

# Bernardo Pacini | Curriculum Vitae

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## Education

- **University of Michigan** **Ann Arbor, MI**  
*Ph.D. Mechanical Eng., Topic: Rotary Wing Vehicles and Multidisciplinary Design Optimization* *September 2018 – Present*  
GPA: 4.00
- **University of Michigan** **Ann Arbor, MI**  
*M.S.E. Mechanical Eng., Specialization: Fluid Dynamics* *September 2018 – May 2020*  
GPA: 4.00
- **Princeton University** **Princeton, NJ**  
*B.S.E. Mechanical and Aerospace Eng.* *September 2014 – June 2018*  
GPA: 3.59  
Cum Laude

## Current Employment

- **University of Michigan** **Ann Arbor, MI**  
*Graduate Student Research Assistant* *September 2018 – Present*  
Currently conducting research on aeromechanics of rotary wing vehicles. Focus on analysis and multidisciplinary design optimization, developing efficient tools for a simulation and optimization framework for next-generation Urban Air Mobility vehicles. Working under the guidance of Prof. Karthik Duraisamy in the Computational Aerosciences Laboratory and Prof. Joaquim R. R. A. Martins in the Multidisciplinary Design Optimization Laboratory.
- **University of Michigan** **Ann Arbor, MI**  
*Graduate Student Instructor* *January 2020 – December 2020*  
[Fall 2020] AEROSP325 - Aerodynamics. Responsible for four hours of office hours per week as well as on-demand extra help sessions with students. Also in charge of organizing homework solutions.  
[Winter 2020] MECHENG320 - Introduction to Fluid Mechanics. Responsible for eleven hours of office hours per week as well as a recitation section. Also in charge of writing homework and quiz solutions as well as grading assessments.

## Previous Employment

- **A<sup>3</sup> by Airbus** **Sunnyvale, CA**  
*Aerodynamics and Aeroacoustics Intern* *June 2019 – August 2019*  
Developed a variable-fidelity aeroacoustic modeling tool called *PULSE* for evaluating noise generation by eVTOL vehicles. This tool utilizes a set of compact aeroacoustic modeling techniques to enable computationally efficient simulations and was developed with a focus on tool flexibility to allow for analysis of varying configurations and vehicle designs. Analyses were carried out on the *Vahana Alpha Demonstrator* vehicle to evaluate its aeroacoustic performance and to test the validity of the aeroacoustic analysis framework.
- **Pratt & Whitney** **Middletown, CT**  
*Advanced Engine Design Intern* *June 2017 – August 2017*  
Designed, simulated, and optimized high pressure compressor cores for both military and commercial engine programs. Thermal and structural optimization analyses for compressor cores were carried out using existing design and optimization frameworks incorporating Siemens NX (Unigraphics), ANSYS (APDL), and other proprietary algorithms.
- **Institut für Photonische Technologien (Freidrich-Alexander-Universität)** **Erlangen, Germany**  
*Simulation and Experimentation Research Intern* *June 2016 – August 2016*  
Developed and improved a computational solver based in OpenFOAM to simulate laser-based welding. Improved the fidelity of the formulations used for conservation laws and ran analyses to understand the performance of the implemented models. Separately, designed and constructed a system of circuits, firmware, and software to control the motor system on a laser welding machine.
- **Veryst Engineering** **Needham Heights, MA**  
*Computational Fluid Dynamics Intern* *2013 – 2014*  
Studied hydrodynamics of submerged foils and resonance frequencies of cantilever beams to build proficiency with COMSOL Multiphysics. Investigated bat flight dynamics using COMSOL to understand bats' use of sensitive hairs on the trailing edges of their wings to ensure stable flight.

## Notable Projects

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- **Rotary Wing Vehicle Analysis Tools for Design and Analysis of eVTOL Vehicles**  
*University of Michigan* *April 2019 – Present*  
Developing a framework for aerostructural/acoustic optimization of rotorcraft vehicles using mixed-fidelity methods. The tools are based in Fortran, C, and C++ and wrapped in Python, to interface with the OpenMDAO Python framework for multidisciplinary design optimization.
- **Design, Development, and Construction of a Biologically Inspired Sensing System for Real Time Flow Visualization**  
*Princeton University Senior Thesis* *2017 - 2018*  
Designed, simulated, and manufactured a micro-scale sensor for fluid flow visualization over the surface of airfoils. Worked with modeling and simulation tools (PTC CREO, ANSYS Fluent) and manufactured the sensor in the PRISM micro-fabrication facility.
- **TigerElectric - AIAA Undergraduate Team Aircraft Design Competition**  
*Team Lead* *2017 – 2018*  
Led a team to design a hybrid-electric general aviation aircraft for the 2017 - 2018 AIAA Undergraduate Design Competition. This included aspects ranging from model development and initial vehicle sizing to detailed component analysis.
- **Research on Bat Flight Dynamics and Feedback Control Mechanisms**  
*Undergraduate Researcher* *2014 - 2018*  
Simulated airflow over bat wings in both stable and stall flight conditions using COMSOL CFD Module to determine the purpose of sensitive hairs on trailing edges of bats' wings.
- **Eaglet Light Business Jet Family - AIAA Undergraduate Team Aircraft Design Competition**  
*Engineering Lead* *2016 – 2017*  
Led a team of engineering students to design a business jet family for the 2016 - 2017 AIAA Undergraduate Design Competition. Managing this team included all aspects of the vehicle design process from preliminary design and sizing to detailed analysis.

## Presentations

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- AIAA Aviation, June 2021  
Oral Presentation: *Aerodynamic and Aeroacoustic Optimization for Urban Air Mobility Vehicle Design*
- Vertical Flight Society - Aeromechanics for Advanced Vertical Flight Technical Meeting, January 2020  
Oral Presentation: *Parametric Aeroacoustic Analysis of Two Fans in Hover Flight Condition*
- Princeton Research Day Keynote Presentation, May 2018  
Oral Presentation: *Design, Development, and Construction of a Biologically Inspired Sensor System for Real Time Flow Visualization*

## Awards

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- Rollin M. Gerstacker Foundation Fellowship 2018 - 2019
- Lore von Jaskowsky Memorial Prize 2018
- John Marshall II Memorial Award - 2<sup>nd</sup> Place 2018
- Morgan W. McKinzie '93 Senior Thesis Prize Fund Fall 2017 & Spring 2018
- Streicker International Fellows Fund Summer 2016
- Norman D. Kurtz '58 Fund for Innovation in Engineering Education Spring 2016

## Skills

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- **Design:** Fortran, Java, Python, C/C++/C#, Visual Studio, HTML/CSS, Matlab, Simulink, NI LabVIEW, NX (Unigraphics), PTC CREO, OpenVSP, KiCAD
- **Analysis:** ANSYS Fluent (APDL), COMSOL Multiphysics, OpenFOAM, Pointwise (Cadence)
- **Manufacturing:** Machine-Shop Manufacturing, Nano-/Micro-Fabrication, Composites Manufacturing
- **Languages:** English, Spanish, Italian, basic level German

## Publications

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- **B Pacini**, J R R A Martins, and K Duraisamy, Aerodynamic and Aeroacoustic Optimization for Urban Air Mobility Vehicle Design, *AIAA Aviation*, June 2021
- **B Pacini**, G Droandi, and M Syal, Parametric Aeroacoustic Analysis of Two Fans in Hover Flight Condition, *Proceedings of the Vertical Flight Society - Aeromechanics for Advanced Vertical Flight Technical Meeting*, January 2020