

# ANDREA VACCARI, PH.D.

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## CONTACT INFORMATION

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<http://www.people.virginia.edu/~av9g>

U.S. Permanent Resident

## EDUCATION

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- 2014 Ph.D. Electrical and Computer Engineering University of Virginia**  
Specialization: image processing, remote sensing, graph signal processing  
Dissertation: *An Automated Image Analysis Framework for Model-based Feature Detection in Sparse Data* [\[link\]](#)
- 1996 M.Sc. Physics Università degli Studi di Milano**  
Summa cum laude – Specialization: solid state physics, superconductivity, radio-astronomy  
Thesis: *Development of Superconductor-Insulator-Superconductor Mixers for Astrophysical Observations*

## RESEARCH INTERESTS

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Image and signal processing with emphasis on remote sensing and biomedical/biological images, model-based data mining for large spatiotemporal datasets, and graph signal processing.  
Novel approaches in experiential undergraduate and graduate education.

## PROFESSIONAL EXPERIENCE

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- 2017 - *Instructor – University of Virginia – Department of Electrical and Computer Engineering*  
· [Fundamentals III](#)  
· Digital Image Processing
- 2016 - 2017 *Adjunct Instructor – University of Virginia – Department of Electrical and Computer Engineering*  
· [Fundamentals III](#)
- 2014 - *Research Scientist - University of Virginia – Department of Electrical and Computer Engineering Virginia Image and Video Analysis laboratory*  
· Co-wrote proposal for and co-managed \$1.6M federal grant awarded in 2014  
· Investigated machine learning techniques for the evaluation of pavement condition from Synthetic Aperture Radar (SAR) imagery.  
· Developed image diffusion techniques to reduce speckle noise within individual SAR images by taking advantage of temporal information.  
· Used graph signal processing techniques for person identification and action recognition.  
· Developed video-analysis tools to study the emergence of complex synchronized behavior

- in clusters of foraging *Drosophila* (fruit fly).
- 2010 - 2014 *Graduate Research Assistant - University of Virginia - Department of Electrical and Computer Engineering Virginia Image and Video Analysis laboratory*
- Developed a model-based automated method to detect evolving sinkholes within large spatiotemporal point cloud datasets derived by large-scale SAR images.
  - Developed a spatiotemporal model of subsidence by analyzing stacks of Interferometric SAR and verified its accuracy using particle-based numerical modeling.
  - Developed a standalone tool for the detection of neuronal degeneration in confocal microscope imagery.
- 1998 - 2012 *Electronics Engineer - National Radio Astronomy Observatory*
- Responsible for the design, development and production of the Atacama Large Millimeter Array (ALMA) front-end monitor and control system hardware and software.
  - Designed a phase stable system for the distribution of the ALMA photonic local oscillator.
- 1996 - 1998 *Research Assistant - Università degli Studi di Milano - Physics Department Relativistic Astrophysics and Cosmology Section*
- Modeled, designed and fabricated superconductor-insulator-superconductor Josephson junctions to use as radio-frequency sensor in a 94GHz heterodyne radio-astronomy receiver.

## GRANTS

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- [RITARS-14-H-UVA](#) *InSAR Remote Sensing for Performance Monitoring of Transportation Infrastructure at the Network Level (Awarded, \$1.6M)*
- Co-wrote the preliminary white paper with Dr. Acton (UVA), Dr. Hoppe, Dr. Bruckno, Ms. Moruza, and Ms. Campbell (VDOT), Mr. Bohane, and Dr. Falorni (TRE Altamira)
  - Co-wrote the proposal with the same team
  - Co-managed the project with Dr. Acton. Responsible for budget, reporting, and interfacing with State (VDOT) and industrial (TRE) partners.
- [RITARS-11-H-UVA](#) *Sinkhole Detection & Bridge/Landslide Monitoring for Transportation Infrastructure by Automated Analysis of Interferometric SAR Images (Awarded, \$870k)*
- Co-managed the project with Dr. Acton. Responsible for budget, reporting interfacing with State (VDOT) and industrial (TRE) partners.

## PUBLICATIONS

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### Book Chapters

E. Hoppe, B. Bruckno, E. Campbell, S. Acton, **A. Vaccari**, M. Stuecheli, A. Bohane, G. Falorni, and J. Morgan, "Transportation Infrastructure Monitoring Using Satellite Remote Sensing," in *Materials and Infrastructures 1*, J.-M. Torrenti and F. La Torre, Eds. Hoboken, NJ: John Wiley & Sons, Inc., 2016, ch.14, pp.185-198.

## Refereed journals

- N. Tabassum, **A. Vaccari**, and S. T. Acton, "Speckle Removal and Change Preservation by Distance-Driven Anisotropic Diffusion of Synthetic Aperture Radar Temporal Stacks," (*Submitted Digital Signal Processing*)
- A. Vaccari**, T. Batabyal, N. Tabassum, E. Hoppe, B. Bruckno, and S. T. Acton, "Integrating remote sensing data in decision support systems for transportation asset management," (*Submitted Transportation Research Record*).
- M. Dombrowski, L. Poussard, K. Moalem, L. Kmecova, N. Hogan, E. Schot, **A. Vaccari**, S. Acton, and B. Condrón, "Cooperative behavior emerges amongst *Drosophila* larvae," (Accepted *Current Biology*).
- E. Hoppe, K. Young-Jun, B. Bruckno, S. Acton, L. Bolton, A. Becker, and **A. Vaccari**, "Historical Analysis of Tunnel Approach Displacements Using Satellite Remote Sensing," *Transportation Research Record: Journal of the Transportation Research Board*, Vol.2510, pp.15-23, 2015.
- A. Vaccari**, M. Stuecheli, B. Bruckno, E. Hoppe, and S. T. Acton, "Detection of geophysical features in InSAR point cloud data sets using spatiotemporal models," *International Journal of Remote Sensing*, Vol.24, No.22, p.8215-8234, 2013
- P. G. Huggard, B. N. Ellison, P. Shen, N. J. Gomes, P. A. Davies, W. Shillue, **A. Vaccari**, and J. M. Payne, "Generation of millimetre and sub-millimetre waves by photomixing in 1.55um wavelength photodiode," *Electronics Letters*, vol.38, no.7, pp.327-328, 28 Mar 2002
- P. G. Huggard, B. N. Ellison, P. Shen, N. J. Gomes, P. A. Davies, W. Shillue, **A. Vaccari**, and J. M. Payne, "Efficient generation of guided millimeter-wave power by photomixing," *Photonics Technology Letters, IEEE*, vol.14, no.2, pp.197-199, Feb. 2002
- V. Lacquaniti, S. Maggi, E. Monticone, R. Steni, and **A. Vaccari**, "Magnetic-field dependence of the critical current of single and stacked Josephson junctions with large idle regions," *Il Nuovo Cimento D*, vol.19, no.8-9, pp.1381-1387

## Conference proceedings (refereed)

- J. Wang, R. Sarkar, A. Aziz, **A. Vaccari**, A. Gahlmann, S. T. Acton, "Bact-3D: A level set segmentation approach for dense multi-layered 3D bacterial biofilm," (Accepted *ICIP 2017*)
- D. K. Harris, M. Alipour, S. T. Acton, L. R. Masseri, **A. Vaccari**, L. E. Barnes, "The *Citizen Engineer*: Urban Infrastructure Monitoring Via Crowd-Sourced Data Analytics," *Structures Congress 2017: Business, Professional Practice, Education, Research, and Disaster Management*, Denver, CO, USA, 2017, pp. 495-510.
- R. Sarkar, **A. Vaccari**, S. T. Acton, "SSPARED: Saliency and sparse code analysis for rare event detection in video," 2016 IEEE 12th Image, Video, and Multidimensional Signal Processing Workshop (IVMSP), Bordeaux, France, 2016, pp. 1-5.
- T. Batabyal, S. T. Acton, and **A. Vaccari**, "UGrAD: A Graph-theoretic Framework for Classification of Activity with Complementary Graph Boundary Detection," 2016 IEEE International Conference on Image Processing (ICIP), Phoenix, AZ, USA, 2016, pp. 1339-1343.
- T. Batabyal, **A. Vaccari**, and S. T. Acton, "LaWeCo: Active region detection in non-uniformly sampled data using Laplacian-weighted covariance," 2016 IEEE Southwest Symposium on Image Analysis and Interpretation (SSIAI), Santa Fe, NM, 2016, pp. 129-132.
- T. Batabyal, **A. Vaccari**, and S. T. Acton, "UGraSP: A unified framework for activity recognition and person identification using graph signal processing," *Image Processing (ICIP)*, 2015 IEEE International Conference on, Quebec City, QC, 2015, pp. 3270-3274. **Top 10% paper award.**
- B. Bruckno, E. Hoppe, **A. Vaccari**, S. Acton, and E. Campbell, "Integration and delivery of interferometric synthetic aperture radar [InSAR] data into stormwater planning within karst terranes," *Proceedings of the*

14th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, October 5-9, 2015, Rochester, Minnesota

E. Hoppe, K. Young-Jun, B. Bruckno, S. Acton, L. Bolton, A. Becker, and **A. Vaccari**, “Historical Analysis of Tunnel Approach Displacements Using Satellite Remote Sensing (15-4928),” TRB 94th Annual Meeting Compendium of Papers, Washington, D.C., January 11-15, 2015. (Revised and updated for the TRB journal).

E. Hoppe, B. Bruckno, E. Campbell, S. Acton, **A. Vaccari**, M. Stuecheli, A. Bohane, G. Falorni, and J. Morgan, “Transportation infrastructure monitoring using satellite remote sensing,” Proceedings of the Transportation Research Arena 2014, Paris, France, September 2014. **Oral presentation awards for industrial application and selected for J. Wiley thematic volume on infrastructure monitoring.**

B. S. Bruckno, **A. Vaccari**, E. Hoppe, W. Niemann, and E. Campbell, “Validation of Interferometric Synthetic Aperture Radar as a Tool for Identification of Geohazards and At-Risk Transportation Infrastructure,” Proceedings of the 64th Highway Geology Symposium, North Conway, New Hampshire, Sept. 9-12, 2013

M. Stuecheli, **A. Vaccari**, and S. T. Acton, “Graph cut segmentation of sparsely sampled images with application to InSAR-measured changes in elevation,” Image Analysis and Interpretation (SSIAI), 2012 IEEE Southwest Symposium on, pp.149-152, 22-24 April 2012

J. Payne, B. Shillue, and **A. Vaccari**, “Photonic techniques for use on the Atacama Large Millimeter Array,” Microwave Photonics, 1999. MWP ‘99. International Topical Meeting on, vol.1, pp.105-108, 1999

G. Sironi, G. Boella, G. Bonelli, M. Gervasi, **A. Vaccari**, and M. Zannoni, “The long wavelength spectrum of the Cosmic Microwave Background,” AIP Conf. Proc. 476, pp.149-153, 1998

M. Gervasi, G. Boella, F. Cavaliere, A. Passerini, M. Saglimbeni, R. Sgro, G. Sironi, M. Tucci, **A. Vaccari**, and M. Zannoni, “Search for Cosmic Microwave Background polarization,” AIP Conf. Proc. 476, pp.154-164, 1998

M. Zannoni, G. Boella, G. Bonelli, F. Cavaliere, M. Gervasi, A. Lagostina, A. Passerini, G. Sironi, and **A. Vaccari**, “TRIS EXPERIMENT: a search for spectral distortions in the CMB spectrum close to 1 GHz,” AIP Conf. Proc. 476, pp.165-173, 1998

G. Sironi, G. Boella, M. Gervasi, M. Potenza, **A. Vaccari**, F. Villa, V. Natale, G. Tofani, D. Andreone, and L. Brunetti, “A 94 GHz radiometer operating a SIS mixer,” Conference Proceedings – Italian Physical Society, vol. 58, pp.248-256, 1998

### Conference proceedings (invited)

N. Tabassum, **A. Vaccari**, and S. T. Acton, “Speckle Removal by Statistically-Driven Anisotropic Diffusion of SAR Temporal Stacks,” (Presented at Asilomar2015)

**A. Vaccari**, and S. T. Acton, “Spatiotemporal Gaussian feature detection in sparsely sample data with application to InSAR,” Proceedings of the SPIE Defense, Security, and Sensing, Baltimore, Maryland, 29 Apr. – 3 May, 2013

**A. Vaccari**, K. K. Gamage, S. Nachum, B. Condron, C. D. Deppmann, and S. T. Acton, “Assessment of Wallerian degeneration by automated image analysis,” Signal, Systems and Computers (ASILOMAR), 2012 Conference Record of the Forty Sixth Asilomar Conference on, pp.1583-1587, 4-7 Nov. 2012

### Invited talks

**A. Vaccari**, and Q. Sang, “Automated Analysis of Interferometric Synthetic Aperture Radar Images for Monitoring the Transportation Infrastructure,” 1st Symposium on Cyber-Physical Systems at WVU Tech, Montgomery, WV, May 2, 2013

### Conference proceedings (abstract only)

D. K. Harris, M. Alipour, S. T. Acton, L. R. Messeri, **A. Vaccari**, and L. E. Barnes, "The Citizen Engineer: Urban Infrastructure Monitoring Via Crowd-Sourced Data Analytics," (Accepted Structures 2017)

B. Bruckno, E. Hoppe, **A. Vaccari**, S. Acton, and E. Campbell, "Integration of Interferometric Synthetic Aperture Radar Data into Geotechnical Planning and Design (P15-5128)," Transportation Research Board 94th Annual Meeting Final Program, Washington, D.C., January 11-15, 2015

B. Bruckno, E. Hoppe, **A. Vaccari**, S. Acton, and E. Campbell, "New applications for interferometric synthetic aperture radar [InSAR]: interpretation of persistent, distributed, and temporary scatterers for geohazard and infrastructure monitoring and evaluation," Geological Society of America Abstracts with Programs, Vol. 46, No. 3, April 10-11, 2014

B. Bruckno, E. Hoppe, **A. Vaccari**, S. Acton, and E. Campbell, "New applications for interferometric synthetic aperture radar [InSAR]: Field validation studies of persistent, distributed, and temporary scatterers," Geological Society of America Abstracts with Programs, Vol. 46, No. 2, March 23-25, 2014

**A. Vaccari**, B. Bruckno, E. Hoppe, S. Acton, and E. Campbell, "Delivering geohazard and geotechnical data: From the satellite to the field," Geological Society of America Abstracts with Programs, Vol. 46, No. 2, March 23-25, 2014

B. Bruckno, E. Hoppe, **A. Vaccari**, and E. Campbell, "Validation of new applications for interferometric synthetic aperture radar [InSAR] data: Geohazards and infrastructure distress," Geological Society of America Abstracts with Programs, Vol. 45, No. 7, p.719, October 27-30, 2013

### Workshops

E. Hoppe, A. Bohane, G. Falorni, B. Bruckno, **A. Vaccari**, F. J. Meyer, and M. Pritchard, "InSAR Remote Sensing for Performance Monitoring of Transportation Infrastructure at the Network Level," 2015 NISAR Applications Workshop, Moffett Field, CA, October 13-15, 2015.

B. Bruckno, E. Hoppe, S. Acton, and **A. Vaccari**, "Updates to applications of Interferometric Synthetic Aperture Radar to sinkhole detection and rock slope monitoring (P15-6523)," Workshop: 110 - Sensing Technologies for Transportation Applications, Transportation Research Board - 94rd Annual Meeting, Washington, DC, January 11-15, 2015

B. Bruckno, E. Hoppe, **A. Vaccari**, S. Acton, E. Campbell, and W. Niemann, "New Applications for Interferometric Synthetic Aperture Radar [InSAR]: Interpretation of Scatterers for Rock Slope Evaluation," Virginia Geological Research Symposium, Charlottesville, Virginia, April 17, 2014

E. Hoppe, B. Bruckno, E. Campbell, S. Acton, **A. Vaccari**, M. Stuecheli, A. Bohane, G. Falorni, and J. Morgan, "Interferometric synthetic aperture radar applications at the Virginia Department of Transportation (P14-2178)," Workshop: 148 - Sensing Technologies for Transportation Applications, Transportation Research Board - 93rd Annual Meeting, Washington, DC, January 12-16, 2014

**A. Vaccari**, M. Stuecheli, S.T. Acton, and B.S. Bruckno, "Monitoring the transportation infrastructure with satellite-based interferometric synthetic aperture radar (InSAR)," 13th Annual Technical Joint Forum, Geohazards Impacting Transportation in Appalachia, Interstate Technical Group on Abandoned Underground Mines, Harrisonburg, VA, July 30 to August 1, 2013

S. T. Acton, M. Stuecheli, **A. Vaccari**, E. Hoppe, and B. Bruckno, "Model for Sinkhole detection by InSAR," TRB Sensing Technologies, Washington, DC, January 13, 2013

## Posters (refereed)

E. Hoppe, A. Bohane, G. Falorni, B. Bruckno, **A. Vaccari**, F. J. Meyer, and M. Pritchard, “InSAR Remote Sensing for Performance Monitoring of Transportation Infrastructure at the Network Level,” Transportation Research Arena 2016 Marketplace, Warsaw, Poland, April 18-21, 2016.

## MEDIA COVERAGE

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Ivan Berger, “[Predicting Sinkholes in the Road](#),” IEEE - the Institute, 9 September 2013  
Monica Rozenfeld, “[Disaster Meets Engineering](#),” TechNews on IEEE.tv  
Josie Pipkin, “[Engineer Seeks to Predict and Mitigate Sinkholes](#),” UVAToday, 11 July 2012  
“[Professor Scott Acton Develops Sinkhole Risk Technology](#),” ECE News, Spring 2012

## AWARDS

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February 2016 Hobby Postdoctoral Fellow in Computational Science  
September 2015 Top 10% ICIP 2015 paper  
Awarded for “UGRASP: A unified framework for activity recognition and person identification using graph signal processing”  
April 2014 Oral presentation awards for industrial application  
Awarded by “Transportation Research Arena 2014”  
for “Transportation infrastructure monitoring using satellite remote sensing”  
Selected for J. Wiley/ISTE thematic volume on infrastructure monitoring.  
October 1998 Consorzio Nazionale per l’Astronomia e l’Astrofisica – CNAA fellowship  
Awarded by the Arcetri Astrophysical Observatory  
January 1998 “Fondazione Fratelli Confalonieri” research scholarship  
Awarded by “Fondazione Fratelli Confalonieri”  
for “Design of a 94 GHz heterodyne SIS receiver”  
December 1996 “Università degli Studi di Milano” research scholarship  
Awarded by “Università degli Studi di Milano”

## PROFESSIONAL DEVELOPMENT

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June 2013 “High performance parallel computing bootcamp” – *University of Virginia (UVACSE)*  
June 2007 “Fundamentals of thermal and flow analysis with CFDDesign” – *Blue Ridge Numerics*  
December 2005 “Introduction to Verilog” – *Xilinx Training Center – San Jose, CA*  
March 2002 “High Bandwidth Photonic Devices” – *University of Arizona*  
March 2001 “High Speed Semiconductor Lasers” and “Microwave Photonics” – *Optical Fiber Communication Conference 2001 – Anaheim, CA*

## TEACHING EXPERIENCE

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### Courses

2017 - Present Instructor in [ECE Fundamentals III](#) and Digital Image Processing  
2016 - 2017 Adjunct instructor in [ECE Fundamentals III](#)  
2012 - Present Guest lecturer in Digital Signal Processing, Image Processing and Science of Information

## Course development

*Spring 2013 – Digital Signal Processing Laboratory*

Upgraded the existing digital signal processing (DSP) laboratory by migrating from C++ and embedded TI DSP boards to National Instruments LabVIEW and MyDAQ hardware. Developed a new set of lab notes and LabVIEW activities to guide students in the experiential exploration of fundamental and advanced DSP topics and techniques.

## Pedagogical training

2017, 6/19-6/23 “Course Design Institute” – *University of Virginia Center for Teaching Excellence*

2017, 5/31-6/1 “Contemplative Pedagogy Retreat” – *Middlebury College Center for Teaching, Learning & Research*

## DIVERSITY TRAINING

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January 2017 “Implicit bias intervention workshop” – *University of Virginia (U.Va. Charge)*

## SERVICE TO THE UNIVERSITY, THE SCHOOL, AND THE DEPARTMENT

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2016 - Present Proctor for IEEEExtreme 24-hours Programming Student Competition

2015 - Present Reviewer for the University of Virginia Engineering Research Symposium

## REVIEWING

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2016 - Present IEEE Transactions on Circuits and Systems for Video Technology

2014 - Present IEEE Transaction on Biomedical Engineering

2013 - Present IEEE Transactions on Image Processing

2013 - Present IEEE Transactions on Geoscience and Remote Sensing

2013 - Present International Journal of Remote Sensing

## MEMBERSHIP IN PROFESSIONAL SOCIETIES

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Institute of Electrical and Electronics Engineers (IEEE)

American Society for Engineering Education (ASEE)

Society of Photo-optical Instrumentation Engineers (SPIE)

## REFERENCES

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Available upon request