

Eileen R. Martin

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Education	Ph.D. Computational and Mathematical Engineering, Stanford University Dissertation: June 2018 <i>Passive Imaging and Characterization of the Subsurface with Distributed Acoustic Sensing</i> Readers: Biondo Biondi (advisor), Jonathan Ajo-Franklin, George Papanicolaou
	M.S. Geophysics Stanford University Masters research presentation: June 2017 <i>Stanford DAS Array: Ambient Noise and Earthquake Recordings</i> 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: <i>Global Coordinate Systems: Continuously Moving Finite-Dimensional Unit Norm Tight Frames on Smooth Manifolds</i> Advisor: Daniel Freeman (advisor, now at 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	DOE DE-FOA-0001990 (recently selected) Amount: \$1,874,999 total = \$1,499,999 DOE + \$375,000 non-DOE <i>Fully Distributed Acoustic and Magnetic Field Monitoring via a Single Fiber Line for Optimized Production of Unconventional Resource Plays</i> Lead PI: G. Pickrell (Virginia Tech Materials Science and Engineering), PIs: L. Ma (Sentek Instrument LLC), E.R. Martin Period of performance proposed: 7/1/19-6/30/22 (to be adjusted)
	NSF 1937984, Engineering for Civil Infrastructure program (recently selected) Amount: \$157,973 <i>EAGER: Exploration of an Interdisciplinary Approach to Resolving a Critical Issue in Evaluating Liquefaction Hazard of Challenging Soil Sites</i> PI: E.R. Martin, Co-PIs: A. Yerro Colom and R. Green (Virginia Tech Civil & Environmental Engineering) Period of Performance: 8/1/19-12/31/20

MAA Tensor Women and Mathematics Grant

Amount: \$6,000

SURE: Speakers and Undergraduate Research Engagement

PI: G. Matthews (Virginia Tech Math), Co-PIs: E.R. Martin and L. Zietsman (Virginia Tech Math)

Period of performance: 6/1/19-5/31/20

Seed Grant from Penn State Institute of Energy and the Environment

Amount: \$50,000

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)

Period of performance: 3/1/19-12/31/19

DOE Phase I STTR DE-SC0019630

Amount: \$149,997

Advanced Computational Methods Towards High-Resolution Fiber Optic Distributed Acoustic Sensing

PI: D. Rountree (Luna Innovations), Co-PI: E.R. Martin

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, Stanford

Best student poster paper at SEG Annual Meeting, co-author

2017

Awarded for Huot et al., *Automatic Noise Exploration in Urban Areas***Schlumberger Innovation Fellowship**

2016-2017

Value \$10,000; Awarded to 1 Ph.D. student and 4 M.S. students in ICME

DOE Computational Science Graduate Fellowship

2012-2016

Value over \$300,000; Awarded to 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

**Journal
Articles****E.R. Martin**, 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 Unsupervised Learning for Coherent Noise Removal*, IEEE Signal Processing Magazine, **35**(2), pp. 31-40.N.J. Lindsey, **E.R. Martin**, 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, **E.R. Martin**, 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, **E.R. Martin**, K.L. Ho, L. Ying, 2015, *Butterfly Factorization*, Multiscale Model. Simul., 13, pp. 714-732.

D. Freeman, R. Hotovy, **E.R. Martin** (alphabetical ordering standard for this journal), 2014, *Moving Finite Unit Norm Tight Frames for S^n* , Illinois J. of Math, 58, pp. 311-322.

Professional Magazines

E.R. Martin, 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.

Conference Papers

E.R. Martin, *Scalable Seismic Acquisition and Algorithms for Next-Generation Engineering Geophysics*, (invited presentation) 2019, International Conference on Engineering Geophysics, Al Ain, United Arab Emirates, 9-12 Oct., *accepted, to appear*.

E.R. Martin, *A Scalable Algorithm for Cross-correlations of Compressed Ambient Seismic Noise*, 2019, 89th Ann. Internat. Mtg. SEG Expanded Abstracts, *accepted, to appear*. Preprint at: <https://eartharxiv.org/sx9zt/>.

E.R. Martin, 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](https://doi.org/10.1190/segam2018-2997853.1)

F. Huot, **E.R. Martin**, 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](https://doi.org/10.1190/segam2018-2997880.1)

E.R. Martin 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](https://doi.org/10.1190/segam2017-17677759.1)

B. Biondi, **E.R. Martin**, 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](https://doi.org/10.1190/segam2017-17745041.1)

F. Huot, Y. Ma, R. Cieplik, **E.R. Martin**, 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](https://doi.org/10.1190/segam2017-17774369.1)

J.B. Ajo-Franklin, S. Dou, N. Lindsey, T. Daley, B. Freifeld, **E.R. Martin**, 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](https://doi.org/10.1190/segam2017-17774027.1)

E.R. Martin, 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](https://doi.org/10.1190/segam2017-17774027.1)

E.R. Martin, 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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1190/segam2015-5926936.1)

Technical Reports

E.R. Martin, *Eighteen months of continuous near-surface monitoring with DAS data collected under Stanford University*, SEP 172, 2018.

F. Huot, **E.R. Martin**, B. Biondi, *Automated ambient noise processing applied to fiber optic seismic acquisition*, SEP 172, 2018.

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. Cieplik, **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.

Papers Under Review

E.R. Martin, N.J. Lindsey, B. Biondi, J.B. Ajo-Franklin, *Introduction to Interferometry of Fiber Optic Strain Measurements* under review following minor revisions for upcoming AGU book on DAS, [preprint on Earth ArXiv](#), doi: [10.31223/osf.io/sx9zt](#).

B. Biondi, S. Yuan, **E.R. Martin**, F. Huot, R.G. Clapp, *Using telecommunication fiber infrastructure for earthquake monitoring and near-surface characterization*, under review following minor revisions for upcoming AGU book on DAS.

Z.J. Spica, M. Perton, **E.R. Martin**, G.C. Beroza, B.L. Biondi, *Urban Seismic Site Characterization by Fiber-Optic Seismology*, recently submitted, [preprint on Earth ArXiv](#).

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
Cambridge, MA, May 2019

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, [video of material on YouTube](#) 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
	<i>Urban ambient noise: from dense nodes to DAS</i> , EAGE Annual Meeting: Workshop on linking active and passive seismics	Paris, France, 2017
	<i>Repurposing our Telecommunications Infrastructure for Seismology</i> , Lawrence Livermore National Laboratory Seismology Seminar	Livermore, CA, 2017
	<i>Dirt Cheap Surveys: near surface monitoring with ambient seismic noise collected by DAS</i> , EAGE Annual Meeting: workshop on reservoir monitoring with distributed fibre-optic sensing	Vienna, Austria, 2016
	<i>Near-surface monitoring using DAS + ambient noise</i> , SEG Annual Meeting: distributed acoustic sensing workshop	New Orleans, LA, 2015
Professional Service	Associate editor , <i>Computers & Geosciences</i>	Nov. 2018-present
	Reviewer for: Seismological Research Letters, American Geophysical Union Books, Geophysical Journal International, Geophysics, Computers & Geosciences, Marine Geophysical Research, Journal of Computational Science, Journal of Environmental and Engineering Geophysics, Interpretation	
	Co-Organizer , SEG Annual International Meeting Post-convention Workshop on ‘Real-time Processing for Large-Scale Streaming Seismic Data’	upcoming Sep. 2019
	Chair , Session on ‘Distributed Acoustic Sensing: VSP, Modeling and Imaging Approaches’ at SEG Annual International Meeting	upcoming Sep. 2019
	Co-Organizer , Session on ‘Photonic and Noninertial 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 , <i>Interpretation</i>	2018
	Special issue on ‘Distributed Acoustic Sensing and its Oil Field Potential’	
	Co-organizer , Stanford Computational Geosciences Seminar	Jan.-Mar. 2018
	Brought in 9 speakers from outside Stanford, organized 1 hr. course EARTH 310	
	Co-chair , Session on ‘Earth Model Building Strategies and Inputs’ at SEG Annual International Meeting	Sep. 2017
	Co-organizer , SEG Data Analytics Post-Convention Workshop	Sep. 2017
	Invited early-career speakers and moderated panel on data science education	
	Student panel Stanford Aeronautics & Astronautics faculty search	Spring 2017
	President , Stanford SEG student chapter	2014-2015
Teaching	Instructor , Extreme-Scale Inverse Problems (VT, MATH 5984)	Upcoming, Fall 2019
	Instructor , Integrated Quantitative Science I (VT, CMDA 2005)	Upcoming, Fall 2019
	Instructor , CS Foundations for CMDA (VT, CMDA 3634)	Spring 2019
	Instructor , Integrated Quantitative Science I (VT, CMDA 2005)	Fall 2018
	ICME Teaching Fellow 2016-2018, status to recognize student teaching experience	
	Course assistant , Intro. to Scientific Computing (Stanford, CME 108)	Winter 2016
	Project Mentor , Projects in App. & Comp. Math (CME 181)	Stanford, Spring 2015
	Undergrad project on statistical analysis of bicycle sharing network data	
	Instructor , Introduction to Scientific Python (Stanford, CME 193)	Winter 2015
	Instructor , Short course on Python at SIAM Conference on Geosciences,	June 2015
	Project Mentor , Projects in App. & Comp. Math (CME 181)	Stanford, Winter 2014
	Undergrad project on tsunami modeling using Hawaiian bathymetry	
	STEM Tutor , Longhorn Center for Academic Excellence	Aug. 2011-May 2012
UT-Austin Division of Diversity and Community Engagement		

Tutored students in introductory math, statistics, physics, and chemistry courses
 Documented tutoring and workshops for grant application materials

Research Advising

Masters Student

Joseph Kump, Mathematics M.S. student VT, May 2019 - present
 Project on efficient high-resolution subsurface imaging methods

Undergraduate Students

Tarun Nadipalli, CMDA undergraduate VT, Spring 2019
 Awarded Hamlett Undergraduate Research Fellowship
 Project on large-scale sensor network data compression
 Ethan Williams, Geophysics and Music undergraduate Stanford, Summer 2016
 Co-advised with Biondo Biondi
 Project on targeted removal of infrastructure noise in ambient seismic data

Educational Service, Mentoring

Mentor, DOE CSGF [High Performance Computing Workshop](#) upcoming Jul. 2019
Panelist, [Early Career Panel](#), DOE CSGF Annual Program Review, upcoming Jul. 2019
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
Faculty sponsor, [Women in Data Science conference at VT](#) Feb. 2019 - present
Mentor, Student mentoring program run by Virginia Tech Sep. 2018 - present
 chapter of American Women in Mathematics
Member, CMDA Computing Curriculum Committee Aug. 2018 - present
Member, Math Department Technology Committee Aug. 2018 - present
Speaker, Virginia Tech Undergraduate Math Club Apr. 2019
Volunteer, ASA DataFest at Virginia Tech Apr. 2019
Judge, CMDA Fall Data Competition at Virginia Tech Nov. 2018
Panelist, UT-Austin American Women in Mathematics career panel Nov. 2018
Speaker, UT-Austin Undergraduate Math Club Nov. 2018
Mentor, ICME first-year mentoring program Sep. 2017-Jun. 2018
Mentor, Stanford Women in Math Mentoring Oct. 2016-Jun. 2017

Industry Experience

High Performance Computing Internship Summer 2016
 Schlumberger, Menlo Park, CA
Mentored by A. Lichnewsy 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