

Esteban A. L. Hufstedler, Ph.D.

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Nationality: USA.

SKILLS SUMMARY

- Programming languages: Python, MATLAB, Java, Mathematica, LaTeX, LabVIEW “G”.
- Fabrication tools: Rapid prototyping (3D printing, laser cutter), 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 (literate), Spanish (basic).

EXPERIENCE

Independent Contractor. *Brussels, Belgium* 12/2019 - 7/2020

- 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, Postdoctoral Fellow. *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.

École Polytechnique, 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. Aeronautics, California Institute of Technology. *CA, USA* 06/2017

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

M.S. Mécanique des Fluides, École Polytechnique. *Palaiseau, France* 08/2012

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

B.S. Aeronautics and Astronautics, Massachusetts Institute of Technology. *MA, USA* 06/2009

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

PUBLICATIONS

- Vortical Gusts: Experimental Generation and Interaction with a Wing. **E. Hufstedler**, B.J. McKeon. AIAA Journal (2019).
- Loads Alleviation on an Airfoil via Reinforcement Learning. **E. Hufstedler**, P. Chatelain. AIAA Scitech Forum (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 nergies 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).
- 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).
- Characterization of vortical gusts produced by a heaving plate. **E. Hufstedler**, B.J. McKeon. 69th Meeting of the American Physical Society Division of Fluid Dynamics (2016).
- 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 Mollication. **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: 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.