

Francisco J. Gonzalez

Ph.D. Student @ University of Illinois

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Education

- 2018–present **Ph.D.**, *University of Illinois at Urbana-Champaign*, Aerospace Engineering.
Alfred P. Sloan MPhD Scholar
- 2016–2018 **M.Sc.**, *University of Illinois at Urbana-Champaign*, Aerospace Engineering.
Adviser: Maciej Balajewicz
Thesis: “Learning low-dimensional feature dynamics using convolutional recurrent autoencoders”
- 2012–2016 **B.Sc.**, *University of Illinois at Urbana-Champaign*, Aerospace Engineering.
Cum Laude, Minor: Computational Science & Engineering

Research Experience

- 2016–2018 **Graduate Research Assistant**, *University of Illinois at Urbana-Champaign*.
Data-driven methods in computational science.
- Developed deep learning based, completely data-driven nonlinear model reduction strategy.
 - Currently researching applications of deep learning to modeling complex dynamical systems.
- Summer 2018 **Research Intern**, *Mitsubishi Electric Research Laboratory*, Cambridge, MA.
Optimal sensor placement for state estimation.
- Developed optimal sensor placement algorithm for state estimation of large thermo-fluid systems.
 - Implemented iterative solvers for large-scale matrix equations used in estimation.
- Summer 2016 **Computational Physics Fellow**, *Los Alamos National Laboratory*.
Quinoa: Adaptive Fluid Dynamics
- Contributed to the development of Quinoa, a fully asynchronous distributed-memory parallel finite element solver using unstructured grids.
 - Implemented load-balancing capabilities on the finite element solver using the Charm++ runtime system.
- 2015–2016 **Blue Waters Research Intern**, *National Center for Supercomputing Applications*, Urbana, IL.
Computational bio-fluid mechanics
- Utilized the petascale supercomputer, Blue Waters, to investigate and develop residual-based turbulence models applicable to arterial blood flow.
 - Designed and ran simulations investigating intracranial blood flow during +Gz accelerations.

- 2014–2016 **Ronald E. McNair Scholar**, *University of Illinois at Urbana-Champaign*.
Computational aerodynamics
- Proposed an independent research project on the aerodynamics of vertical axis wind turbines.
 - Developed a vortex code to study rotating airfoils under changing tip-speed ratios and blade pitch angles.

Publications

- 2018
1. **Gonzalez, F.**, Balajewicz, M. (2018) Dilated recurrent neural networks for learning multi-scale dynamics. (*Working paper*)
 2. **Gonzalez, F.**, Balajewicz, M. (2018) Deep convolutional recurrent autoencoders for learning low-dimensional feature dynamics of fluid systems, *arXiv preprint arXiv:1808.01346*. (Submitted to *Int J Num Meth Fluids*)
- 2016
1. **Gonzalez, F.**, Rogers, B. (2016) Asynchronous Navier-Stokes solver for unstructured grids using overdecomposition, Los Alamos National Laboratory Tech. Rep. LA-UR-16-27258, 104-124.

Conference Proceedings

- 2017
1. Bakosi, J., Bird, R., Junghans, C., Pavel, R., Waltz, J., **Gonzalez, F.**, Rogers, B. (2017) Quinoa: Adaptive Computational Fluid Dynamics, 15th Annual Workshop on Charm++ and its Applications, Urbana, IL.
- 2016
1. **Gonzalez, F.** (2016) Numerical simulation of highly pulsatile blood flow through idealized femoral artery bifurcations, 2016 Undergraduate Research Symposium, Urbana, IL.
- 2015
1. **Gonzalez, F.** (2015) Gain scheduling approach to variable pitch vertical axis wind turbines, 2015 SAEOPP McNair/SSS Scholars Research Conference, Atlanta, GA. (2nd Place Oral Presentation Award)
 2. **Gonzalez, F.** (2015) Parallelized 2D vortex panel model for rotating airfoils, 2015 Undergraduate Research Symposium, Urbana, IL.

Honors & Awards

- 2018–2020 Alfred P. Sloan MPhD Scholar, *Alfred P. Sloan Foundation*
- 2016–2021 SURGE Fellowship, *UIUC College of Engineering*
- 2014–2016 Ronald E. McNair Scholar, *UIUC*
- 2015–2016 Blue Waters Fellowship, *National Center for Supercomputing Applications*
- 2013–2016 Edmund J. James Scholar, *UIUC College of Engineering*
- 2014, 2015 Dean's List, *UIUC College of Engineering*
- 2012–2016 President's Award Program Honors Scholarship, *UIUC*

2015 David Kuck Computational Science & Engineering Award, *UIUC*

2015 La Casa Latina Outstanding Scholar Award, *UIUC*

Teaching

Fall 2015 **Teaching Assistant**, CSE High Performance Computing Workshop, *NCSA*

2013–2014 **Mathematics Tutor**, Office of Minority Student Affairs, *UIUC*

Software

Languages & **Programming**

Frameworks

- C/C++, Python, MATLAB, Fortran 90

High Performance Computing

- OpenMP, MPI, CUDA, Charm++

Machine Learning

- TensorFlow, Keras, Scikit-learn

Packages *nMOR: Neural Model Order Reduction*

- Deep learning based package for nonlinear model order reduction written in Python and Tensorflow, available on Github.