

Akshay Anand

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Tallahassee, Florida - 32304, USA (**Graduating: Fall 2025 - Available from 12/2025**)

OBJECTIVE

PhD researcher specializing in ML/AI and computer vision with expertise in developing innovative visual processing frameworks that integrate physics-based modeling with advanced AI. An invited speaker at the National AI Research Resource (NAIRR) program, eager to leverage my interdisciplinary background to solve real-world, complex problems through collaborative research.

KEY ACHIEVEMENTS

- Developed visual AI framework processing 200,000+ geometric configurations of facial features, integrating deep learning and computer vision techniques to analyze how facial morphology impacts respiratory dynamics and mask efficacy across diverse populations
- Reduced computational costs by 85% (compared to traditional engineering approach such as computational fluid dynamics simulations) through innovative ML & physics hybrid approaches, demonstrating ability to create efficient solutions for complex computational problems
- Implemented GPU-accelerated visualization and deep learning pipeline for complex fluid dynamics problems, using CUDA and distributed computing to process large-scale visual data, transforming domain expertise into novel AI applications with practical impact through cross-disciplinary collaboration
- Invited speaker at National AI Research Resource (NAIRR) Pilot, presenting research on large-scale visual AI applications, contributing to the broader research community

EDUCATION

- **Florida State University** Tallahassee, FL, USA
Ph.D in Mechanical Engineering (Extensively on Computational Physics & Scientific Computing) 05 2021 – Present*
Focus: Fluid Dynamics, Computational Modeling, High-Performance Computing, Machine Learning
- **École Centrale de Lille & ISAE - ENSMA** Lille, France
Masters in Aeronautics and Space, Major: Turbulence & Applied Mathematics 09 2017 – 08 2019
Focus: Unsteady Simulations, Numerical Modeling, Computational Fluid Dynamics
- **Bansal Institute of Research & Technology** Bhopal, India
Bachelor of Engineering, Major: Mechanical Engineering 06 2013 – 05 2017

SKILLS

- **Programming & Scripting Languages:** Python (95%), C++ (80%), Java (75%), FORTRAN (95%), MATLAB (95%), Julia (70%), R (85%)
- **AI & Machine Learning:** TensorFlow, PyTorch, JAX, Computer Vision, Deep Learning, Visual Language Models, Generative AI, LLMs
- **High Performance Computing:** CUDA, OpenMP, MPI, GPU Programming, Distributed Computing
- **Data Science & Analytics:** NumPy, Pandas, Scikit-learn, Large-scale Data Processing, Real-time Analytics
- **DevOps & Version Control:** Git, GitHub, Doxygen, Jenkins, Docker
- **Development Tools:** Linux/Unix, VS Code, Jupyter
- **Documentation & Technical Writing:** \LaTeX , LibreOffice, MS Office

RESEARCH PROJECTS

- **Project A: [Physics-Informed AI Framework for Respiratory Disease Modeling and Prevention]** 09 2024 - Present
Tools: [Python, PyTorch, Computer Vision, CUDA, GPU], Advisor: [Dr. Kouros Shoele] at FSU (USA) PhD Ch 3
 - Developed innovative physics-informed AI framework for epidemiological modeling, integrating fundamental fluid dynamics principles with machine learning to analyze 200,000+ geometric configurations of facial features, creating interpretable and physically consistent models that predict respiratory disease transmission with 85% reduction in computational cost while maintaining scientific rigor and addressing critical public health challenges
 - Architected end-to-end collaborative machine learning pipeline integrating visual language models with computer vision algorithms, enabling automated feature extraction and semantic understanding of complex visual patterns across large-scale datasets



- Implemented GPU-accelerated visual processing system using CUDA, achieving real-time 3D reconstruction and visualization through distributed computing, with optimized performance across multi-node GPU clusters for processing high-resolution image data
- **Project B: [Deep Learning-Driven Analysis of Speech-Based Respiratory Pathogen Transmission]** 01 2024 - 08 2024*
Tools: [Python, TensorFlow, Computer Vision, Rhino/Grasshopper], Advisor: [Dr. Kourosh Shoele] at FSU, (USA) PhD Ch 2
 - Created real-time virus transmission risk assessment system using deep neural networks, analyzing 1000+ video sequences to quantify how facial movements during speech contribute to respiratory pathogen spread, with applications for public health policy and intervention strategies
 - Pioneered an integrated deep learning framework for transmission risk analysis, employing advanced facial dynamics tracking to identify aerosol and droplet generation patterns during various speech activities with 95% accuracy
 - Engineered a novel multi-modal signal processing solution combining visual and acoustic data, revealing that plosive-initiated words (/p/, /b/, /t/) generate 3x higher pathogen transmission risk through increased peripheral leakage, providing critical insights for mask design and social distancing protocols
- **Project C: [Population-Scale Anthropometry: Integrating Facial Dynamics and Interface Flow]** 05 2021 - 12 2023*
Tools: [Python, Grasshopper, C++, HPC], Advisor: [Dr. Kourosh Shoele] at Florida State University (USA) PhD Ch 1
 - Devised novel geometric modeling framework using Geometrically Weighted PCA for human facial analysis, implementing Sigmoidal weighting functions to precisely analyze complex datasets across 6 critical interface regions across 7000+ diverse facial configurations, demonstrating innovative computational solutions for challenging problems
 - Developed high-performance analytical framework combining fluid dynamics and facial soft tissue anthropometry, achieving 85% reduction in computational cost while maintaining anatomical accuracy for interface analysis across diverse populations
 - Build an end-to-end pipeline for wearable device optimization, integrating parallel computing for collaborative evaluation of fit and comfort across 7000+ unique facial configurations, with findings published in high-impact public health journals
- **Project D: [Large-Scale Data Analysis and Pattern Recognition in Complex Non-Linear Systems]** 05 2023 - 12 2024*
Tools: [FORTRAN, C++, PyTorch], Advisor: [Dr. Kourosh Shoele] at Florida State University (USA) PhD - Side Project
 - Implemented high-performance simulation framework coupling physical models with pattern recognition algorithms, enabling real-time collaborative analysis of complex system dynamics and automated feature detection across distributed computing environments
 - Developed innovative graph neural network and spectral clustering algorithms to process 5TB+ of high-dimensional data, achieving automated pattern recognition and relationship extraction with 90% accuracy compared to manual analysis, demonstrating capability to advance state-of-the-art research
 - Created scalable feature extraction pipeline combining dimensionality reduction with machine learning, enabling real-time pattern detection and visualization of complex system behaviors, published in AIAA SciTech 2025
- **Project E: [Research Intern: DNS and Data Analysis of Active Turbulence in Ocean]** 04 2018 - 08 2018
Tools: [C++, Python, HPC], Advisor: [Dr. Enrico Calzavarini] at Université de Lille (France) [G]
 - Developed C++-based large-scale data processing pipeline for turbulent flow analysis, implementing parallel algorithms for processing terabytes of simulation data, demonstrating experience with the scale of data processing relevant to Google's research challenges
 - Created custom analysis tools for extracting and visualizing complex flow patterns from high-dimensional datasets
 - **Additional research projects and publications are available at:** <https://web1.eng.famu.fsu.edu/~aanand/>

PUBLICATIONS & PRESENTATIONS



C=CONFERENCE, J=JOURNAL, A=ABSTRACT, **GOOGLE SCHOLAR**

- [A.1] Anand, A., Shoele, K. (2025). **Integrating Large-Scale Data and Physics-Based Modeling to Evaluate Facemask Efficiency Across Populations.** In National Artificial Intelligence Research Resource (NAIRR) Pilot, **Invited talk**
- [A.2] Anand, A., Shoele, K. (2024). **Integrating Machine Learning and Physics-Based Flow Models for Population-Level Respiratory Disease Simulation.** In APS Division of Fluid Dynamics Meeting Abstracts, ZC05.2
- [A.3] Anand, A., Tavanashad, V., Shoele, K. (2024). **Sedimentation of Flexible Inertial Particles with Different Aspect Ratios.** In APS Division of Fluid Dynamics Meeting Abstracts, T22.5
- [J.1] Anand, A., Shoele, K. (2024). **Identifying the effectiveness of face mask in a large population with a network-based fluid model.** Manuscript under review in *PLOS One Global Public Health Journal*
- [J.2] Anand, A., Tavanashad, V., Shoele, K. (2024). **Sedimentation of flexible particle suspensions and formation of particle clusters at finite Reynolds number.** Manuscript submitted for publication in *Journal of Fluid Mechanics*
- [C.1] Anand, A., Tavanashad, V., Shoele, K. (2025). **Dynamics of Flexible Fiber Sedimentation and Cluster Formation at Finite Reynolds Numbers.** In *AIAA SciTech Forum*, Orlando, Florida, USA


HONORS AND AWARDS

- **Recognized for the "Most Persuasive Op-Ed" (Opposite of Editorial Page)** 2024
Florida State University, [Featured in FSU News](#), [College of Engineering Newsletter](#) 
 - Winner of \$500 prize editorial competition highlighting significant research impact
- **People's Choice Award in 3-Minute Thesis Competition (Most people voted for the presenter)** 2022
Florida State University, [Featured in FSU News](#), [College of Engineering LinkedIn](#) 
 - Won \$500 prize for effectively communicating complex research to a broad audiences

LEADERSHIP EXPERIENCE

- **President, Mechanical Engineering Graduate Student Association (MEGSA)** 2022 - 2024
FAMU-FSU College of Engineering 
 - * Lead organization of 70+ graduate students, organizing ML/AI workshops and technical seminars
 - * Created mentorship program connecting students with industry researchers in AI and computational science
- **Research Mentorship & Technical Leadership** 2017 - 2022
Various Institutions 
 - * Mentored high school students in ML and computational projects through FSU's Young Scholar Program
 - * Coordinated computational workshops and technical events at multiple institutions

REVIEWER AND MEMBERSHIP

- **Reviewer, Physics of Fluids Journal (Impact Factor: 4.6)** *AIP Publishing*
Jan 2023 - Present | [Reviewed 5+ journal articles](#) 
- **Reviewer, Journal of Open Source Software** *Open Journals*
Jan 2024 - Present | [Reviewed one journal articles and code implementation \(Fortran & PyTorch - FTorch\)](#)
- **Member, American Physical Society (APS), & AIAA** *Division of Fluid Dynamics*
2020 - Present