Dilip Kalagotla

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EDUCATION

University of Cincinnati, Cincinnati, Ohio, USA

- Doctor of Philosophy in Aerospace Engineering and Engineering Mechanics — Aug 2025
- Master of Science in Aerospace Engineering and Engineering Mechanics — Apr 2018

Indian Institute of Technology (ISM), Dhanbad, Jharkhand, India

- Bachelor of Technology in Mechanical Engineering — Apr 2015

PHD DISSERTATION

Title: A Data-Driven Framework for Studying and Correcting Particle Inertia Bias in Particle Image Velocimetry
Supervisors: Professor Daniel Cuppoletti and Professor Paul Orkwis
Description This project explores developing and analyzing a deep learning framework for reducing particle inertia bias in supersonic velocity diagnostic experiments. An average of 74% error reduction was achieved in all the shock-dominated flow cases tested. Simulations were performed using ANSYS Fluent, and experimental testing was conducted at Florida State University (FSU).

MASTERS THESIS

Title: Modeling Particle Drag in Accelerating Flows with Implications for SBLI in PIV - A Numerical Analysis
Supervisor: Professor Paul Orkwis
Description This project showcases the particle inertia bias in a supersonic shock boundary layer interaction velocimetry study. The error metric obtained is the best among 30 computational fluid dynamics simulation comparisons. This was done in collaboration with an experimental group at the University of Michigan.

PROFESSIONAL EXPERIENCE

Teaching Assistant, University of Cincinnati, Cincinnati, Ohio, USA — Jan 2021 – Dec 2024
- Developed instructional modules for Aerodynamic Simulations, focusing on numerical analysis.
- Created an educational API to introduce Deep Neural Networks (DNNs) to undergraduate students.
- Delivered several lectures covering the fundamentals of linear algebra, DNNs, and Python programming.
- Assisted in teaching Biostatistics-I, helping in delivering high-quality lectures on various statistical concepts such as descriptive statistics, ANOVA, t-test, Rates/Proportions, and Confidence intervals.

Graduate Assistant, University of Cincinnati, Cincinnati, Ohio, USA — May 2021 – Dec 2022
- Contributed to the supervision and maintenance of the computing infrastructure and provided support to the administrative team at CEAS, UC.
- Produced quarterly reports to simplify the comprehension of computing demands, leading to hundreds of thousands of cost savings for the IT team.

Research Assistant, University of Cincinnati, Cincinnati, Ohio, USA — May 2017 – Dec 2020
- Engaged in advanced research at the graduate level.
- Pioneered the development of an internal CFD data analysis and visualization tool to help with several projects at the Gas Turbine Simulation Laboratory (GTSL).
- Provided mentorship to numerous Master's and Ph.D. students, educating them on the use of Linux, git, and various programming languages, along with assistance in the technical aspects of fluid mechanics and deep learning.
- Maintained a collaborative repository of CFD solutions ranging from RANS to DNS to assist in the ongoing development of machine learning tools.

Research Assistant, Procter & Gamble Sim Center, Cincinnati, Ohio, USA — May 2016 – May 2017
- Contributed to the modeling and simulation of a new production line for baby care products using ABAQUS and automated several processes using Fortran 95.
- Developed a universal air-based folding system, eliminating the requirement for separate machines. The impacts included meeting demand with varying customer needs and long-term cost savings in maintenance.

RESEARCH EXPERIENCE

Gas Turbine Simulation Laboratory, UC, Cincinnati   May 2017 – Aug 2024

- Project-Arrakis/lptlib: Developed a highly parallelized Python-based tool for one-way coupled Lagrangian Particle Tracking (LPT) and Lagrangian-to-Eulerian transformation tailored for particle inertia bias uncertainty quantification in non-intrusive experiments. The auxiliary set of tools implemented includes grid and flow IO, grid manipulation, visualization, several drag models, and a particle response model to quantify the particle specifications used in supersonic Particle Image Velocimetry (PIV). This tool is published on PyPI for open-source access.
- syPIV: Created a highly parallelized Python-based synthetic particle image velocimetry data generator. The code is available via PyPI for open-source access.
- PIVnet: Engineered a bilateral convolutional neural network (CNN) to mitigate uncertainty stemming from particle inertia in PIV. Successfully demonstrated its efficacy in oblique shock dataset utilizing the tools mentioned above. The improvements showed a substantial error reduction of 76% on average, highlighting future implications for one-of-a-kind research.
- Modified OpenFOAM: Adapted the SIMPLE algorithm in OpenFOAM to extract residuals from simulations. The fine grid residuals were used to demonstrate a similar fine solution on a coarse grid. This showcases a new data-driven modeling capability that significantly impacts computational fluid dynamics work, particularly in terms of hardware efficiency and simulation accuracy.
- Modified-Visual3: Enhanced an existing streamline plotting code to accommodate solid particles, facilitating improved validation of an RANS-based code (OVERFLOW) with corresponding PIV data in a shock boundary layer interaction scenario. The results showed the significance of considering particle inertia in velocity diagnostic experiments. The error metric computed stood out first among thirty other simulation studies.

Advanced Laboratory for Fluids and Acoustics (ALFA), UC, Cincinnati   Aug 2024 – Current

- Inlet flows: Conducted planar and stereoscopic Particle Image Velocimetry (PIV) measurements for adverse pressure gradient nozzle inlets. Developed on a test rig that is capable of modular nozzle analysis. Extended data processing capabilities by creating a framework for HPC processing of PIV data.

PUBLICATIONS

[1] D. Kalagotla, and P. Orkwis "Numerical Analysis of Drag Models and Particle Size Estimation for PIV in Supersonic Flows," *AIAA AVIATION FORUM AND ASCEND 2024, 29 July - 2 August 2024, Las Vegas, NV, (AIAA 2024-4382)*

[2] D. Kalagotla, and P. Orkwis "A New Approach to Synthetic PIV Data Based on Particle Dynamics History," *AIAA SCITECH 2024 Forum, 8-12 January 2024, Orlando, FL, (AIAA 2024-2667)*

[3] D. Kalagotla, and P. Orkwis "An Object-Oriented Approach to Tracking Particles in a Flow," *AIAA Aviation 2023 Forum, 12-16 June 2023, San Diego, CA, (AIAA 2023-3276)*

[4] D. Kalagotla, A. Karnam, and E. Gutmark, "Comparison of Flow Characteristics of Single and Twin Rectangular Jets Using OVERFLOW Code," *AIAA SciTech 2020 Forum, 6-10 January 2020, Orlando, FL, (AIAA 2020-1334)*

[5] D. Kalagotla, P. Orkwis, and M. Turner, "Methodology to Study the Behavior of Tracer Particles in the Flow Field of Rotor 37 Using CFD Data," *(AIAA SciTech 2020 Forum, 6-10 January 2020, Orlando, FL, (AIAA 2020-1809)*

[6] D. Kalagotla, P. D. Orkwis, and M. G. Turner, "Modeling Particle Drag in Accelerating Flows with Implications for SBLI in PIV - A Numerical Analysis," *2018 Fluid Dynamics Conference, AIAA AVIATION Forum, (AIAA 2018-3555)*, Atlanta, Georgia, USA, Jun 2018.

[7] H. Chhabra, D. Kalagotla, and P. Orkwis, "Python based API to post-process CFD data," *(AIAA SciTech 2023 Forum, 23-27 January 2023, National Harbor, MD, (AIAA 2023-1225).*

[8] D. Kalagotla, P. Orkwis, and D. Cuppoletti, "PIVnet: A Deep Learning Based Particle Dynamics History Corrector for Particle Image Velocimetry," *(AIAA SciTech 2025 Forum, 06-10 January 2025, Orlando, FL)*

[9] D. Kalagotla, K. Hernandez-Lichtl, J. Gustavsson, R. Kumar, D. Cuppoletti, and P. Orkwis, "Particle Size Distribution Estimation in Supersonic PIV Experiments," *(AIAA Journal (Under Consideration))*

[10] D. Kalagotla, D. Cuppoletti, P. Orkwis, K. Hernandez-Lichtl, J. Gustavsson, and R. Kumar "Deep Learning Based Particle Inertia Bias Corrector for Shock-Dominated PIV Data," *(Exp. in Fluids (Under Consideration))*

[11] D. Kalagotla, D. Cuppoletti, and P. Orkwis "Particle Inertia Bias in a Jet Exhaust PIV Study," *(AIAA Journal (In progress))*

CONFERENCE PRESENTATIONS

[1] D. Kalagotla, H. Chhabra, and P. Orkwis "A Python-based program for post-processing CFD data," *47th Dayton-Cincinnati Aerospace Sciences Symposium, March 8, 2022, Dayton, OH*

[2] D. Kalagotla, and P. Orkwis "A Novel Methodology to Validate Numerical Data to PIV Data," *48th Dayton-Cincinnati Aerospace Sciences Symposium, February 28, 2023, Dayton, OH*

[3] D. Kalagotla, and P. Orkwis "A Generalized Approach to Synthetic PIV images," *49th Dayton-Cincinnati Aerospace Sciences Symposium, March 5, 2024, Dayton, OH*

LEADERSHIP EXPERIENCE

Mentor, Aerospace Engineering, CEAS, UC   Aug 2020 – Dec 2023
- Provided mentorship to several graduate students, facilitating their journey to a Master's degree
- Played a pivotal role in improving the manipulation and visualization aspects of the grid by contributing to developing a project module.

UC Piloting Club, UC
- Founder and President   Aug 2019 – Aug 2022
  - Established and led the UC Piloting Club, fostering piloting experiences for UC students through collaboration with Sporty's Piloting Academy
  - Organized club events, managed budget allocation, and oversaw various operational aspects
- External Advisor   Aug 2022 – Current
  - Continues to serve on the board, offering guidance to the Piloting Club team and providing strategic direction for a growing community of 300 piloting enthusiasts

Aerospace Engineering Graduate Student Association, UC
- Secretary   Aug 2015 – Aug 2017
  - Orchestrated student events within the Aerospace Engineering department
  - Assumed responsibility for verifying travel reimbursement forms

Department of Mechanical Engineering, IIT(ISM) Dhanbad
- Prefect   Aug 2013 – Apr 2014
  - Organized two national-level symposiums, showcasing exceptional leadership and event management skills
  - Received the Outstanding Student of the Year award

ACHIEVEMENTS

- Facilitator, AIAA SciTech Idea Challenge Workshop   Jan 2025
  Selected to lead a workshop on "DARPA hard" aerospace challenges in Information Innovation, guiding young professionals through an ideation session, synthesizing key findings, and presenting outcomes during a prestigious Forum 360 session.
- Armstrong Institute for Space, Technology, and Research (ASTRO) Grant, awarded by UC   Dec 2024
  Awarded a total of $6,405$ to conduct research on HPC that aligns with ASTRO 2030 goals
- Graduate student of the month, awarded by CEAS, UC   May 2023
  Awarded to recognize the best graduate students across the university
- UGS/GIA (Grad Incentive Scholarship), awarded by UC   2015 – 2020
  For attaining a semester GPA of at least 3.0 and being a full-time student.
- Merit Cum Means Scholarship, Awarded by the Indian Government   2011 – 2015
  For attaining a semester GPA of at least 3.75.

SKILLS   Python, Fortran, C++, Pointwise, NASA OVERFLOW, NUMECA FINE, Ansys Fluent, StarCCM+, OpenFOAM, Paraview, Tecplot, LaTeX, MATLAB, SIMULINK, Solidworks, Microsoft Office.

CERTIFICATIONS   Machine Learning, DNNs with PyTorch, Deep Learning Specialization, Accelerated Computing CUDA C/C++, ABAQUS Ansys Mechanical APDL

REFERENCES
- **Dr. Paul D. Orkwis**
  Professor Emeritus, University of Cincinnati
  Distinguished Staff Engineer, Aerodynamic Operations
  GE Aerospace, Evendale, OH
  paul.orkwis@ge.com

- **Dr. Daniel Cuppoletti**
  Assistant Professor
  University of Cincinnati
  Cincinnati, OH
  cuppoldr@ucmail.uc.edu

[CV compiled on 2025-11-17]