Albert R. Gnadt

Aerospace Engineer · Computer Scientist

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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

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

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

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 *Remote*

Consultant *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 *Madison, MI*

Undergraduate Researcher *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 *Dearborn, MI*

Refrigerant Subsystem Intern *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 *Madison, MI*

Undergraduate Researcher *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 *Milwaukee, WI*

Bearing Development Intern *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 *Madison, MI*

Undergraduate Researcher *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 *Madison, WI*

Verification & Validation Co-op *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

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

Honors & Awards

Achievements

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

Fellowships & Scholarships

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

Awards

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

Conference Presentations

2024 **ION Joint Navigation Conference**, *Cincinnati, OH*
Magnetic Navigation Flight Testing by the DAF-MIT AI Accelerator
JuliaCon, *Eindhoven, NL*
Real-Time Approaches for Airborne Magnetic Anomaly Navigation in MagNav.jl

2023 **IEEE/ION Position Location and Navigation Symposium**, *Monterey, CA*
Knowledge-Informed Approaches for Airborne Magnetic Anomaly Navigation
JuliaCon, *Cambridge, MA*
Knowledge-Informed Learning in MagNav.jl for Magnetic Navigation

2022 **AIAA SciTech Forum**, *San Diego, CA*
Machine Learning-Enhanced Magnetic Calibration for Airborne Magnetic Anomaly Navigation
ION Joint Navigation Conference, *San Diego, CA*
A Comparison of Aeromagnetic Compensation Models for Airborne Magnetic Anomaly Navigation
JuliaCon, *Online*
MagNav.jl: airborne Magnetic anomaly Navigation

2021 **JuliaCon**, *Online*
Airborne Magnetic Anomaly Navigation Enhanced with Neural Networks

2019 **AIAA SciTech Forum**, *San Diego, CA*
Hybrid Turbo-Electric STOL Aircraft for Urban Air Mobility

2015 **ASME Student Professional Development Conference**, *Milwaukee, WI*
RCCI Cycle-Simulations with Stochastic Operating Conditions

2014 **ASME Internal Combustion Engine Division Fall Technical Conference**, *Columbus, IN*
RCCI Cycle-Simulations with Stochastic Operating Conditions

Leadership

Accenture Generative AI Program *MIT*
Facilitator *Oct 2023 – Oct 2023*
- Assisted senior-level Accenture employees in working through business challenges that incorporate generative AI

Department of Athletics, Physical Education, and Recreation *MIT*
Advisory Board *Sep 2018 – May 2021*
- Advised on matters of policy & procedure related to athletics, physical education, & recreation at MIT

Edgerton House *MIT*
Athletics Chair *Mar 2019 – Apr 2021*
- Managed the apartment building gym & initiated fitness-related activities

Hyperloop II Team *MIT*
Aerodynamics Lead *Sep 2018 – Jul 2019*
- Led the aerodynamic analysis & design of the shell (casing) for the MIT Hyperloop pod

American Society of Mechanical Engineers *UW–Madison*
Academic Chair, Banquet Chair, Secretary, Sophomore Representative, Design Team Member *Sep 2011 – May 2015*
- Heavily active member of the largest mechanical engineering club on campus

Pi Tau Sigma Mechanical Engineering Honor Society *UW–Madison*
Secretary *Feb 2012 – May 2015*
- Participated in professional development events

Tau Beta Pi Engineering Honor Society *UW–Madison*

Corresponding Secretary *Apr 2012 – May 2015*

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

Energy Hub *UW–Madison*

Energy Hub Conference Committee *Sep 2013 – Nov 2014*

- Organized & participated in the Energy Hub Conference, twice

Division of Information Technology *UW–Madison*

Student Advisory Committee *Oct 2013 – May 2014*

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

Associate Students of Madison *UW–Madison*

Office of the Registrar Student Advisory Board *Sep 2011 – Dec 2012*

- Provided input on Registrar projects

Extracurricular Activities

Intramurals Basketball (captain), cornhole, dodgeball, football, hockey, soccer, ultimate, volleyball, & water polo

Rollerblading Expert at navigating Boston's "fun & exciting" street layout

Other MIT GSC Hometown Presentation Initiative participant (2018)

MIT & Kennedy Space Center Program participant (2017)

Second Harvest Foodbank volunteer

Young Scientists of America mentor

Publications

[1] A. R. Gnadt, 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. Gnadt, "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. Gnadt, 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. Gnadt, 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. Gnadt, 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. Gnadt, 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. Gnadt, "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