and Roadmap." *12th International Conference on Simulation and Modeling Methodologies, Technologies and Applications (SIMULTECH-2022), Lisbon, Portugal, 2024* [\[A\]](#) [\[S\]](#)

## Book Chapters

- S. Ganesan, B. Teja, T. Anandh, "Computational Ship Hydrodynamics: Modeling and Simulation." *Computational Science and its Applications, 1st edition, Taylor & Francis, 2020* [\[A\]](#)

## SKILLS

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- **Programming Languages:** C, C++, Python
- **High Performance Computing:** MPI, OpenMP, CUDA, pympi, OpenACC, Triton\*
- **Machine Learning & AI:** TensorFlow, scikit-learn, flask, DeepXDE (PINNs), Jax\*
- **Scientific Computing:** deal.II, Gmsh, CMake, Paraview
- **MLOPs:** Git, DVC, GitHub Actions, Docker, Kubernetes, Jenkins\*
- **Monitoring Tools** Prometheus\* , Grafana\*
- **Web Dev:** HTML, CSS, Javascript, p5.js

Skills marked with \* indicate beginner-level proficiency






## HONORS AND AWARDS






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- **Best Poster Award** - IGHASC, Heidelberg University, Germany Oct 2024  
Presentation titled: Variational PINNs for Singularly Perturbed PDE's
- **Best Presentation Award (AI/ML Track)** - EECS, IISc Feb 2024  
Presentation titled: FastVPINNs: Efficient hp-Variational PINNs for large scale simulations
- **Best Presentation Award (AI/ML Track)** - EECS, IISc Feb 2023  
Presentation titled: Large Scale - AI Augmented simulations for wind farms, IISc, India
- **Gold Medalist - Best Outgoing Student** - KEC Jul 2015






## PROJECTS

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- **FastVPINNs: Fast and efficient hp-Variational Physics-Informed Neural Networks** [Github](#)   
Skills: TensorFlow | CI/CD | Docker | SciML
  - \* Developed a tensor-based computational framework achieving 100x speedup in training time for solving PDEs using hp-VPINNs
  - \* Extended framework to handle complex geometries and inverse problems and demonstrated a 1.5x speedup over conventional PINNs
- **GPU-Accelerated Particle Tracking** [Github](#)   
Skills: CUDA (GPU) | C++ | FEM | CFD; *Industry Collaboration Project*
  - \* Developed GPU-accelerated FEM-based Lagrangian particle tracking framework for human airway simulations, achieving 100x speedup over sequential and 8x over OpenMP implementations
  - \* Designed efficient zonal-based particle searching algorithms and optimized FEM data structures for GPU computation, reducing simulation time from days to hours
- **hp-VPINNs for Incompressible Navier-Stokes Equations** [Github](#)   
Skills: TensorFlow | CFD | SciML; *In collaboration with Shell Research India Pvt Ltd.*
  - \* Extended FastVPINNs framework for vector-valued PDEs, achieving successful solutions for Incompressible Navier-Stokes equations
  - \* Achieved a 2x speedup on solving benchmark problems like Falker-Skan, Flow past backward facing step and also in solving Inverse Problems when compared with PINNs in literature
- **SUPG Stabilized VPINNs for Convection-Dominated Problems** [Github](#)   
Skills: Tensorflow | SciML | FEM
  - \* Incorporated SUPG stabilization technique for VPINNs to handle convection-dominated flows
  - \* Proposed novel architectures to handle stabilization parameter prediction and ansatz functions for boundaries.
- **Contact Tracing Algorithm using OpenMP and CUDA** [Github](#)   
Skills: CUDA | OpenMP | Parallel Computing

- \* Engineered a hybrid OpenMP-CUDA based asynchronous contact tracing system with parallel file I/O optimization
- \* Achieved 3x speedup over baseline with additional 25% performance gain through CUDA stream-based memory transfer overlapping
- **Digital Shadow Framework for Wind Farms** [Github](#)   
Skills: DMD | PINNs; *In Collaboration with Shell Research India Pvt Ltd*
  - \* Developed a hybrid PINNs-DMD framework for real-time monitoring of wind farms using reduced-order models to be deployed on Edge Devices.
- **Asynchronous Mesh movement computations in GPU for ALE-FEM Framework** [Github](#)   
Skills: CUDA | C++ | HPC; *Parallel Programming, Course Capstone Project*
  - \* Implemented asynchronous mesh movement computations in GPU using CUDA streams, overlapping computation with data transfers for improved performance
  - \* Optimized FEM data structure transfer between CPU-GPU using mapped memory and developed CUDA kernels for cell parameter calculations
- **3D FEM-ALE Free Surface Flow Simulation** [Github](#)   
C++ | ParMooN | ALE-FEM | CFD
  - \* Developed 3D ALE-FEM solver for free surface flows using ParMooN library, incorporating mesh deformation techniques for curved surfaces and mesh movement algorithms
- **COVID-19 Ensemble Forecasting** [Github](#)   
FEM | Statistics
  - \* Created ensemble forecast model with 972 scenarios for COVID-19 Wave-3 prediction in Karnataka, analyzing key factors like vaccination rates and behavioral compliance
  - \* Analyzed scenarios predicting Wave-3 emergence conditions, showing importance of parameters like vaccine rates that could prevent wave occurrence.
- **Uncertainty Quantification using DO Field Equations** [Github](#)   
C++ | FEM | Monte Carlo | Stochastic Systems
  - \* Implemented DO field equations method for reduced-order uncertainty quantification in FEM.
  - \* Validated framework against Monte Carlo simulations for both linear and non-linear systems, demonstrating computational efficiency


## LEADERSHIP & ORGANIZATIONAL EXPERIENCE

- Conference Organizer - CASML 2024** IISc, Bangalore | Dec 2024 [Link](#)   
First scientific machine learning conference in India with 300+ participants
- Lead Student Organizer - IGCM-2024** IISc, Bangalore | Mar 2023 [Link](#)   
Coordinated Indo-German conference on Computational mathematics with 100+ attendees
- Speaker & Organizer - Kotak-IISc ML School** IISc, Bangalore | Mar 2023 [Link](#)   
Organized and delivered ML training to 50+ non-CS faculty from Bangalore region
- Lead Student Organizer - Parallel FEM Workshop** IISc, Bangalore | Oct 2019 [Link](#)   
Coordinated workshop and taught parallel computing concepts to 100+ students
- Speaker - NSM Workshop on PDE Methods** IISER Trivandrum | Aug 2022 [Link](#)   
Delivered talks on Practical FEM and Parallel Implementation to 50+ students

## PROFESSIONAL CERTIFICATIONS

- **Google:** TensorFlow Developer Certificate | Jan 2024 [Link](#) 
- **DeepLearning.AI:** TensorFlow Developer Professional Certificate | Dec 2023 [Link](#) 
- **NVIDIA Deep Learning Institute:** Deep Learning | Feb 2022 [Link](#) 
- **NVIDIA Deep Learning Institute:** Accelerating Data Engineering Pipelines | Feb 2022 [Link](#) 
- **University of Michigan:** The Finite Element Method for Problems in Physics | Jul 2020 [Link](#) 

## OPEN SOURCE LIBRARIES

- FastVPINNs** [Github](#)   
Tensor-driven hp-Variational PINNs written in TensorFlow 2.0
  - \* Implemented comprehensive CI/CD pipelines using GitHub Actions and Docker containerization

- \* Published as Python package on PyPI with over 3.2k downloads

## ParMoon

Github 

C++ based Finite Element framework

- \* Developed CUDA-based GPU codes for asynchronous mesh displacement computations
- \* Implemented CUDA routines for Lagrangian particle tracking in complex geometries like human air pathway which provided 8x speedup over OpenMP implementations
- \* Contributed 4000+ lines of CUDA/C++ code to the library

## TEACHING EXPERIENCE

10+ TASHIPS IN TOTAL

Led 10+ Teaching Assistantships where I have conducted lectures, tutorials, and responsible for creating course assessments (quizzes and assignments). For details, [refer here](#).

### Introduction to Data Science

Jan-2022

PG Course @ IISc, Bangalore [Online M.Tech]

Feedback: 4.9/5 

- \* Python ML libraries, Linear algebra, Machine learning algorithms for 60+ participants

### MLOps at Scale

Jan-2022

PG Course @ IISc, Bangalore [Online M.Tech]

Feedback: 4.4/5 

- \* Parallel programming(OpenMP, MPI, CUDA), docker, Github Actions, distributed training with tf

### Introduction to Computing for AI and ML

Jan-2023, Jan-2022

PG Course @ IISc, Bangalore [Online M.Tech]

Feedback: 4.5/5 

- \* Computer Architecture, Calculus, Data Munging, Machine learning algorithms and Neural Networks

### Introduction to Computing for AI and ML

Aug-2024, Jan-2023, Jun-2023, Jan-2022

Center for continuing education @ IISc, Bangalore

- \* Python ML libraries, Machine Learning algorithms, Neural Networks, Github Actions

### Finite Elements: Theory and Algorithms

Aug-2022

Offline PG Course at Indian Institute of Science

- \* FEM Algorithms, Implementation in C++

### Numerical Methods

Sep-2021

Offline PG Course at Indian Institute of Science

- \* Taylor series, Polynomial fitting, Numerical differentiation, Numerical integration

## VOLUNTEERING & SERVICE

Member, CDS Wellness Committee | Indian Institute of Science

2022 - 2023

NCC 'C' Certificate Holder | National Cadet Corps

2015

Rashtrapati Award (President Award) | Bharat Scouts and Guides

2009

## EXTRACURRICULAR ACTIVITIES

Keyboard Player | Rhythmica Music Band, IISc

2020 - Present