

# Albert R. Gnad

Aerospace Engineer · Computer Scientist

Boston, MA

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*"The three most exciting sounds in the world... anchor chains, plane motors, and train whistles."  
– It's a Wonderful Life*

## Summary

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B.S. from UW–Madison MechE, M.S. and PhD from MIT AeroAstro. Interested in sustainability, transportation (especially aviation), and the Julia programming language. Former NSF GRFP fellow. Private pilot.

## Education

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### Massachusetts Institute of Technology

Cambridge, MA

PhD Aeronautics and Astronautics

May 2022

- GPA 5.0/5.0
- Concentration in applied & scientific machine learning (SciML)

M.S. Aeronautics and Astronautics

Feb 2018

- GPA 5.0/5.0
- Concentration in aerodynamics & air-breathing propulsion

### University of Wisconsin–Madison

Madison, WI

B.S. Mechanical Engineering

May 2015

- GPA 3.98/4.0, Graduated with Highest Distinction
- Certificate in Engineering Thermal Energy Systems
- Honors in Research
- Studied abroad at the Budapest University of Technology and Economics

## Work Experience

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### MIT CSAIL

Cambridge, MA

Postdoctoral Associate

Jun 2022 – present

- Research & development of the open-source [MagNav.jl](#) software package
- Presented bleeding edge work on airborne magnetic anomaly navigation (MagNav) & aeromagnetic compensation at 6 conferences

### SandboxAQ

Remote

Consultant

Jun 2022 – Sep 2022

- Advised the development & debugging of MagNav software
- Performed literature review on MagNav-related research articles

### MIT AeroAstro

Cambridge, MA

Research Assistant

Sep 2015 – May 2022

- Assessed the technical & environmental viability of all-electric commercial aircraft
- Led the propulsion analysis for a short takeoff & landing (STOL) aircraft design
- Designed a test section with a flexible wall for use in a subsonic wind tunnel
- Developed ML-based compensation models for airborne magnetic anomaly navigation (MagNav)
- Collaborated with researchers across multiple labs & universities, leading to 5 publications

**Wright Electric**

Consultant

*Remote**Dec 2019 – Jan 2020*

- Modeled turboelectric fan performance toward development of the Wright 1 aircraft
- Evaluated the eMSTAR aircraft design & performed an analysis of alternatives

**UW-Madison Eriten Research Group**

Undergraduate Researcher

*Madison, MI**Sep 2014 – May 2015*

- Computed frictional energy dissipation & damping variations under various loadings
- Designed a test setup with multidimensional piezoelectric actuators & force measurements

**Ford Motor Company**

Refrigerant Subsystem Intern

*Dearborn, MI**May 2014 – Aug 2014*

- Reorganized & improved the functionality of a thermodynamic analysis tool
- Developed an acceptance test procedure for a new refrigerant subsystem test chamber
- Analyzed A/C performance test data to determine causes of enhanced performance
- Communicated with external teams to answer questions about refrigerant subsystems

**UW-Madison Engine Research Center**

Undergraduate Researcher

*Madison, MI**Jan 2014 – May 2014*

- Developed & implemented a statistical combustion model into a cycle-simulation tool
- Exercised model to explain sources of cycle-to-cycle stochastic instability in Reactivity Controlled Compression Ignition (RCCI) engines

**GE Healthcare**

Bearing Development Intern

*Milwaukee, WI**Jun 2013 – Aug 2013*

- Performed weekly bearing coast down data analyses for multiple programs
- Completed a tolerance stack-up analysis between a rotor & stator (included GD&T)
- Designed a bolted joint test to ensure constant bolt elongation (including solid modeling)
- Setup & monitored automated bearing tests in rotational & eccentricity rigs

**UW-Madison Polymer Engineering Center**

Undergraduate Researcher

*Madison, MI**May 2012 – Sep 2012*

- Designed & prototyped a cost-effective inhaler spacer made from recycled materials
- Researched ideal properties & design considerations for inhaling aerosolized medicine

**GE Healthcare**

Verification &amp; Validation Co-op

*Madison, WI**May 2012 – Jan 2013*

- Oversaw automated software tests for anesthesia machines & critical care ventilators
- Created & updated (& executed) test protocols with specification changes
- Won 2 monthly awards for efficiency & best risk remediation
- Leader in reporting critical care ventilator software issues

## Skills

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<b>General</b>	Data analysis & visualization, machine learning, statistics, communication, documentation, teamwork
<b>Programming</b>	<b>Julia</b> (expert), <b>Python</b> (Dash/Plotly, NumPy, Pandas, PyTorch, SciPy, scikit-learn, etc.), MATLAB, Fortran
<b>Technical</b>	<b>Microsoft Office</b> , <b>Git/GitHub</b> , <b>ArcGIS</b> , <b>LaTeX</b> , Shell (Bash/Zsh), Tableau, EES, OpenVSP, SolidWorks, TASOPT, XFOIL
<b>Private Pilot</b>	airplane single-engine land

## Honors & Awards

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### Achievements

2015	<b>Passed</b> , Fundamentals of Engineering (FE) Mechanical exam	<i>Platteville, WI</i>
2010	<b>Valedictorian</b> , Wisconsin Dells High School, GPA 4.0/4.0	<i>Wisconsin Dells, WI</i>
2009	<b>Eagle Scout</b> , designed & directed construction of a state park information kiosk	<i>Wisconsin Dells, WI</i>

### Fellowships & Scholarships

2015	<b>Dodson Fellowship</b> , Tau Beta Pi Engineering Honor Society	<i>Madison, WI</i>
	<b>F.M. Young Award</b> , Pi Tau Sigma Mechanical Engineering Honor Society	<i>Madison, WI</i>
	<b>Graduate Research Fellowship, National Science Foundation</b>	<i>Madison, WI</i>
	<b>Marjorie Roy Rothermel Scholarship</b> , American Society of Mechanical Engineers Auxiliary	<i>Madison, WI</i>
	<b>W.G. Kirchoffer Memorial Scholarship</b> , Polygon Engineering Student Council	<i>Madison, WI</i>
2014	<b>Engineering Student Scholarship</b> , AfterCollege	<i>Madison, WI</i>
	<b>Uyehara-Myers Scholarship</b> , UW-Madison Mechanical Engineering Department	<i>Madison, WI</i>
2013	<b>Edward F. Obert Endowment</b> , UW-Madison Mechanical Engineering Department	<i>Madison, WI</i>
	<b>Fred W. and Josephine H. Colbeck Scholarship</b> , UW-Madison Polygon Eng. Student Council	<i>Madison, WI</i>
	<b>John and Elsa Gracik Scholarship</b> , American Society of Mechanical Engineers	<i>Madison, WI</i>
	<b>Stabile Scholarship</b> , Tau Beta Pi Engineering Honor Society	<i>Madison, WI</i>
2012	<b>Alvarado Global Experience Scholarship</b> , UW-Madison International Eng. Studies and Programs	<i>Madison, WI</i>
	<b>David C. Spraker Scholarship</b> , UW-Madison Mechanical Engineering Department	<i>Madison, WI</i>
	<b>Foundation for Global Scholars Scholarship</b> , Foundation for Global Scholars	<i>Madison, WI</i>
2011	<b>Charles J. Marshall Scholarship</b> , UW-Madison College of Engineering	<i>Madison, WI</i>
2010	<b>Academic Excellence Scholarship</b> , Wisconsin Higher Educational Aids Board	<i>Wisconsin Dells, WI</i>
	<b>Freshman Academic Achievement Award</b> , UW-Madison College of Engineering	<i>Madison, WI</i>
	<b>Hold Harmless Grant</b> , Wisconsin Higher Educational Aids Board	<i>Madison, WI</i>

### Awards

2022	<b>Transition Award</b> , DAF-MIT Artificial Intelligence Accelerator	<i>Cambridge, MA</i>
2019	<b>3rd Place</b> , MIT Can Talk Oratory Competition	<i>Cambridge, MA</i>
2018	<b>3rd Place</b> , Siemens FutureMakers Challenge (software competition)	<i>Cambridge, MA</i>
2015	<b>Winner</b> , F.M. Young Award (outstanding graduating senior in UW-Madison MechE)	<i>Madison, WI</i>
	<b>3rd Place &amp; Best Technical Content</b> , Old Guard Oral Presentation Competition	<i>Milwaukee, WI</i>
2014	<b>Winner</b> , ASME ICE Division Undergraduate Student Presentation Competition	<i>Columbus, IN</i>
	<b>3rd Most Active Member</b> , UW-Madison American Society of Mechanical Engineers	<i>Madison, WI</i>
2013	<b>Most Active Member</b> , UW-Madison American Society of Mechanical Engineers	<i>Madison, WI</i>

## Conference Presentations

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2024	<b>ION Joint Navigation Conference,</b> Magnetic Navigation Flight Testing on a C-17A by the DAF-MIT AI Accelerator <b>JuliaCon,</b> Real-Time Airborne Magnetic Navigation with MagNav.jl	<i>Cincinnati, OH</i> <i>Eindhoven, NL</i>
2023	<b>IEEE/ION Position Location and Navigation Symposium,</b> Knowledge-Informed Approaches for Airborne Magnetic Anomaly Navigation <b>JuliaCon,</b> Knowledge-Informed Learning in MagNav.jl for Magnetic Navigation	<i>Monterey, CA</i> <i>Cambridge, MA</i>
2022	<b>AIAA SciTech Forum,</b> Machine Learning-Enhanced Magnetic Calibration for Airborne Magnetic Anomaly Navigation <b>ION Joint Navigation Conference,</b> A Comparison of Aeromagnetic Compensation Models for Airborne Magnetic Anomaly Navigation <b>JuliaCon,</b> MagNav.jl: airborne Magnetic anomaly Navigation	<i>San Diego, CA</i> <i>San Diego, CA</i> <i>Online</i>
2021	<b>JuliaCon,</b> Airborne Magnetic Anomaly Navigation Enhanced with Neural Networks	<i>Online</i>
2019	<b>AIAA SciTech Forum,</b> Hybrid Turbo-Electric STOL Aircraft for Urban Air Mobility	<i>San Diego, CA</i>
2015	<b>ASME Student Professional Development Conference,</b> RCCI Cycle-Simulations with Stochastic Operating Conditions	<i>Milwaukee, WI</i>
2014	<b>ASME Internal Combustion Engine Division Fall Technical Conference,</b> RCCI Cycle-Simulations with Stochastic Operating Conditions	<i>Columbus, IN</i>

## Leadership

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<b>Accenture Generative AI Program</b> Facilitator	<i>MIT</i> <i>Sep 2023 – Oct 2023</i>
<ul style="list-style-type: none"><li>Assisted senior-level Accenture employees in working through business challenges that incorporate generative AI</li></ul>	
<b>Department of Athletics, Physical Education, and Recreation</b> Advisory Board	<i>MIT</i> <i>Sep 2018 – May 2021</i>
<ul style="list-style-type: none"><li>Advised on matters of policy &amp; procedure related to athletics, physical education, &amp; recreation at MIT</li></ul>	
<b>Edgerton House</b> Athletics Chair	<i>MIT</i> <i>Mar 2019 – Apr 2021</i>
<ul style="list-style-type: none"><li>Managed the apartment building gym &amp; initiated fitness-related activities</li></ul>	
<b>Hyperloop II Team</b> Aerodynamics Lead	<i>MIT</i> <i>Sep 2018 – Jul 2019</i>
<ul style="list-style-type: none"><li>Led the aerodynamic analysis &amp; design of the shell (casing) for the MIT Hyperloop pod</li></ul>	
<b>American Society of Mechanical Engineers</b> Academic Chair, Banquet Chair, Secretary, Sophomore Representative, Design Team Member	<i>UW-Madison</i> <i>Sep 2011 – May 2015</i>
<ul style="list-style-type: none"><li>Heavily active member of the largest mechanical engineering club on campus</li></ul>	
<b>Pi Tau Sigma Mechanical Engineering Honor Society</b> Secretary	<i>UW-Madison</i> <i>Feb 2012 – May 2015</i>
<ul style="list-style-type: none"><li>Participated in professional development events</li></ul>	

## Tau Beta Pi Engineering Honor Society

Corresponding Secretary

UW-Madison

Apr 2012 – May 2015

- Volunteered at the Pi Mile Run & UW-Madison Arboretum

## Energy Hub

Energy Hub Conference Committee

UW-Madison

Sep 2013 – Nov 2014

- Organized & participated in the Energy Hub Conference, twice

## Division of Information Technology

Student Advisory Committee

UW-Madison

Oct 2013 – May 2014

- Discussed Division of Information Technology services, products, & initiatives

## Associate Students of Madison

Office of the Registrar Student Advisory Board

UW-Madison

Sep 2011 – Dec 2012

- Provided input on Registrar projects

## Extracurricular Activities

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<b>Intramurals</b>	Basketball (captain), cornhole, dodgeball, football, hockey, soccer, ultimate, volleyball, & water polo
<b>Rollerblading</b>	Expert at navigating Boston's "fun & exciting" street layout
<b>Other</b>	MIT GSC Hometown Presentation Initiative participant (2018) MIT & Kennedy Space Center Program participant (2017) Second Harvest Foodbank volunteer Young Scientists of America mentor

## Publications

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- [1] A. R. Gnad, A. B. Wollaber, and A. P. Nielsen, "Derivation and Extensions of the Tolles-Lawson Model for Aeromagnetic Compensation," *arXiv*, pp. 1–9, 2022. [Online]. Available: <https://doi.org/10.48550/arXiv.2212.09899>
- [2] A. R. Gnad, "Advanced Aeromagnetic Compensation Models for Airborne Magnetic Anomaly Navigation," Doctoral dissertation, Massachusetts Institute of Technology, 2022. [Online]. Available: <https://dspace.mit.edu/handle/1721.1/145137>
- [3] —, "Machine Learning-Enhanced Magnetic Calibration for Airborne Magnetic Anomaly Navigation," in *AIAA SCITECH 2022 Forum*. San Diego, CA: AIAA, 2022, pp. 1–16. [Online]. Available: <https://doi.org/10.2514/6.2022-1760>
- [4] A. R. Gnad, J. Belarge, A. Canciani, G. Carl, L. Conger, J. Curro, A. Edelman, P. Morales, A. P. Nielsen, M. F. O'Keeffe, C. V. Rackauckas, J. Taylor, and A. B. Wollaber, "Signal Enhancement for Magnetic Navigation Challenge Problem," *arXiv*, pp. 1–21, jul 2020. [Online]. Available: <https://doi.org/10.48550/arXiv.2007.12158>
- [5] A. R. Gnad, R. L. Speth, J. S. Sabnis, and S. R. H. Barrett, "Technical and Environmental Assessment of All-Electric 180-Passenger Commercial Aircraft," *Progress in Aerospace Sciences*, vol. 105, pp. 1–30, feb 2019. [Online]. Available: <https://doi.org/10.1016/j.paerosci.2018.11.002>
- [6] A. W. Schäfer, S. R. H. Barrett, K. Doyme, L. M. Dray, A. R. Gnad, R. Self, A. O'Sullivan, A. P. Synodinos, and A. J. Torija, "Technological, Economic and Environmental Prospects of All-Electric Aircraft," *Nature Energy*, pp. 1–7, 2019. [Online]. Available: <https://doi.org/10.1038/s41560-018-0294-x>
- [7] A. R. Gnad, S. Isaacs, R. Price, M. Dethy, and C. Chappelle, "Hybrid Turbo-Electric STOL Aircraft for Urban Air Mobility," in *AIAA Scitech 2019 Forum*. San Diego, CA: MIT, 2019, pp. 1–22. [Online]. Available: <https://doi.org/10.2514/6.2019-0531>
- [8] A. R. Gnad, "Technical and Environmental Assessment of All-Electric 180-Passenger Commercial Aircraft," Master's thesis, Massachusetts Institute of Technology, 2018. [Online]. Available: <https://dspace.mit.edu/handle/1721.1/122501>