DANA LAVACOT, PH.D.

(949) 381-8414 dlansigan.github.io dlavacot@wustl.edu

## SUMMARY

Passionate and motivated **computational scientist** specializing in physics-based scientific machine learning (ML) and computational methods for multiscale/multiphysics modeling of fluid phenomena. Possesses 5+ years of research experience in traditional scientific computing and developing scientific software with first author publications in high-impact journals. Impactful collaborator, experienced with diverse teams.

## EDUCATION

**Stanford University,** Stanford, CA **September 2019 - August 2025**
**Ph.D in Mechanical Engineering**
GPA: 4.06/4.0

**Stanford University,** Stanford, CA **September 2019 - June 2021**
**M.S. in Mechanical Engineering**
GPA: 4.05/4.0

**UC Berkeley,** Berkeley, CA **August 2015 - May 2019**
**B.S. in Mechanical Engineering, High Honors**
GPA: 3.875/4.0

## RESEARCH EXPERIENCE

**WASHINGTON UNIVERSITY IN ST. LOUIS,** St. Louis, MO **August 2025 - Present**
*Postdoctoral Research Associate (PI: Fanwei Kong)*

- Developing physics-informed diffusion-based model using Pytorch and CUDA for spatio-temporal cardiovascular flow reconstruction from heart ultrasound data
- Generating and processing large ML training dataset of cardiac blood flow using high-fidelity computational fluid dynamics simulations (100+ simulations of 10,000+ cells each) in SimVascular (C++/Fortran)
- Communicates complex technical concepts to clinical collaborators, enabling identification of needs and development of solution strategies
- Authored proposals for novel computational science and ML research, from conception to submission
- Mentoring Ph.D. and undergraduate students on research projects in ML and computational modeling

**STANFORD UNIVERSITY,** Stanford, CA **January 2020 - August 2025**
*Graduate Researcher (PI: Ali Mani)*

- Conducted 1,000+ high-fidelity hydrodynamic instability simulations using Lawrence Livermore National Lab's (LLNL) Ares (C/C++) and Pyranda (Python/Fortran) codes on a high-performance computing cluster
- Performed simulation data analysis using novel data-driven method to develop a new turbulent mixing model, now integrated into LLNL's code for nuclear fusion experiment design
- Employed collaborative coding practices and version control using Git in adapting a parallel pseudo-spectral code (C++) for turbulence simulations
- Presented work in four first-author papers in high-impact journals and at research conferences

**LAWRENCE LIVERMORE NATIONAL LABORATORY,** Livermore, CA **June 2024 - September 2024**
*Defense Sciences and Technology Intern (PI: Brandon Morgan)*

- Applied numerical method developed during my Ph.D. to assess turbulence models for hydrodynamic instability in nuclear fusion experiments, identifying a critical need for density ratio adjustments
- Developed scientific software in Python to numerically solve turbulence models and perform assessment
- Effectively communicated complex research in presentations to LLNL scientists and DSTI scholars across disciplines

**UNIVERSITY OF CALIFORNIA, BERKELEY,** Berkeley, CA **August 2017 - May 2019**
*Undergraduate Researcher (PI: Philip Marcus)*

- Derived and programmed analytical gradients for a novel neural network layer designed for unstructured grids
- Built and trained an ML model using Pytorch and CUDA for an airfoil shape optimization task to demonstrate the effectiveness of the layer
- Co-authored publication presented at top computer vision conference (ICCV)

## AWARDS AND HONORS

- **Stanford Graduate Fellowship in Science & Engineering**, 3-year award for top incoming Ph.D.s (2019)
- **UC Berkeley Dean's List**, semesterly distinction for GPAs in top 10% (2015-2018)
- **Boeing Scholarship**, awarded to outstanding STEM undergraduates (2016)
- **Banatao Scholarship**, awarded to 4 outstanding Filipino-American students in STEM (2015)

## RESEARCH PAPERS

**Lavacot, D. L. O.-L.**, Morgan, B. E., and Mani, A. (2026). Development and assessment of models for turbulent Rayleigh-Taylor mixing using the macroscopic forcing method. *Physica D: Nonlinear Phenomena*. https://doi.org/10.1016/j.physd.2026.135136.

**Lavacot, D. L. O.-L.**, Mani, A., and Morgan, B. E. (2025). Atwood effects on nonlocality of the mean scalar transport operator in Rayleigh-Taylor mixing. *Physical Review Fluids*. https://doi.org/10.1103/svjh-8pzl.

**Lavacot, D. L. O.-L.**, Liu, J., Morgan, B. E., and Mani, A. (2025). Techniques for improved statistical convergence in quantification of eddy diffusivity moments. Physical Review Fluids. https://doi.org/10.1103/yrnt-y4mp.

**Lavacot, D. L. O.-L.**, Liu, J., Williams, H., Morgan, B. E., and Mani, A. (2024). Assessment of nonlocality of mean scalar transport in Rayleigh-Taylor instability using the Macroscopic Forcing Method. *Journal of Fluid Mechanics*. https://doi.org/10.1017/jfm.2024.323.

Jiang, C., **Lansigan, D. L. O.**, Marcus, P., and Niessner, M. (2019). DDSL: Deep Differentiable Simplex Layer for learning geometric signals. In *Proceedings of the IEEE/CVF International Conference on Computer Vision*.

## CONFERENCE PRESENTATIONS

**Lavacot, D. L. O.-L.**, Morgan, B. E., and Mani, A. (2024). Atwood effects on nonlocality of mean scalar transport in three-dimensional Rayleigh-Taylor Instability. Presented at the APS Division of Fluid Dynamics 77th Annual Meeting, Session X27.00006, Salt Lake City, UT.

**Lavacot, D. L. O.-L.**, Liu, J., Morgan, B. E., and Mani, A. (2023). Assessment of RANS models for Rayleigh-Taylor mixing using the Macroscopic Forcing Method. Presented at the APS Division of Fluid Dynamics 76th Annual Meeting, Session J43.00003, Washington, D.C.

**Lavacot, D. L. O.-L.**, Liu, J., Morgan, B. E., and Mani, A. (2022). Continuing Investigations of Nonlocality in Rayleigh-Taylor Instability Using the Macroscopic Forcing Method.'' Presented at the APS Division of Fluid Dynamics 75th Annual Meeting, Session J22.00005, Indianapolis, IN.

**Lansigan, D. L. O.**, Liu, J., Williams, H., Morgan, B. E., and Mani, A. (2021). Evaluating the Importance of Nonlocal Eddy Diffusivity for Rayleigh Taylor Instability. Presented at the APS Division of Fluid Dynamics 74th Annual Meeting, Session E11.00009, Phoenix, AZ.

**Lansigan, D. L. O.**, D. Park, and Mani, A. (2020). An Accelerated Macroscopic Forcing Method for Determining Eddy Viscosity Operators. Presented at the APS Division of Fluid Dynamics 73rd Annual Meeting, Session X11.00009, Chicago, IL.

**Lansigan, D. L. O.**, Jiang, C., and Marcus, P. (2018). Neural Network Powered Adjoint Methods: Gradient Based Shape Optimization with Deep Learning. Presented at the APS Division of Fluid Dynamics 71st Annual Meeting, Session F32.00002, Atlanta, GA.

## INDUSTRY EXPERIENCE

**GENERAL ATOMICS, ASI,** Poway, CA **June 2023 - August 2023**
*Aero/CFD/HPC Tools Intern*

- Assessed capabilities of STAR-CCM+ solver through 2D & 3D RANS simulations of airfoils and full fixed-wing aircraft, as part of evaluation of the CFD software presented to Engineering VP
- Demonstrated software capabilities with a simulation of flow over the MQ-9B aircraft, the largest simulation of the study (180M+ cells)
- Prepared documentation of best-practice simulation procedures to facilitate team’s efficient transition to STAR-CCM+

## TEACHING

**STANFORD UNIVERSITY-** *Graduate Teaching Assistant*

- Assisted in teaching Turbulence (Spring 2023, 20 students, graduate) and Numerical Methods (Spring 2022, 20 students, graduate), and undergraduate course, Vector Calculus (Fall 2024, 140 students, undergraduate)
- Supported instruction by facilitating office hours, designing exams, and evaluating assignments
- Presented guest lecture on Green's Theorem for Vector Calculus

**UNIVERSITY OF CALIFORNIA-** *Undergraduate Student Instructor*

- Taught weekly mini-lectures for Intro to Circuits & Linear Algebra (Fall 2018 & Spring 2019, ~1,000 students, undergraduate) in two discussion sections with ~40 students each