

Anthony T. Wertz

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Education

- 2025 **Ph.D. in Robotics**, Carnegie Mellon University
Holistic soft material systems for advancing robotic and wearable sensing functionality.
- 2012 **M.Sc. in Computer Engineering**, University of Central Florida.
Intelligent systems and machine learning focus.
- 2009 **B.Sc. in Computer Engineering**, University of Central Florida
Designed, developed, and analyzed a three phase AC to DC power converter for use with a low power wind turbine to efficiently charge a 12V or 24V battery lead acid battery. Designed dual DSP controlled circuitry and firmware to rectify the turbine input, perform power factor correction, maximize power extraction, and provide useful telemetry and external control. One of six teams worldwide to progress to the 2009 Future Energy Challenge competition in Melbourne, Australia, winning first place.

Awards and Recognition

- 2024 **CMU News**
Autonomous Trauma Care Extends 'Golden Hour' for Saving Lives
- 2019 **Oral Presentation at ESICM**, European Society of Intensive Care Medicine.
Hemodynamic monitoring parsimony: minimal information for rapid hemorrhage detection.
- 2018 **Star Research Award and Oral Presentation at SCCM**, Annual Congress of the Society of Critical Care Medicine.
Sufficient Sampling Frequency for Machine Learning to Separate Monitoring Artifact from Instability
- 2009 **First Place at Future Energy Challenge**, FEC 2009 at Melbourne, Australia.
Design of efficient wind turbine power converter.

Presentations and Lectures

- 2024 **Liquid metal embedded elastomers: electromigration characterization and use in stretchable sensors**, SEMI Workshop: Enabling the Future of Electronics (2024)
- 2022 **Engineering Materials for Soft Robotics**, Gelfend Center Outreach, grades 7-9.
- 2018 **Developing data-driven models using high-frequency time series**, NRSA T-32 Training, University of Pittsburgh School of Nursing.
- 2017 **Learning Multi-granular Models of Physiology for Detection of Bleeding**, CRISMA Research Group, University of Pittsburgh Department of Critical Care Medicine.





Research Publications

Journal Articles

- 1 M. R. Pinsky, H. Gomez, **A. Wertz**, J. Leonard, A. Dubrawski, and R. Poropatich, "Evaluation of a physiologic-driven closed-loop resuscitation algorithm in an animal model of hemorrhagic shock," *Critical Care Medicine*, vol. 52, no. 12, pp. 1947–1957, 2024.

- 2 M. Zadan, **A. Wertz**, D. Shah, D. K. Patel, W. Zu, Y. Han, J. Gelorme, H. J. Mea, L. Yao, M. H. Malakooti, S. H. Ko, N. Kazem, and C. Majidi, "Stretchable thermoelectric generators for self-powered wearable health monitoring," *Advanced functional materials*, Jul. 2024.  DOI: <https://doi.org/10.1002/adfm.202404861>.
- 3 A. P. Sabelhaus, Z. J. Patterson, **A. T. Wertz**, and C. Majidi, "Safe supervisory control of soft robot actuators," *Soft Robotics*, Feb. 2024.  DOI: <https://doi.org/10.1089/soro.2022.0131>.
- 4 A. P. Sabelhaus, R. K. Mehta, **A. T. Wertz**, and C. Majidi, "In-situ sensing and dynamics predictions for electrothermally-actuated soft robot limbs," *Frontiers in Robotics and AI*, vol. 9, p. 888 261, 2022.  DOI: [10.3389/frobt.2022.888261](https://doi.org/10.3389/frobt.2022.888261).
- 5 M. Zadan, D. K. Patel, A. P. Sabelhaus, J. Liao, **A. Wertz**, L. Yao, and C. Majidi, "Liquid crystal elastomer with integrated soft thermoelectrics for shape memory actuation and energy harvesting," *Advanced Materials*, p. 2 200 857, 2022.  DOI: [10.1002/adma.202200857](https://doi.org/10.1002/adma.202200857).
- 6 P. Laird, **A. Wertz**, G. Welter, D. Maslove, A. Hamilton, J. H. Yoon, D. E. Lake, A. E. Zimmet, R. Bobko, J. R. Moorman, *et al.*, "The critical care data exchange format: A proposed flexible data standard for combining clinical and high-frequency physiologic data in critical care," *Physiological Measurement*, 2021.  DOI: [10.1088/1361-6579/abfc9b](https://doi.org/10.1088/1361-6579/abfc9b).
- 7 M. R. Pinsky, **A. Wertz**, G. Clermont, and A. Dubrawski, "Parsimony of hemodynamic monitoring data sufficient for the detection of hemorrhage," *Anesthesia & Analgesia*, vol. 130, no. 5, pp. 1176–1187, 2020.  DOI: [10.1213/ANE.0000000000004564](https://doi.org/10.1213/ANE.0000000000004564).
- 8 **A. Wertz**, A. L. Holder, M. Guillame-Bert, G. Clermont, A. Dubrawski, and M. R. Pinsky, "Increasing cardiovascular data sampling frequency and referencing it to baseline improve hemorrhage detection," *Critical Care Explorations*, vol. 1, no. 10, Oct. 2019.  DOI: [10.1097/CCE.000000000000058](https://doi.org/10.1097/CCE.000000000000058).
- 9 M. Hravnak, T. Pellathy, L. Chen, A. Dubrawski, **A. Wertz**, G. Clermont, and M. R. Pinsky, "A call to alarms: Current state and future directions in the battle against alarm fatigue," *Journal of electrocardiology*, vol. 51, no. 6, S44–S48, 2018.  DOI: [10.1016/j.jelectrocard.2018.07.024](https://doi.org/10.1016/j.jelectrocard.2018.07.024).

Conference Proceedings

- 1 **A. Wertz**, A. P. Sabelhaus, and C. Majidi, "Trajectory optimization for thermally-actuated soft planar robot limbs," in *2022 IEEE 5th International Conference on Soft Robotics (RoboSoft)*, IEEE, 2022, pp. 439–446.  DOI: [10.1109/RoboSoft54090.2022.9762226](https://doi.org/10.1109/RoboSoft54090.2022.9762226).
- 2 W. Potosnak, K. A. Dufendach, **A. Wertz**, K. Miller, A. Dubrawski, and A. Kilic, "Continuous intraoperative data analysis using machine learning reveals multiple parameters to predict post-cabg renal failure," in *The Society of Thoracic Surgeons Annual Meeting*, 2021.
- 3 V. Jeanselme, **A. Wertz**, G. Clermont, M. Pinsky, and A. Dubrawski, "Robustness of machine learning models for hemorrhage detection," in *What's New in Non-Pulmonary Critical Care?*, American Thoracic Society, 2020, A6320–A6320.  DOI: [10.1164/ajrccm-conference.2020.201.1_MeetingAbstracts.A6320](https://doi.org/10.1164/ajrccm-conference.2020.201.1_MeetingAbstracts.A6320).
- 4 V. Jeanselme, **A. Wertz**, G. Clermont, M. Pinsky, and A. Dubrawski, "Cross-correlation features of vital signs enable robust detection of hemorrhage," ISICEM, 2020.
- 5 **A. Wertz**, G. Clermont, A. Dubrawski, and M. Pinsky, "Hemodynamic monitoring parsimony: Minimal information for rapid hemorrhage detection," in *ESICM LIVES 2019*, vol. 7, Sep. 2019, pp. 91–92.  DOI: [10.1186/s40635-019-0265-y](https://doi.org/10.1186/s40635-019-0265-y).
- 6 L. Chen, A. Dubrawski, G. Clermont, T. Pellathy, **A. Wertz**, J. H. Yoon, M. Pinsky, and M. Hravnak, "Binarized severity level of future instability risk in continuously monitored patients," 1, vol. 47, LWW, Jan. 2019, p. 605.  DOI: [10.1097/01.ccm.0000552001.54183.00](https://doi.org/10.1097/01.ccm.0000552001.54183.00).

- 7 **A. Wertz**, M. Hravnak, A. Dubrawski, L. Chen, T. Pellathy, G. Clermont, and M. Pinsky, "Sufficient sampling frequency for machine learning to separate monitoring artifact from instability," 1, vol. 46, LWW, 2018, p. 19. [DOI: 10.1097/01.ccm.0000528093.59059.9e](https://doi.org/10.1097/01.ccm.0000528093.59059.9e).
- 8 L. Chen, A. Dubrawski, G. Clermont, T. Pellathy, **A. Wertz**, M. R. Pinsky, and M. Hravnak, "Model based estimation of instability severity level in continuously monitored patients," in *ESICM LIVES 2018*, vol. 6, Oct. 2018, pp. 59–60. [DOI: 10.1186/s40635-018-0201-6](https://doi.org/10.1186/s40635-018-0201-6).

Genome Announcements

- 1 W. H. Pope, E. N. Berryman, K. M. Forrest, L. McHale, **A. T. Wertz**, Z. Zhuang, N. S. Kasturiarachi, C. A. Pressimone, J. G. Schiebel, E. C. Furbee, S. R. Grubb, M. H. Warner, M. T. Montgomery, R. A. Garlena, D. A. Russell, D. Jacobs-Sera, and G. F. Hatfull, *Genome sequence of gordonia phage betterkatz*, 2016. [DOI: 10.1128/genomeA.00590-16](https://doi.org/10.1128/genomeA.00590-16). eprint: <https://mra.asm.org/content/4/4/e00590-16.full.pdf>.

Robotics Institute Summer Scholars

- 1 W. Potosnak, **A. Wertz**, J. K. Miller, A. Kilic, K. A. Dufendach, and A. Dubrawski, *Cardiothoracic surgery analysis for predicting acute renal failure outcomes*, 2020. [URL: https://riss.ri.cmu.edu/research_showcase/working-papers-journals/](https://riss.ri.cmu.edu/research_showcase/working-papers-journals/).
- 2 C. Edwards, **A. Wertz**, and A. Dubrawski, *Using similarity measures to detect organizations in online escort advertisements*, 2019. [URL: https://riss.ri.cmu.edu/research_showcase/working-papers-journals/](https://riss.ri.cmu.edu/research_showcase/working-papers-journals/).
- 3 C. Gao, F. Falck, M. Goswami, **A. Wertz**, M. R. Pinsky, and A. Dubrawski, *Detecting patterns of physiological response to hemodynamic stress via unsupervised deep learning*, 2019. [URL: https://arxiv.org/abs/1911.05121](https://arxiv.org/abs/1911.05121).

Employment History

📌 Research and Development Engineer (intern), Arieca.

Spring 2024

- Designed and built a custom test apparatus for investigating the effects of high-voltage electric fields near materials susceptible to degradation due to ion migration. The device generates a DC potential up to 6 kV in close proximity to a material sample to allow investigation of its degradation over time and to inform the use of such materials near high-voltage electronics, as in the case of thermal interface materials for power modules on electric vehicles.
- Devised and demonstrated a novel sensor design to detect localized strain in elastic objects requiring just a four-wire device interface and a simple sensor element design.

📌 Senior Analyst, Auton Systems.

2015 - 2020

- Architected an analytic software platform for monitoring health and scheduling maintenance of complicated equipment.

Employment History (continued)

📌 **Senior Research Analyst and Programmer**, Auton Lab, Carnegie Mellon University.

2014 - 2020

- Integrated various biomedical monitoring devices and actuators, and designed and developed a software monitoring and control application to run real-time closed-loop resuscitation for assessing and treating hemodynamic instability.
- Developed software and analyzed data as part of applied research aimed at solving many challenging problems of societal importance including: detection of human trafficking to aid police force and investigators; localization and classification of threatening radiation sources; and analysis of patient vital signals to identify instability.
- Converted high level research algorithms into scalable real time applications, including a computer vision pipeline for extracting blood vessels, velocities, and flow patterns in videos of microvascular bloodflow.

📌 *(continued)* **Senior Research Analyst and Programmer**, Auton Lab, Carnegie Mellon University.

2014 - 2020

- Applied machine learning methods to complex problems, including the featurization of vital sign data and detection of bleeding in pig models of hemorrhage. Methods included training various classification and regression models (logistic regression, neural networks, random forests, etc), validating using a cross validation framework, and evaluating performance through ROC and AMOC curves. Clustering approaches used as well, e.g. K-means for grouping similar subjects.
- Optimized code for memory and time complexity and implemented algorithms using a variety of parallel processing frameworks (e.g. multithreading in C++ with OpenMP, pthreads; in R with doParallel and foreach packages; multiprocessing in Python and MATLAB; using hadoop on compute clusters; and moving video processing to the GPU using the C/C++ CUDA, CUDNN, and CUFFT APIs).
- Predominantly developed with C/C++, Python, R, and MATLAB languages, including building wrappers to incorporate high-performance C/C++ software in the interpreted languages (e.g. using boost::python, Rcpp, and MATLAB mex).

📌 **ASIC Design Engineer (intern)**, AMD Advanced Micro Devices.

Summer 2012

- Developed a system test automation suite to streamline the unit testing of individual GPU modules and characterize their performance in terms of power and computational efficiency in a repeatable manner.
- Debugged microcode on unique microprocessors incorporated in GPU ASIC, including APU power management control inefficiencies.

Employment History (continued)

📌 **Embedded Software Engineer**, Lockheed Martin Missiles and Fire Control.

2009 - 2011

- Developed, tested, and integrated operational flight program software incorporating safety critical software components in a GPS and INS guided projectile. Updated and maintained software for performing vehicle guidance, navigation, and control, device communication, and telemetry.
- Supported off-site projectile launch and flight tests, system integration efforts, and software development efforts along with customers and contractors.
- Developed and utilized various levels of test frameworks for the system including module level unit testing, software simulation, and hardware-in-the-loop simulation incorporating simulations of satellite constellations, vehicle dynamics, physics, and environmental forces. Developed and debugged software on hard real-time operating systems running on various processor technologies (PowerPC, MIPS, Intel).
- Worked directly with subcontractors and customers to solve issues and support off-site hardware and software test installations, as well as facilitating independent verification and validation.

📌 **Software Engineer (intern)**, Lockheed Martin Missiles and Fire Control.

2008 - 2009

- Made substantial improvements to integration test tools interfaces and functionalities for evaluating operation, behavior, and performance of a tri-mode seeker (radar, infrared, and laser-guided).
- Developed and debug software tools on Windows and Linux using Qt and MFC user interface frameworks, along with embedded operational flight program software on Integrity real time operating system.

📌 **Software Engineer (intern)**, DiSTI (Distributed Simulation Technology Inc.)

2006 - 2007

- Rebuilt backend of in-house web tools using PHP and MySQL.
- Reimplemented C++ simulations in Java using the company's simulation framework.

📌 **Web Developer**, Freelance

2002 - 2008

- Developed web software for a variety of clients involving database application development in ASP and VBScript using MSSQL, or PHP with MySQL.

Volunteering and Personal Enrichment

📌 **Student mentoring**

- **Sarvesh** (*Current*) 2023-2024 RoboBuddies First-year Robotics PhD Mentor
- **Souhail** 2023-2024 MechE/Robotics Undergraduate Researcher
- **Vijaya** 2022 Summer AI Mentoring Program
- **Willa** 2020 Robotics Institute Summer Scholar (RISS)
- **Alexander** Fall 2019 ECE Undergraduate Researcher
- **Chufan** 2019 Robotics Institute Summer Scholar (RISS)
- **Carl** 2019 Robotics Institute Summer Scholar (RISS)

Volunteering and Personal Enrichment (continued)

📌 **Gelfand Center Outreach**, Carnegie Mellon University.

2022

- Developed and presented a soft robotics and materials workshop for children in grades 7-9.

📌 **Salud para niños**, Children's Hospital of Pittsburgh.

2016

- Assisted in various small tasks in the children's free clinic.

📌 **UPMC Preceptorship Program**, University of Pittsburgh Medical Center.

2016

- Primarily shadowed residents and some medical students at UPMC Montefiore and Presbyterian for over forty contact hours.
- Observed professional interactions in patient interviews, examinations, and patient conflict mitigation and de-escalation.
- Observed medical rounds, interesting case studies discussed in resident groups, and studies in small student groups.

📌 **Peace Corps Education Volunteer**, Toussiana, Burkina Faso.

2013 - 2014

- Developed mathematics curriculum for, taught, and evaluated classrooms of about 160 middle school students in a rural, francophone community.
- Developed lessons and experiments for a week-long science camp.
- Organized a three day, multi-city bike tour to discuss malaria and prevention in rural villages.

📌 **Summit Church**, Orlando, FL.

2012

- Controlled music, audio, and lighting in Sunday performances for young children in Sunday school.
- Lead and coordinated a group of about twenty volunteers in a cleanup project of a local elementary school.

Skills

Human Languages	📌 English (native), Spanish (Intermediate), French (Intermediate).
Robot Languages	📌 C/C++, Julia, Python, MATLAB, R, Java, Go, PHP, Object Pascal
Tools	📌 Visual Studio Code, MATLAB, Jupyter, SEGGER Ozone, KiCAD, OnShape