

ERIC A. DIECKMAN

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My research uses signal processing and machine learning methods to find useful information hidden inside noisy or complex signals. For applications in the acoustic and electromagnetic domains, numerical simulations provide additional insight into the underlying physical phenomena to allow tailored improvements in these methods.

Education

Doctor of Philosophy, Applied Science

November 2013

The College of William and Mary, Williamsburg, VA

Advisor: Dr. Mark Hinders

Concentration: Non-Destructive Evaluation (NDE)

Dissertation: *Use of pattern classification algorithms to interpret passive and active data streams from a walking-speed robotic sensor platform*

Specialized coursework: Acoustic and EM Scattering, Imaging Methods, Fundamental Data Acquisition, Mathematical and Computational Methods (3 sem), Applied Solid State Physics

Master of Science, Architectural Science (Architectural Acoustics)

May 2009

Rensselaer Polytechnic Institute, Troy, NY

Advisor: Dr. Ning Xiang

Thesis: *Bayesian parameter estimation of porous materials*

Specialized coursework: Architectural Acoustics (2 sem), Applied Psychoacoustics, Sonics Research Lab (2 sem)

Bachelor of Science, Physics

May 2008

Truman State University, Kirksville, MO

Advisors: Dr. Mohammad Samiullah, Dr. Ian Lindevald

Projects: *Design and construction of a scanning tunneling microscope*

Impulse response measurements as a method of obtaining the reverberation time of a concert hall

Research experience and related publications, presentations, and reports

Visiting Assistant Professor, Mechanical Engineering, University of New Haven, West Haven, CT

2014-

Professional in Residence (2015), Adjunct Professor (2014)

Guiding undergraduate and masters-level students in independent research projects combining signal processing and statistical learning techniques applied to time-domain signals. Coordinating the integrated delivery of uncertainty analysis and technical writing content in a three-course lab sequence for Mechanical Engineering majors. Assisting students and technical staff in the construction and maintenance of laboratory experiments and the design and machining of deliverables for externally-funded student projects.

Advising students in the ABET-accredited BSME program. Primary instructor for the following courses, which include theoretical lectures, hands-on experiments, and computer modeling components.

- MECH 2215 Instrumentation Laboratory (F17, S17, F16, S16, F15, S15)
- MECH 3315/3316 Mechanics Laboratory (F17, S17, S16, F15, S15)
- MECH 6611 System Vibrations (F16)
- MECH 6613 Fundamentals of Acoustics (S17, S16, S14)

- Eric A. Dieckman, Sonalysts, Inc., *Digital Early Warning Receiver (EWR) for the Next Generation Submarine Electronic Warfare (EW)*, Navy SBIR 161-025 Phase I award (\$45k subcontract from \$150k total award), July 2016 - January 2017 (Base), May - October 2017 (Option)
- Eric A. Dieckman, *The importance of feature selection in supervised machine learning problems in acoustics*, Invited for The 171st Meeting of the Acoustical Society of America, Salt Lake City, UT, 24 May 2016

Research Scientist, Systems Engineering Associates Corporation (SEA CORP), Middletown, RI

2016-

Member of the EW Engineering group. Providing analysis support for Matlab control of test equipment. Writing proposals to articulate creative solutions to technical research problems.

- Eric A. Dieckman, Samuel Tannatt, *Solid-state radar emitter identification*, Navy SBIR 171-043 Phase I award (\$125k), Awarded May 2017

Research Scientist, Sonalysts, Inc., Waterford, CT

2013-2016

Established the Wavelet Signal Processing and Nondestructive Evaluation Systems Testing (WaSP-NEST) lab to explore new methods of ultrasonic non-destructive evaluation of complex structures using advanced signal processing and machine

learning approaches. Projects included tasking under a Defense Advanced Research Projects Agency (DARPA) contract (\$194k) to develop methods to inspect thermal-spray coatings for ship structures using guided wave ultrasonics.

Provided high-level analysis support to tasks including Pareto optimization of UUV operational parameters, computerized control of electronics test equipment, verification of physics implementations in a fully three-dimensional game engine, physical modeling of satellite motion for software training systems, and analysis of torpedo acoustic performance.

- Eric A. Dieckman, Armand E. Halter, *Ultrasonic nondestructive techniques for Naval Advanced Amorphous Coating (NAAC)*, DARPA SBIR Phase II award (\$194k subcontract), Final technical report, 29 September 2015
- Eric A. Dieckman, *The Dynamic Wavelet Fingerprint Process (DWFP): Revealing hidden information in noisy signals*, Technical white paper, November 2014
- Eric A. Dieckman, *Robotics, free-reed instruments, and naughty birds: Finding the common thread*, Invited for The 167th Meeting of the Acoustical Society of America, Providence, RI, 6 May 2014

Graduate Research Assistant, The College of William and Mary

2009-2013

Designed, machined, and constructed the mechanical, electrical, and software components of a robotic mobile sensor platform. Analyzed data collected from acoustic, infrared, radar, and video sensors to explore their capabilities and limitations in outdoor mobile ground robotics applications. Used statistical pattern recognition and machine learning algorithms to classify oncoming vehicles at long range.

Applied non-destructive evaluation methods, including ultrasonics and thermography, and novel signal processing techniques to solve problems in such areas as the characterization of counterfeit electronics and flaw detection in critical structures. Created cross-platform data acquisition and analysis software packages for users of varying technical abilities.

Wrote high-performance code to run on large distributed computing clusters to simulate the propagation of a nonlinear acoustic beam to and fully three-dimensional scattering from real-world targets. Helped design and implement field tests of acoustic 'nets' to humanely exclude pest bird species from target areas.

- Eric A. Dieckman and Mark Hinders, *Automated classification of oncoming ground vehicles using acoustic echolocation and supervised machine learning*, Invited for The 167th Meeting of the Acoustical Society of America, Providence, RI, 7 May 2014
- Ghazi Mahjoub, John Swaddle, Mark Hinders, Elizabeth Skinner, and Eric Dieckman, *Effectiveness of a 'sonic net' at displacing European Starlings from food patches in an outdoor aviary: implications for reduced aircraft bird strikes*, The 2013 Bird Strike North America Conference, Milwaukee, WI, 12-15 August 2013
- John P. Swaddle, Ghazi Mahjoub, Eric Dieckman, and Mark Hinders, *Using animal behavior to improve health and safety: deterring birds from crops and airports*, The 50th Annual Conference of the Animal Behavior Society, Boulder, CO, 28 July - 1 August 2013
- Eric A. Dieckman, Elizabeth Skinner, Ghazi Mahjoub, John Swaddle, and Mark Hinders, *Benign exclusion of birds using acoustic parametric arrays*, The 165th Meeting of the Acoustical Society of America and 21st International Congress on Acoustics, Montreal, Quebec, Canada, 6 June 2013
- Ghazi Mahjoub, John Swaddle, Mark Hinders, Eric A. Dieckman, and Elizabeth D. Skinner, *Effectiveness of the 'Sonic Net' at displacing European Starlings from economically important locations*, The College of William and Mary Graduate Research Symposium, Williamsburg, VA, 23 March 2013
- Eric A. Dieckman, Lora Weiss, and Mark Hinders, *Acoustic detection and classification of oncoming vehicles by a walking-speed robotic sensor platform*, The College of William and Mary Graduate Research Symposium, Williamsburg, VA, 22 March 2013
- Ghazi Mahjoub, John Swaddle, Mark Hinders, Eric A. Dieckman, and Elizabeth D. Skinner, *Can we use a sound net to block vocal communication and persistently exclude European Starlings from food sources?*, The 125th Meeting of the Wilson Ornithological Society, Williamsburg, VA, 8 March 2013
- Eric A. Dieckman and Mark Hinders, *Use of pattern classification algorithms to interpret acoustic echolocation data from a walking-speed robotic sensor platform*, The 164th Meeting of the Acoustical Society of America, Kansas City, MO, 23 October 2012
- Eric A. Dieckman and Mark Hinders, *Acoustic echolocation for mobile robots with parametric arrays*, invited for the Acoustical Society of America's World-Wide Press Room at the 164th Meeting in Kansas City, MO 22-26 October 2012
- Eric A. Dieckman and Mark Hinders, *Toward autonomous walking-speed robots: Acoustic and infrared data fusion*, The College of William and Mary Graduate Research Symposium, Williamsburg, VA, 23 March 2012
- Eric A. Dieckman and Mark Hinders, *Numerical simulations of acoustic parametric arrays*, The College of William and Mary Graduate Research Symposium, Williamsburg, VA, 26 March 2011
- Eric A. Dieckman, Mark Hinders, and Jonathan Stevens, *Subsurface characterization of microelectronics using high-frequency contact ultrasound*, The 2nd Pan American/Iberian Meeting on Acoustics, Cancun, Mexico, 18 November 2010 (*Awarded Best Student Paper in Engineering Acoustics- Second Prize*)

- Eric A. Dieckman, Mark Hinders, and Jonathan Stevens, *A method of detecting subsurface flaws in microelectronics using high-frequency contact ultrasound*, The College of William and Mary Graduate Research Symposium, Williamsburg, VA, 26 March 2010
- Mark Hinders, Eric A. Dieckman, and Jonathan Stevens, *High-frequency contact ultrasound for subsurface characterization of microelectronics*, The 19th Annual Research Symposium and Spring Meeting of the American Society of Nondestructive Testing, Williamsburg, VA, 23 March 2010
- Mark Hinders, Eric A. Dieckman, and Jonathan Stevens, *Handheld high-frequency ultrasound for subsurface characterization of microelectronics*, Final Technical Report, 67 pages, December 2009

Graduate Research Assistant, Rensselaer Polytechnic Institute

2008-2009

Applied Bayesian analysis to estimate physical parameters of porous materials. Invented a method to create spatially-sounding artificial reverberance using coded sequences. Collected and analyzed acoustic data from area concert halls and churches using state-of-the-art techniques.

- Cameron Fackler, Eric Dieckman, and Ning Xiang, *Porous material parameter estimation: A Bayesian approach*, Proceedings of MaxEnt 2011 31st International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering, Waterloo, Canada, 10-15 July 2011
- Ning Xiang, Eric A. Dieckman, and Uday Trivedi. U.S. Patent Application #12/615,655 *Spatially enveloping reverberation in sound fixing, processing, and room-acoustic simulations using coded sequences*, Filed 10 Nov 2009
- Eric A. Dieckman and Ning Xiang, *Bayesian parameter estimation of porous materials*, The 158th Meeting of the Acoustical Society of America, San Antonio, TX, 28 October 2009 (*Awarded Best Student Paper in Engineering Acoustics- First Prize*)
- Uday Trivedi, Eric Dieckman, and Ning Xiang, *Reciprocal maximum-length and related sequences in the generation of natural, spatial sounding reverberation*, The 157th Meeting of the Acoustical Society of America, Portland, OR, 22 May 2009

NSF REU Grant Research, The College of William and Mary; Coe College, Cedar Rapids, IA

Summers 2005-2007

Under three separate NSF Research Experience for Undergraduates (REU) awards, researched the feasibility of an alternative mechanical source to generate acoustic pulses for surface-enhanced laser desorption and ionization time-of-flight mass spectroscopy (William and Mary, 2007) and studied the acoustics of various Southeast Asian free reed instruments using both experimental and computational methods (Coe 2005 & 2006).

- James P. Cottingham and Eric A. Dieckman, *Measured and calculated sounding frequencies of pipes coupled with free reeds*, Proceedings of Meetings on Acoustics, 4-1, June 2009
- James P. Cottingham and Eric A. Dieckman, *Measured and calculated sounding frequencies of pipes coupled with free reeds*, The 2nd ASA/EAA Joint Meeting: Acoustics 08, Paris, France, 29 June- 4 July 2008
- James P. Cottingham and Eric A. Dieckman, *Sounding frequencies of the Asian free-reed mouth organs*, Proceedings of the 2007 International Symposium on Musical Acoustics, Barcelona, Spain, 9-12 Sept 2007
- Eric A. Dieckman and James P. Cottingham, *Input impedance of Asian free reed mouth organs*, The 4th Joint Meeting of the Acoustical Society of America and the Acoustical Society of Japan, Honolulu, HI, 29 November 2006 (*Awarded Best Student Paper in Musical Acoustics- Second Prize*)
- Eric A. Dieckman and James P. Cottingham, *Experimental and calculated frequencies of the Southeast Asian naw*, The 151st Meeting of the Acoustical Society of America, Providence, RI, 8 June 2006

Research/Teaching Assistant, Truman State University

2004-2008

Studied room acoustics theory and wrote custom LabVIEW data acquisition and analysis software to conduct acoustic analyses of rooms. Assisted with lab setup and implementation, grading, and tutoring for introductory physics courses.

- Eric A. Dieckman and Mohammad Samiullah, *Design and construction of a low cost, high performance scanning tunneling microscope*, National Conference for Undergraduate Research, Salisbury, MD, 11 April 2008
- Eric A. Dieckman and Ian Lindevald, *Impulse response measurements as a method of obtaining the reverberation time of a concert hall*, Truman State University Student Research Conference, Kirksville, MO, 3 April 2008

Computer Skills

Matlab · LabVIEW · Mathematica · Python · C/C++ · Solidworks · CATT-Acoustic · L^AT_EX · GNU/Linux · HTML/CSS

Professional Service

Acoustical Society of America 2006-
Technical Program Organizing Meeting, Providence, RI, January 2014
Student Council Chair 2011-2013
Student Council representative to the Technical Committee on Musical Acoustics 2006-2011

Thesis committees

- Adam Shelley, *The design and development of a non-invasive thermal measurement technology for HVAC duct airflow*, MSME Thesis, University of New Haven Department of Mechanical Engineering, 14 December 2016
- Mohammed Al-Bayati, *A novel multi-die, multi-stage, pultrusion process modeling*, MSME Thesis, University of New Haven Department of Mechanical Engineering, 01 April 2016

Supervised student research

- Joseph Caruso, *Acoustic echolocation*, Summer 2016

Other qualifications

Volunteer Firefighter/EMT-B

Certifications: Firefighter I/II, EMT-B, CPR, HazMat operations, BPO, RWS, NIMS 100/200/700/800, EVOG Class 1/2/3, HTR
Hanover County, VA Fire/EMS (Station 7) 2010-2013
Williamsburg, VA Volunteer Fire Department (WVFD) 2009-2010
Rensselaer Polytechnic Institute Ambulance (RPIA) 2008-2009

PADI Open Water Scuba Diver