Eileen R. Martin

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Education

Ph.D. Computational and Mathematical Engineering,   **Stanford University**
Dissertation: June 2018
Passive Imaging and Characterization of the Subsurface with Distributed Acoustic Sensing
Readers: Biondo Biondi (advisor), Jonathan Ajo-Franklin, George Papanicolaou

M.S. Geophysics   **Stanford University**
Masters research presentation: June 2017
Stanford DAS Array: Ambient Noise and Earthquake Recordings
Committee: Biondo Biondi (advisor) and Greg Beroza

B.S. Dean's Scholars Honors Mathematics,   **University of Texas at Austin**
Dean's Honored Graduate, graduated with high honors   May 2012
Honors thesis: *Global Coordinate Systems: Continuously Moving Finite-Dimensional Unit Norm Tight Frames on Smooth Manifolds*
Advisor: Daniel Freeman (now Mathematics & Statistics, St. Louis University)

B.S. Computational Physics   **University of Texas at Austin**
Graduated with high honors   May 2012

Academic Appointments

Assistant Professor, Virginia Tech, Blacksburg, VA   Aug. 2018 - present
    - Department of Mathematics (primary appointment)
    - Program in Computational Modeling and Data Analytics

Affiliate, Lawrence Berkeley National Laboratory, Berkeley, CA   Sep. 2016 - present
    - Earth and Environmental Sciences Area, Geophysics Department

Funding

MAA Tensor Women and Mathematics Grant
SURE: Speakers and Undergraduate Research Engagement
PI: G. Matthews (Virginia Tech Math), Co-PIs: E.R. Martin and L. Zietsman (Virginia Tech Math)
Amount: $6,000
Period of performance: 6/1/19-5/31/20

Seed Grant from Penn State Institute of Energy and the Environment
Lighting Up the Subsurface for Tomorrow's City: Initiating a Penn State DAS Array for Mapping Near-Surface Geology
PI: T. Zhu (Penn State Geosciences), Co-PIs: E.R. Martin, A. Nyblade (Penn State Geosciences), P. Fox (Penn State Civil & Env. Engineering)
Amount: $50,000
Period of performance: 3/1/19-12/31/19

DOE Phase I STTR DE-SC0019630
Advanced Computational Methods Towards High-Resolution Fiber Optic Distributed Acoustic Sensing

PI: D. Rountree (Luna Innovations), Co-PI: E.R. Martin
Amount: $149,997
Period of performance: 2/19/19-11/18/19

Honors, Awards, Fellowships	**Gene Golub Dissertation Award**	2018
	Top dissertation, Institute for Computational and Mathematical Engineering at Stanford	
	Best student poster paper at SEG Annual Meeting, co-author	2017
	Awarded to Huot et al., *Automatic Noise Exploration in Urban Areas*	
	Schlumberger Innovation Fellowship	2016-2017
	Award value $10,000	
	1 Ph.D. student and 4 M.S. students selected by ICME faculty committee	
	DOE Computational Science Graduate Fellowship	2012-2016
	Award value over $300,000	
	Approximately 20 students selected in 2012 throughout the United States	
	ICME Xpo Best Poster Design	2016
	Travel Grant to attend SEG Annual International Meeting	2015
	ICME Student Leadership Award	2014
	Annually awarded cash prize and plaque recognizing service to the institute	
	NSF Graduate Research Fellowship Program award offered	2012
	Dean's Honored Graduate	2012
	Fewer than 1% of students in UT-Austin College of Natural Sciences receive this award, selected through faculty panel vote	
	Barry M. Goldwater Scholarship	2011-2012

Peer-Reviewed Journal Articles

<u>E.R. Martin</u>, F. Huot, Y. Ma, R. Cieplicki, S. Cole, M. Karrenbach, B.L. Biondi, 2018, *A Seismic Shift in Scalable Acquisition Demands New Processing: Fiber-Optic Seismic Signal Retrieval in Urban Areas with Unsupervized Learning for Coherent Noise Removal*, IEEE Signal Processing Magaine, **35**(2), pp. 31-40.

N.J. Lindsey, <u>E.R. Martin</u>, S. Cole, D. Dreger, S. James, B. Freifeld, B. Biondi, J. Ajo-Franklin, 2017, *Fiber-Optic Network Observations of Earthquake Wavefields*, Geophysical Research Letters, **44**(23), pp. 11792-11799, (featured on cover of issue).

S. Dou, N. Lindsey, A. Wagner, T. Daley, B. Freifeld, M. Robertson, J. Peterson, C. Ulrich, <u>E.R. Martin</u>, J. Ajo-Franklin, 2017, *Distributed Acoustic Sensing for Seismic Monitoring of the Near Surface: A Traffic-Noise Interferometry Example*, Scientific Reports, 7, article 11620.

Y. Li, H. Yang, <u>E.R. Martin</u>, K.L. Ho, L. Ying, 2015, *Butterfly Factorization*, Multiscale Model. Simul., 13, pp. 714-732.

D. Freeman, R. Hotovy, <u>E.R. Martin</u>, 2014, *Moving Finite Unit Norm Tight Frames for S^n*, Illinois J. of Math, 58, pp. 311-322.

Professional Magazines	<u>E.R. Martin</u>, C. Castillo, S. Cole, S. Sawasdee, S. Yuan, R. Clapp, M. Karrenbach, B. Biondi, 2017, *Seismic Monitoring Leveraging Existing Telecomm Infrastructure at the Stanford Distributed Acoustic Sensing Array: Active, Passive and Ambient Noise Analysis*, The Leading Edge, 36(12), pp. 1025-1031.
Under Review	<u>E.R. Martin</u>, N.J. Lindsey, B. Biondi, J.B. Ajo-Franklin, *Introduction to Interferometry of Fiber Optic Strain Measurements*, under review following minor revisions, preprint on Earth ArXiv, doi: 10.31223/osf.io/sx9zt.
	B. Biondi, S. Yuan, <u>E.R. Martin</u>, F. Huot, R.G. Clapp, *Using telecommunication fiber infrastructure for earthquake monitoring and near-surface characterization*, under review following minor revisions.
Conference Papers	<u>E.R. Martin</u>, *Scalable Seismic Acquisition and Algorithms for Next-Generation Engineering Geophysics*, (invited abstract) *to accepted, to appear*, 2019, International Conference on Engineering Geophysics, Al Ain, United Arab Emirates, 9-12 Oct.
	<u>E.R. Martin</u>, *A Scalable Algorithm for Cross-correlations of Compressed Ambient Seismic Noise*, *accepted, to appear*, 2019, 89th Ann. Internat. Mtg. SEG Expanded Abstracts. Preprint at: `https://eartharxiv.org/sx9zt/`
	<u>E.R. Martin</u>, B. Biondi, *Eighteen months of near-surface monitoring with ambient noise at the Stanford Fiber Optic Seismic Observatory*, 2018, 88th Ann. Internat. Mtg. SEG Expanded Abstracts. doi: 10.1190/segam2018-2997853.1
	F. Huot, <u>E.R. Martin</u>, B. Biondi, *Automated ambient-noise processing applied to fiber-optic seismic acquisitions (DAS)*, 2018, 88th Ann. Internat. Mtg. SEG Expanded Abstracts. doi: 10.1190/segam2018-2997880.1
	<u>E.R. Martin</u> and B.L. Biondi, *Ambient noise interferometry across two-dimensional DAS arrays*, 2017, 87th Ann. Internat. Mtg. SEG Expanded Abstracts. doi: 10.1190/segam2017-17677759.1
	B. Biondi, <u>E.R. Martin</u>, S. Cole, M. Karrenbach, N. Lindsey, *Earthquakes analysis using data recorded by the Stanford DAS array*, 2017, 87th Ann. Internat. Mtg. SEG Expanded Abstracts. doi: 10.1190/segam2017-17745041.1
	F. Huot, Y. Ma, R. Cieplicki, <u>E.R. Martin</u>, B. Biondi, *Automatic noise exploration in urban areas*, 2017, 87th Ann. Internat. Mtg. SEG Expanded Abstracts (awarded best student poster paper). doi: 10.1190/segam2017-17774369.1
	J.B. Ajo-Franklin, S. Dou, N. Lindsey, T. Daley, B. Freifeld, <u>E.R. Martin</u>, C. Ulrich, T. Wood, I. Eckblaw, A. Wagner, M. Robertson, *Timelapse surface wave monitoring of permafrost thaw using distributed acoustic sensing and a permanent automated seismic source*, 2017, 87th Ann. Internat. Mtg. SEG Expanded Abstracts. doi: 10.1190/segam2017-17774027.1
	<u>E.R. Martin</u>, B. Biondi, M. Karrenbach, S. Cole, *Ambient noise interferometry from DAS array in underground telecommunications conduits*, 2017, EAGE Annual Meeting Proceedings. doi: 10.1190/segam2017-17774027.1
	<u>E.R. Martin</u>, B.L. Biondi, M. Karrenbach, S. Cole, *Continuous Subsurface Monitoring by Passive Seismic with Distributed Acoustic Sensors- The "Stanford Array" Experiment*,

2017, Extended Abstracts of the 1st EAGE Workshop on Practical Reservoir Monitoring. doi: 10.3997/2214-4609.201700017

E.R. Martin, P. Wills, D. Hohl, J.L. Lopez, *Using machine learning to predict production at a Peace River thermal EOR site*, Proceedings of the 2017 SPE Reservoir Simulation Conference. SPE-192696-MS. doi: 10.2118/182696-MS

E.R. Martin, N.J. Lindsey, S. Dou, J.B. Ajo-Franklin, A. Wagner, K. Bjella, T.M. Daley, B. Freifeld, M. Robertson, C. Ulrich, *Interferometry of a roadside DAS array in Fairbanks, AK*, 2016, 86th Ann. Internat. Mtg. SEG Expanded Abstracts. doi: 10.1190/segam2016-13963708.1

E.R. Martin, J. Ajo-Franklin, N. Lindsey, T.M. Daley, B. Freifeld, M. Robertson, C. Ulrich, S. Dou, A. Wagner, *Interferometry of ambient noise from a trenched distributed acoustic sensing array*, 2015, 85th Ann. Internat. Mtg. SEG Expanded Abstracts. doi: 10.1190/segam2015-5902207.1

J. Ajo-Franklin, N. Lindsey, T.M. Daley, B. Freifeld, E.R. Martin, M. Robertson, C. Ulrich, A. Wagner, *A field test of distributed acoustic sensing for ambient noise recording*, Expanded Abstracts of the 2015 SEG Ann. Internat. Mtg. doi: 10.1190/segam2015-5926936.1

Technical Reports

E.R. Martin, B. Biondi, G. Fabient-Ouellet, R.G. Clapp, *Sensitivity analysis of distributed acoustic sensing arrays*, SEP 170, 2017.

E.R. Martin, B. Biondi, *Time-lapse changes in ambient noise interferometry and dispersion analysis at the Stanford DAS Array*, SEP 170, 2017.

R. Clapp, S. Farris, T. Dahlke, E.R. Martin, *C++11 non-linear solver*, SEP 170, 2017.

E.R. Martin, B. Biondi, S. Cole, M. Karrenbach, *Overview of the Stanford DAS Array-1 (SDASA-1)*, SEP 168, 2017.

B. Biondi, E.R. Martin, S. Cole, M. Karrenbach, *Earthquakes analysis using data recorded by the Stanford DAS Array*, SEP 168, 2017.

E.R. Martin, B. Biondi, *Ambient noise interferometry on two-dimensional DAS arrays*, SEP 168, 2017.

F. Huot, Y. Ma, R. Cieplicki, E.R. Martin, B. Biondi, *Automatic noise exploration in urban areas*, SEP 168, 2017.

E. Williams, E.R. Martin, *Detection and removal of coherent anthropogenic noise from passive seismic data*, SEP 165, 2016.

E.R. Martin, N. Lindsey, S. Dou, J. Ajo-Franklin, A. Wagner, K. Bjella, T. Daley, B. Freifeld, M. Robertson, C. Ulrich, *Interferometry of a roadside DAS array in Fairbanks, AK*, SEP 163, 2016.

E.R. Martin, J. Ajo-Franklin, N. Lindsey, T. Daley, B. Freifeld, M. Robertson, C. Ulrich, S. Dou, A. Wagner, *Applying interferometry to ambient seismic noise recorded by a trenched distributed acoustic sensing array*, SEP 158, 2015.

E.R. Martin, *Compression for effective memory bandwidth use in forward modeling*, SEP

152, 2014.

E.R. Martin, R. Clapp, H. Le, C. Leader, D. Nichols, *SEPVector: a C++ inversion library*, SEP 152, 2014.

M. Denolle, S. de Ridder, J. Chang, E.R. Martin, T. Dahlke, H. Arevalo-Lopez, Sr., S. Levin, *Scholte-wave excitation*, SEP 150, 2013.

Selected Talks	Upcoming:

Scalable Seismic Acquisition and Algorithms for Next-Generation Engineering Geophysics, International Conference on Engineering Geophysics (invited)   Al Ain, UAE, Oct. 2019

Seismology at Unprecedented Scale, BiSEPPS Seminar at Harvard University
<div align="right">Cambridge, MA, May 2019</div>

Fast Algorithms for Ultra-high-resolution Ambient Noise Interferometry, Solid Earth
Brownbag Seminar at Princeton University   Princeton, NJ, May 2019

An Introduction to Seismology with Distributed Acoustic Sensing (tutorial talk)
AGU Fall Meeting   Washington, DC, Dec. 2018

Beyond cosine squared: understanding trends in passive DAS data, SEG Annual Meeting
Workshop on DAS   Anaheim, CA, Oct. 2018

*Pushing for Continuous, Dense, Urban Seismic Monitoring at the Stanford Fiber Optic
Seismic Observatory* (plenary talk) IRIS Workshop: Foundations, Frontiers and Future
Facilities for Seismology   Albuquerque, NM, Jun. 2018

Scalable seismic monitoring with fiber optics beneath our feet, Heiland Lecture at
Colorado School of Mines   Golden, CO, Jan. 2018

Active and passive recording at the Stanford DAS Array, SEG Annual Meeting Workshop:
DAS, a vision of the future?   Houston, TX, 2017

DAS in existing telecommunications conduits on the Stanford campus, SPE Workshop
on Distributed Fiber-Optic Sensing   Denver, CO, 2017

Urban ambient noise: from dense nodes to DAS, EAGE Annual Meeting: Workshop on
linking active and passive seismics   Paris, France, 2017

Repurposing our Telecommunications Infrastructure for Seismology, Lawrence Livermore
National Laboratory Seismology Seminar   Livermore, CA, 2017

Dirt Cheap Surveys: near surface monitoring with ambient seismic noise collected by DAS,
EAGE Annual Meeting: workshop on reservoir monitoring with distributed fibre-optic
sensing   Vienna, Austria, 2016

Near-surface monitoring using DAS + ambient noise, SEG Annual Meeting: distributed
acoustic sensing workshop   New Orleans, LA, 2015

Professional Service	Associate editor, *Computers & Geosciences*	Nov. 2018-present

Reviewer for:

- Seismological Research Letters
- Geophysical Journal International
- Geophysics
- Computers & Geosciences
- Marine Geophysical Research
- Journal of Computational Science
- Journal of Environmental & Engineering Geophysics
- Interpretation

Co-Organizer, SEG Annual Meeting Post-convention Workshop on "Real-time Processing for Large-Scale Streaming Seismic Data"   to occur Sep. 2019

Chair, Session on 'Distributed Acoustic Sensing: VSP, Modeling and Imaging Approaches' at SEG Annual Meeting   to occur Sep. 2019

Co-Organizer, Session on 'Photonic and Nonintertial Seismology' at Seismological Society of America Annual Meeting   Apr. 2019

Organizer, Session on 'Computational Advances for Large-Scale Geophysical Data' at SIAM CS&E   Feb. 2019

Special section associate editor, *Interpretation*   2018
    Special issue on 'Distributed Acoustic Sensing and its Oil Field Potential'

Co-organizer, Stanford Computational Geosciences Seminar, EARTH 310 Jan.-Mar. 2018

Session co-chair   Sep. 2017
    "Earth Model Building Strategies and Inputs" at SEG Annual International Mtg.

Helped organize SEG Data Analytics Post-Convention Workshop   Sep. 2017
    Invited early-career speakers and moderated panel on data science education

Student panel for Stanford Aeronautics & Astronautics faculty search,   Spring 2017

Stanford SEG student chapter president   2014-2015

Consultative Committee Member   Jul. 2011- Apr. 2012
    Group of roughly 15 students, faculty, staff and donors tasked with recommending
      UT-Austin Dean of Natural Sciences after conducting candidate interviews

Chair, Dean's Scholars Distinguished Lecture Series,   Jun. 2011-May 2012
    Hosted astronaut/physician Michael Barratt and mathematician Richard Tapia

Teaching, Mentoring, Educational Service

Co-organizer, Speakers and Undergraduate Research Engagement   Feb. 2019 - present
    Program to guide female undergrad math students through their first research projects,
    and to bring in diverse women mathematician speakers for research talks and career
    path discussions

Mentor, AWM Mentoring Program at Virginia Tech   Sep. 2018 - present

Member, CMDA Computing Curriculum Committee   Aug. 2018 - present

Member, Math Department Technology Committee   Aug. 2018 - present

Instructor of Record, CS Foundations for CMDA (CMDA 3634) Virginia Tech, Spring 2019

Mentor, Hamlett Undergraduate Research Fellowship Program
    Mentoring CMDA undergraduate T. Nadipalli   Virginia Tech, Spring 2019
    Project on large-scale sensor network data compression

Volunteer, ASA DataFest at Virginia Tech   Apr. 2019

Faculty sponsor, Women in Data Science conference at Virginia Tech, VT Daily News Story   Feb. 2019

Judge, CMDA Fall Data Competition at Virginia Tech   Nov. 2018

Instructor of Record, Integrated Quantitative Science I (CMDA 2005)   Fall 2018
    Co-taught introductory course covering multivariable calculus and introductory
    probability and statistics taken by 65 CMDA undergrads.
    Updated math curriculum to include more vector calculus and to incorporate python
    programming throughout the course.

ICME Teaching Fellow 2016-2018, status to recognize student teaching experience

Mentor, ICME first-year mentoring program   Sep. 2017-Jun. 2018

Mentor, Stanford Women in Math Mentoring   Oct. 2016-Jun. 2017

Project Mentor, Stanford Earth Summer Undergraduate Resarch Program
    Co-mentored geophysics undergraduate E. Williams   Summer 2016
    Project on targeted detection/removal of infrastructure noise from ambient noise

Course assistant, Introduction to Scientific Computing   Winter 2016
    CME 108/MATH 114 taught by Eric Dunham at Stanford

Project Mentor, Projects in App. & Comp. Math (CME 181)   Spring 2015
    Undergrad project on statistical analysis of bicycle sharing network data

Instructor of Record, Introduction to Scientific Python   Winter 2015
    CME 193, Stanford: 1 credit hr. pass/fail course for 46 undergrads and grads

Instructor, Short course on Python at SIAM Conference on Geosciences,   June 2015
    Developed course with hands-on analysis and visualization of real geoscience data

Project Mentor, Projects in App. & Comp. Math (CME 181)   Winter 2014
    Undergrad project on tsunami modeling using Hawaiian bathymetry

STEM Tutor, Longhorn Center for Academic Excellence, UT-Austin Division of Diversity and Community Engagement   Aug. 2011-May 2012
    Tutored students in introductory math, statistics, physics, and chemistry courses
    Documented tutoring and workshops for grant application materials

| Industry Experience | **High Performance Computing Internship** Schlumberger, Menlo Park, CA | Summer 2016 |

Mentored by A. Lichnewsky and R.G. Clapp, and supervised by C. Boneti
Benchmarked, co-developed, and tested compression scheme for HPC applications

Areal Monitoring Internship   Summer 2015
Shell Projects & Technology, Houston, TX
Mentored by J. Lopez and supervised by P. Wills
Applied machine learning techniques to analyze data and predict production at
    steam-driven bitumen field in Peace River
Regularly consulted with reservoir engineer to develop useful products

Computational Physics Internship   2010-2011
Nanohmics, Inc. Austin, TX
Project funded through U.S. Department of Defense, PI B. Zollars
Implemented unstructured adaptive mesh methods for finite element code to model
    liquid erosion of coated lenses

Skills

Preferred programming languages: C/C++ and Python
HPC tools: MPI, openMP, CUDA, TBB
Profiling tools: Tau, HPM, NVCC, Vampir
Scientific tools: MATLAB, Mathematica, COMSOL, IDL
Environment and development tools: Google Cloud Compute Engine, Docker,
    Singularity, Doxygen, Git, Jupyter Notebooks