Cristian Lacey

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Education

Princeton University *Princeton, NJ*
Ph.D. in Mechanical and Aerospace Engineering, Advisor: **Michael E. Mueller**, GPA: **4.00/4.00** *Expected May 2023*

The Cooper Union *New York, NY*
B.E. in Mechanical Engineering, GPA: **3.98/4.00** *May 2018*

Honors

2019	**Sayre Award for Academic Excellence**, Highest-ranking graduate student after first year.	*Princeton University*
2019	**Daniel and Florence Guggenheim Foundation Fellowship**, Competitive second-year fellowship.	*Princeton University*
2018	**Gordon Y. S. Wu Fellowship in Engineering**, Competitive first-year fellowship.	*Princeton University*
2018	**Henri D. Dickinson Award**, Highest cumulative ranking upon graduation.	*The Cooper Union*
2018	**Alexander C. Grove Memorial Prize**, For scholarship, personal integrity, and professional promise.	*The Cooper Union*
2018	**The Mechanical Engineering Design Prize**, For excellence in mechanical design.	*The Cooper Union*
2016	**Tyler G. Hicks Mechanical Engineering Prize**, For academic achievement during the first two years.	*The Cooper Union*
2015	**Howard Silfin Mechanical Engineering Internship Award**, For ability to conduct quality research.	*The Cooper Union*
2014	**Half-tuition scholarship**, Merit scholarship for all four years.	*The Cooper Union*

Peer-Reviewed Publications

- **Lacey, C.E.**, Novoselov, A.G., Mueller, M.E., In-Situ Adaptive Manifolds: Enabling computationally efficient simulations of complex turbulent reacting flows, *Proceedings of the Combustion Institute* 38 (2020) in press.
- Novoselov, A.G., **Lacey, C.E.**, Perry, B.A., Mueller, M.E., Large Eddy Simulation of a turbulent lifted flame using multi-modal manifold-based models: Feasibility and interpretability, *Proceedings of the Combustion Institute* 38 (2020) in press.

Conference Papers & Presentations

- **Lacey, C.E.**, Novoselov, A.G., Mueller, M.E., In-Situ Adaptive Manifolds: Enabling simulations of complex turbulent reacting flows, 38th International Symposium on Combustion, Adelaide, AU, January 24-29, 2021.
- Novoselov, A.G., **Lacey, C.E.**, Perry, B.A., Mueller, M.E., Large Eddy Simulation of a turbulent lifted flame using multi-modal manifold-based models: Feasibility and interpretability, 38th International Symposium on Combustion, Adelaide, AU, January 24-29, 2021.
- **Lacey, C.E.**, Mueller, M.E., Leveraging In-Situ Adaptive Manifolds for computationally efficient simulations of turbulent combustion with multiple and/or inhomogeneous inlets, 73rd Annual Meeting of the APS Division of Fluid Dynamics, Chicago, IL, November 22-24, 2020.
- **Lacey, C.E.**, Novoselov, A.G., Mueller, M.E., In-Situ Adaptive Manifolds: Enabling simulations of complex turbulent reacting flows, Spring Technical Meeting of the Eastern States Section of the Combustion Institute, Columbia, SC, March 8-11, 2020.
- Novoselov, A.G., **Lacey, C.E.**, Mueller, M.E., Multi-modal manifold-based modeling of turbulent lifted flames, Spring Technical Meeting of the Eastern States Section of the Combustion Institute, Columbia, SC, March 8-11, 2020.
- Baglione, M., Chin, A., Faddoul, R., **Lacey, C.E.**, Mosin, A., Rundell, J., Zhang, O., Optimizing condenser water supply temperature to minimize energy usage, 2020 ASHRAE Winter Conference, Orlando, FL, February 1-5, 2020.
- **Lacey, C.E.**, Novoselov, A.G., Mueller, M.E., In-Situ Adaptive Manifolds: Enabling simulations of complex turbulent reacting flows, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA, November 23-26, 2019.
- Novoselov, A.G., **Lacey, C.E.**, Mueller, M.E., Large Eddy Simulations of turbulent flames using two-dimensional reduced-order manifold models, 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, WA, November 23-26, 2019.
- Wei, H., Bianco, V., **Lacey, C.E.**, Trubatch, A.D., Yecko, P.A., Experimental quantification of volume loss rate and flow dynamics due to a magnetically localized fluid region in a laboratory model blood vessel flow, 12th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Copenhagen, DK, May 22-26, 2018.

Research

High-Fidelity Manifold-Based Modeling of Turbulent Combustion
Princeton, NJ

Princeton University
Jan. 2019 - Present

- Developing In-Situ Adaptive Manifolds (ISAM), a new computational approach for manifold-based modeling that enables more general yet computationally efficient turbulent combustion models via on-the-fly adaptive tabulation.
- Integrating ISAM with the multi-modal manifold model, facilitating simulations of realistic, multi-modal systems without any a priori information about the combustion mode.
- Generalizing manifold models to accommodate multiple inlet streams, liquid fuels, and staged combustion.
- Leveraging neural networks to construct hybrid physics-based and data-based manifold models of turbulent combustion, a novel approach culminating in far more generally applicable models.

Magnetic Nanoparticle Feedback Control System
New York, NY

The Cooper Union
Sept. 2017 - May 2018

- Investigated using a magnetic control system to direct drug-coated magnetic nanoparticles to disease targets, increasing the effectiveness of treatments such as chemotherapy while decreasing the side-effects.
- Designed and constructed an experimental setup comprising a closed-loop flow channel, nanoparticle cluster, webcam, stepper motors, and electromagnets on rails.
- Wrote a Python program using OpenCV to track the location of a nanoparticle cluster in real-time.
- Programmed an Arduino to actuate stepper motors and vary electromagnet strength in feedback control loop.

Employment

Smith Engineering, PLLC
New York, NY

Engineering Intern
May 2017 - Apr. 2018

- Trained predictive models in Microsoft Azure Machine Learning Studio.
- Integrated machine learning models with a local PI database using Python and API requests.
- Prepared screens in PI Vision for real-time data visualization.
- Wrote Python programs to scrape data using API requests and WebDrivers.
- Built Con Edison electric and steam rate structures in MATLAB.

Projects

Genetic Algorithm for Structural Design and Topological Optimization
Princeton, NJ

Princeton University
Nov. 2018 - Jan. 2019

- Developed a Python package that employs a genetic algorithm to optimize truss structures.
- Versioned with Git and coordinated with a team to proactively avoid merge conflicts.
- Leveraged Coveralls and Codacy for code coverage evaluations and linting.
- Generated automatic documentation with Sphinx and Read the Docs.

CFD Analysis and Design of a Turbojet Compressor
New York, NY

The Cooper Union
Apr. 2017 - May 2017

- Designed the compressor stage of a turbojet engine to satisfy pressure and compression ratio specifications.
- Modeled the compressor geometry in BladeGen and SolidWorks.
- Meshed the solid geometry in HyperMesh and ANSYS Meshing.
- Simulated the design transiently in ANSYS Fluent and performed post-processing in CFD-Post.
- Documented results in final report and delivered presentation.

Skills

Software ANSYS Fluent, ANSYS APDL, HyperMesh, SolidWorks, AutoCAD, MATLAB.
Languages Python, C, Fortran.
Tools Make, Git, Mercurial, UNIX command-line, LaTeX.
IoT Raspberry Pi, Arduino.

Memberships

Honor Societies Tau Beta Pi.
Professional Associations The Combustion Institute, APS DFD, ASME.