

Esteban A. L. Hufstedler, Ph.D.

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SKILLS SUMMARY

- Programming languages: C#, MATLAB, Python, Java, Mathematica, LaTeX
- Fabrication tools: Rapid prototyping, manual and G-code machining.
- Software: MATLAB, LabVIEW, SolidWorks, Blender, XFOIL, Linux.
- Scientific: Experimental design and data analysis.
- Communications: authored 10+ papers and conference presentations.
- Languages: English (native), French (basic), Spanish (basic).

EXPERIENCE

Heliogen, Senior Simulation and Analysis Engineer. *CA, USA* 04/2021 – 08/2025

- Simulation, design, and optimization of concentrated solar power fields.
 - Spearheaded new field modeling tool for faster execution, higher accuracy, and more flexibility.
 - Balanced safety, construction, maintenance, and efficiency when designing novel fields.
 - Optimized fields to fulfill these complex requirements.
 - Created subsampling method to reduce simulation time by 80x.
- Developed tools for optical simulations
 - Designed methods for efficiently spreading flux on the target, avoiding equipment damage.
 - Glint/glare safety analysis of reflected light reaching human eyes.
 - Avian safety analysis: designed control strategies to help protect birds.
- Informed manufacturing decisions
 - Simulated novel mirror kinematics, helping to increase their efficiency.
 - Created pass/fail criteria for mirror manufacturing tolerances.

Independent Contractor. *Brussels, Belgium* 12/2019 - 07/2020

- Created simulation tools for industrial methods in the fiber industry.
- Wrote efficient code, user-friendly documentation, and iterated with the client to ensure satisfaction.
- Performed literature research, reproduced published simulations.

Université Catholique de Louvain, Postdoc. *Louvain-la-Neuve, Belgium* 08/2017 - 10/2019

- Applied machine learning tools to control simulated aerodynamic systems, such as reducing turbulent loads.
- Developed an internal codebase of machine learning algorithms and aerodynamic models to support the research team.
- Simulated efficiency of formation flight of aircraft, and optimized flock changes.
- Coached four PhD candidates in their research.

California Institute of Technology, Graduate Researcher. CA, USA 08/2012 - 06/2017

- Created a novel vortex-gust generation system, with reduced experimental interference with the test article.
 - Investigated separated flow, vortex dynamics, and fluid-structure interaction.
- Designed and built an experimental testing apparatus including its control/actuation system.
 - Designed a custom modular wing to be 3D printed, with a stepper motor actuated flap. Machined its lightweight and stiff support structure.
 - Designed, assembled, and characterized a computer controlled heaving plate to generate gusts.
 - Designed and implemented efficient LabVIEW programs to actuate the motor, plate, record force data, and synchronize external particle image velocimetry measurements.
- Developed numerical tools to analyze more than 4 TB of data.
 - Analyzed forces with Fourier and modal analysis, sparse approximation, and reduced order modeling techniques.
 - Analyzed flow velocity fields with vortex identification and tracking algorithms.

Ecole Polytechnique, Graduate Researcher. Palaiseau, France 08/2011 - 08/2012

- Examined dynamics of tidal power generation.
- Designed and implemented in MATLAB an unsteady vortex panel method with adaptive time-stepping, parallel execution, and several explicit and implicit numerical integration methods.

Jet Propulsion Laboratory, Intern. CA, USA 06/2007 - 08/2007

- Performed thermal, structural, and performance analysis of diamond-epoxy grinding bits.
- Created the safety plan for a material impact test, and aided in its execution.

EDUCATION

Ph.D. in Aeronautics, Caltech. Pasadena, CA 2017

- Thesis: Experimental Generation and Modeling of Vortical Gusts and Interactions with an Airfoil.

M.S. in Fluid Mechanics, École Polytechnique. Palaiseau, France 2012

- First in class.
- Thesis: Power Generation and Stability of a Flapping Airfoil.

M.S. in Aeronautics, Caltech. Pasadena, CA 2011

B.S. in Aeronautics and Astronautics, MIT. Cambridge, MA 2009

- Thesis: Modeling and experimental measurement of boundary layer cooling on a wing-mounted solar panel.

PUBLICATIONS

- [Evaluating Glint and Glare Hazards From Fields of Parabolic Mirrors](#). E. Hufstedler. Journal of Solar Energy Engineering 147.5 (2025).
- [Loads Alleviation on an Airfoil via Reinforcement Learning](#). E. Hufstedler, P. Chatelain. AIAA SciTech Forum (2019).
- [Vortical Gusts: Experimental Generation and Interaction with a Wing](#). E. Hufstedler, B.J. McKeon. AIAA Journal (2019).
- [Isolated Gust Generation for the Investigation of Airfoil-Gust Interaction](#). E. Hufstedler, B.J. McKeon. 46th AIAA Fluid Dynamics Conference (2016).
- **Simultaneous PIV and Force Measurements on an Airfoil: Model Reduction and Force Estimation**. E. Hufstedler, B.J. McKeon. 11th International Symposium on Particle Image Velocimetry (2015).

CONFERENCE PRESENTATIONS

- **Reinforcement Learning for Turbulent Loads Alleviation with Individual Pitch Control**. E. Hufstedler, P. Chatelain. Simulation et Optimisation pour les Énergies Marines Renouvelables (2019).
- **Learning to fly more efficiently in groups: Reinforcement learning and string stability**. E. Hufstedler, J. Riehl, J. M. Hendrickx, P. Chatelain. Benelux Meeting on Systems and Control (2019).
- **String Stability in Energy-Saving Formation Flight**. P. Chatelain, J. Riehl, E. Hufstedler, J. M. Hendrickx. APS Division of Fluid Dynamics (2019).
- **Loads Alleviation on an Airfoil via Reinforcement Learning**. E. Hufstedler, P. Chatelain. AIAA Scitech Forum (2019).
- **Investigation of an Aperiodic Vortical Gust Generator**. E. Hufstedler, B.J. McKeon. 11th European Fluid Mechanics Conference (2016).
- **Simultaneous PIV and Force Measurements on an Airfoil: Model Reduction and Force Estimation**. E. Hufstedler, B.J. McKeon. 11th International Symposium on Particle Image Velocimetry (2015).
- **Isolated Gust Generation for the Investigation of Airfoil-Gust Interaction**. E. Hufstedler, B.J. McKeon. 46th AIAA Fluid Dynamics Conference (2016).
- **Characterization of an Aperiodic Vortical Gust Generator**. E. Hufstedler, B.J. McKeon. Southern California Flow Physics Symposium (2016).
- **Simultaneous PIV and Force Measurements on an Airfoil: Model Reduction and Force Estimation**. E. Hufstedler, B.J. McKeon. 11th International Symposium on Particle Image Velocimetry (2015).
- **Characterization of a Vortical Gust Generator using PIV**. E. Hufstedler, B.J. McKeon. 68th Meeting of the American Physical Society Division of Fluid Dynamics (2015).
- **Vortex Tracking with Simultaneous PIV and Force Measurements**. E. Hufstedler, B.J. McKeon. Southern California Flow Physics Symposium (2015).
- **Investigation of Bio-Inspired High Lift Devices for Stall Mitigation**. E. Hufstedler, B.J. McKeon. 67th meeting of the American Physical Society Division of Fluid Dynamics (2014).

- **Toward Applying High-Lift Effectors for Gust-Force Mollification.** E. Hufstedler, B.J. McKeon. Southern California Flow Physics Symposium (2013).

INTERESTS

- Recreational programming:
 - An evolutionary algorithm in MATLAB and XFOIL to optimize airfoils.
 - Mathematically rigorous approaches to image half-toning.
 - Abstract and nature-inspired generative art.
 - Transformational cartography: accurately mapping globes to polyhedra.
- Physical projects:
 - CNC Machining, primarily in wood.
 - Papercraft-inspired metalwork sculptures.
 - Persistence of vision spinning LED display.
 - Realization of half-toning programs in sheet metal.
 - Ultimate Frisbee: was captain of the Caltech Aerospace department's league-winning team.
- Personal education:
 - Reviewed manuscripts for Nature Scientific Reports, Physical Review E, Physical Review Fluids, and Experiments in Fluids.
 - Avid reader of fiction and non-fiction.
 - Google Project Management certification (2024).