

Russell J. Hewett
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Education

- Ph.D. in Computer Science (w/ Computational Science & Engineering option), December, 2011
University of Illinois at Urbana-Champaign
Thesis: *Numerical Methods for Solar Tomography in the STEREO Era*
Advisors: Michael T. Heath and Farzad Kamalabadi
- B.S. *in Honors* in Computer Science, *Summa Cum Laude*, May, 2005
Virginia Polytechnic Institute and State University (Virginia Tech)
Thesis: *Wavelet Analysis of Solar Active Regions*
Advisors: Calvin Ribbens and Peter T. Gallagher

Academic Positions

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|-------------------|--|
| Aug 2018–Present | Assistant Professor, Department of Mathematics, Virginia Tech |
| Aug 2018–Present | Affiliate Faculty in Computational Modeling & Data Analytics, Virginia Tech |
| Sep 2011–Apr 2014 | Postdoctoral Associate, Department of Mathematics & Earth Resources Laboratory (by courtesy), Massachusetts Institute of Technology |

Industrial Research Positions

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|-------------------|---|
| Jul 2017–Aug 2018 | Chef de Project (Project Manager) for Inverse Problems, Uncertainty Quantification, and Machine Learning Project, Total E&P Research and Technology USA |
| May 2014–Aug 2018 | Research Scientist, Computational Science & Engineering Department, Total E&P Research and Technology USA |

Fellowships and Grants

- 2008–2011 NASA Graduate Student Research Program (GSRP) Fellowship (\$90,000)

Other Research History and Relevant Work Experience

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|-------------------|--|
| Jan 2008–Jul 2011 | Graduate Research Assistant, University of Illinois at Urbana-Champaign |
| Jun 2007–Aug 2007 | Graduate Research Assistant, University of Illinois at Urbana-Champaign |
| Jun 2006–Sep 2006 | Visiting Student, Trinity College Dublin |
| Sep 2004–Sep 2006 | Junior Programmer, L3-Communications GSI, NASA Goddard Space Flight Center |
| May 2004–Aug 2004 | Student Intern, NASA Goddard Space Flight Center |
| May 2003–Aug 2003 | Student Intern, NASA Goddard Space Flight Center |
| Jun 2000–Aug 2001 | Student Intern, NASA Goddard Space Flight Center |

Teaching Experience

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|-------------|--|
| Spring 2019 | Instructor, CMDA 3634 Computational Science Foundations of CMDA, Virginia Tech |
| Fall 2018 | Instructor, CMDA 2006 Integrated Quantitative Science, Virginia Tech |
| Fall 2018 | Guest Lecturer, CS 6804 Physics and Machine Learning, Virginia Tech |
| Spring 2013 | Recitation Instructor, 18.06 Linear Algebra, Massachusetts Institute of Technology |
| Spring 2013 | Co-organizer, Earth Resources Laboratory Reading Group on Full Waveform Inversion, Massachusetts Institute of Technology |
| Fall 2012 | Guest Lecturer, 18.325 Special Topics in Applied Mathematics: Waves and Imaging, Massachusetts Institute of Technology |
| Fall 2010 | Guest Lecturer, CS498dwh Computational Photography, University of Illinois |
| Fall 2007 | Teaching Assistant, CS450 Intro to Numerical Analysis (U/G), University of Illinois |
| Spring 2007 | Teaching Assistant, CS450 Intro to Numerical Analysis (U/G), University of Illinois |
| Fall 2006 | Teaching Assistant, CS450 Intro to Numerical Analysis (U/G), University of Illinois |
| Spring 2006 | Teaching Assistant, CS450 Intro to Numerical Analysis (U/G), University of Illinois |
| Fall 2005 | Teaching Assistant, CS232 Intro to Computer Architecture II, University of Illinois |

Invited Lectures & Summer Schools

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| Apr 2019 | Invited Lecturer, <i>Theory and experience in solving inverse problems in geophysics workshop</i> , Uppsala University, Uppsala, Sweden |
| Sep 2018 | Invited Instructor, <i>Summer School on Full Waveform Inversion: Mathematics and Geophysics</i> , Karlsruhe Institute of Technology, Karlsruhe, Germany |
| Nov 2014 | <i>Computational and Applied Mathematics Seminar</i> , Rice University, Houston, TX, USA |
| Nov 2014 | <i>Scientific Computing Seminar</i> , University of Texas at Dallas, Dallas, TX, USA |
| Apr 2014 | <i>Princeton Geophysics Brownbag</i> , Princeton University, Princeton, NJ, USA |
| Jul 2013 | Instructor for Computational Exercises, <i>Summer School on Introduction to the Mathematics of Seismic Imaging</i> , Mathematical Sciences Research Institute (MSRI), Berkeley, CA, USA |
| Apr 2013 | MIT Haystack Observatory, Massachusetts Institute of Technology, Burlington, MA, USA |
| Nov 2011 | <i>MIT Camera Culture Group Seminar</i> , Media Lab, Massachusetts Institute of Technology, Cambridge, MA, USA |
| Feb 2011 | <i>Imaging and Computing Seminar</i> , Department of Mathematics, Massachusetts Institute of Technology, Cambridge, MA, USA |

Workshops and Minisymposia

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| Feb 2017 | Co-organizer, minisymposium, "Numerical and computational challenges in high order DG methods," at 2017 SIAM Conference on Computational Science and Engineering, Atlanta, GA |
| May 2016 | Co-convenor, workshop, "Open-source Software in Applied Geosciences," at 78th EAGE Conference & Exhibition 2016, Vienna, Austria |
| Jun 2015 | Co-organizer, minisymposium, "Advances in Software for Computational Geosciences," at 2015 SIAM Conference on Mathematical & Computational Issues in the Geosciences, Palo Alto, CA |
| Jun 2015 | Co-organizer, minisymposium, "Discontinuous Galerkin Methods in Seismology," at 2015 SIAM Conference on Mathematical & Computational Issues in the Geosciences, Palo Alto, CA |
| Apr 2011 | Co-organizer, Python for Science and Engineering Workshop, University of Illinois |
| Oct 2010 | Co-organizer, Python for Scientific Computing Workshop, University of Illinois |

Students Supervised

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| Summer 2018 | Gaetan Fuss, VIE with Computational Science & Engineering Department at TOTAL E&P Research & Technology, USA (TOTAL), on geometric constraints for full waveform inversion |
| Summer 2016 | Zheng Wang, intern with Computational Science & Engineering Department at TOTAL E&P Research & Technology, USA (TOTAL), on multirate time stepping DG methods for the wave equation and DG methods in imaging and inversion |
| Summer 2016 | Peter Geldermans, intern with Computational Science & Engineering Department at TOTAL E&P Research & Technology, USA (TOTAL), on HPS solvers for the Helmholtz equation and applications to imaging and inversion |
| Summer 2015– Summer 2016 | Kevin Tuil, VIE with Computational Science & Engineering Department at TOTAL E&P Research & Technology, USA (TOTAL), on computational and numerical aspects of full waveform inversion |
| Summer 2014– Fall 2014 | Mamadou N'diaye, VIE with Computational Science & Engineering Department at TOTAL E&P Research & Technology, USA (TOTAL), on optimizing finite difference coefficients for wave equations |
| Summer 2013 | Léopold Cambier, intern with Imaging and Computing Group at MIT on applications of matrix probing to the full waveform inversion Hessian |
| Summer 2013 | Christine Cutting, intern with Imaging and Computing Group at MIT on uncertainty quantification and stochastic Newton methods for seismic imaging |
| Summer 2012 | Minghua “Michel” Rao, intern with Imaging and Computing Group at MIT on locally one-dimensional methods for wave equations |

Ph.D. Thesis Committees

2015 Marie Bonhasse-Gahot, University of Nice, France

Refereed Journal Publications

N. Beams, A. Gillman, and **R. J. Hewett**, “A parallel implementation of a high order accurate solution technique for variable coefficient Helmholtz problems,” *in review for Computers and Mathematics with Applications*, December, 2018.

L. Zepeda-Núñez, A. Scheuer, **R. J. Hewett**, and , L. Demanet, “The Method of Polarized Traces for the 3D Helmholtz Equation,” *Geophysics*, published online, April, 2019.

J. Chan, **R. J. Hewett**, and T. Warburton, “Weight Adjusted Discontinuous Galerkin Methods: Curvilinear Meshes,” *SIAM Journal on Scientific Computing*, 39 (6), A2395-A2421, 2017.

J. Chan, **R. J. Hewett**, and T. Warburton, “Weight Adjusted Discontinuous Galerkin Methods: Wave Propagation in Heterogeneous Media,” *SIAM Journal on Scientific Computing*, 39 (6), A2935-A2961, 2017.

J. Chan, **R. J. Hewett**, Z. Wang, and T. Warburton, “Reduced Storage Nodal Discontinuous Galerkin Methods on Semi-structured Prismatic Meshes,” *Computers & Mathematics with Applications*, 73 (5), 775-793, 2017.

The SunPy Community, S. J. Mumford, S. Christe, D. Pérez-Suárez, J. Ireland, A. Y. Shih, A. R. Inglis, S. Liedtke, **R. J. Hewett**, F. Mayer, K. Hughitt, N. Freij, T. Meszaros, S. M. Bennett, M. Malocha, J. Evans, A. Agrawal, A. J. Leonard, T. P. Robitaille, B. Mampaey, J. Iván Campos-Rozo, and M. S. Kirk, “SunPy–Python for solar physics,” *Computational Science and Discovery*, Volume 8, Issue 1, January 2015.

R. J. Hewett, I. H. Jermyn, M. T. Heath, and F. Kamalabadi, “A Phase Field Method for Tomographic Reconstruction from Limited Data,” *Proceedings of the British Machine Vision Conference*, pp. 120.1-

120.11, August, 2012.

R. A. Frazin, A. M. Vázquez, W. T. Thompson, **R. J. Hewett**, P. Lamy, A. Llebaria, A. Vourlidas, and J. Burckpile, "Intercomparison of the LASCO-C2, SECCHI-COR1, SECCHI-COR2, and Mk4 Coronagraphs," *Solar Physics*, Volume 280, Issue 1, pp. 273-293, 2012.

R. J. Hewett, M. T. Heath, M. D. Butala, and F. Kamalabadi, "A Robust Null Space Method for Linear Equality Constrained State Estimation," *IEEE Transactions on Image Processing*, Volume 58, Issue 8, pp. 3961-3971, August, 2010.

M. D. Butala, **R. J. Hewett**, R. A. Frazin, and F. Kamalabadi, "Dynamic Three-Dimensional Tomography of the Solar Corona," *Solar Physics*, Volume 262, Issue 2, pp. 495-509, February, 2010.

J. Ireland, C. A. Young, R. T. J. McAteer, C. Whelan, **R. J. Hewett**, and P. T. Gallagher, "Multiresolution Analysis of Active Region Magnetic Structure and Its Correlation with the Mt. Wilson Classification and Flaring Activity," *Solar Physics*, Volume 252, Issue 1, pp. 121-137, August, 2008.

R. J. Hewett, P. T. Gallagher, R. T. J. McAteer, C. A. Young, J. Ireland, P. A. Conlon, and K. Maguire, "Multiscale Analysis of Turbulence in Active Regions Using Wavelets," *Solar Physics*, Volume 248, Issue 2, pp. 297-309, April, 2008.

P. A. Conlon, P. T. Gallagher, R. T. J. McAteer, J. Ireland, C. A. Young, P. Kestener, **R. J. Hewett**, and K. Maguire, "Multifractal Properties of Evolving Active Regions," *Solar Physics*, Volume 248, Issue 2, pp. 311-322, April, 2008.

Conference Proceedings

L. Zepeda-Núñez, M. Taus, **R. J. Hewett**, and L. Demanet, "An accurate, fast, and scalable solver for high-frequency wave propagation," AGU Fall Meeting Abstracts, December, 2017.

L. Zepeda-Núñez, L. Demanet, **R. J. Hewett**, and A. Scheuer, "A short note on a pipelined polarized-trace algorithm for 3D Helmholtz," 86th Annual Meeting, SEG, Expanded Abstracts, October, 2016.

M. N'Diaye, **R. J. Hewett**, A. Atle, and H. Calandra, "Optimized finite difference coefficients for the Helmholtz equation," 85th Annual Meeting, SEG, Expanded Abstracts, October, 2015.

M. N'Diaye, **R. J. Hewett**, A. Atle, and H. Calandra, "Optimized finite difference coefficients for the Helmholtz equation," 85th Annual Meeting, SEG, Expanded Abstracts, October, 2015.

L. Zepeda-Núñez, **R. J. Hewett**, and L. Demanet, "Preconditioning the 2D Helmholtz equation with polarized traces," 84th Annual Meeting, SEG, Expanded Abstracts, October, 2014.

L. Zepeda-Núñez, **R. J. Hewett**, M. Rao, and L. Demanet, "Time-stepping beyond CFL: a locally one-dimensional scheme for acoustic wave propagation," 83rd Annual Meeting, SEG, Expanded Abstracts, September, 2013.

M. Leinonen, **R. J. Hewett**, X. Zhang, L. Ying, and L. Demanet, "High-dimensional wave atoms and compression of seismic datasets," 83rd Annual Meeting, SEG, Expanded Abstracts, September, 2013.

S. Mumford, D. Pérez-Suárez, S. Christe, F. Mayer, and **R. J. Hewett**, "SunPy: Python for Solar Physicists," Proceedings of the 12th Python in Science Conference, July, 2013.

R. T. J. McAteer, P. T. Gallagher, J. Ireland, C. A. Young, **R. J. Hewett**, and P. Conlon, "The Complex Sun: Turbulence and Complexity of the Solar Atmosphere," *SOHO-17. 10 Years of SOHO and Beyond*, 2006.

Book Chapters

B. Hewett and **R. J. Hewett**, *IM Talking about Literacy: Instant Messaging in the Workplace*, in *Handbook of Research on Virtual Workplaces and the New Nature of Business Practices*. Eds.: Kirk St. Amant and Pavel Zemliansky. Hershey, PA, USA: IGI Global, 2008.

P. T. Gallagher, R. T. J. McAteer, C. A. Young, J. Ireland, **R. J. Hewett**, and P. A. Conlon, *Solar Activity Monitoring*, in *Space Weather: Research Towards Applications in Europe*. Ed.: Jean Lilensten. Dordrecht, The Netherlands: Springer, 2007.

Conference Talks as Primary Contributor

R. J. Hewett "PySIT: Seismic Imaging Toolbox for Python," *SIAM Geoscience 2015*, Stanford University, Palo Alto, CA, June 2015.

R. J. Hewett, L. Zepeda-Núñez, and L. Demanet, "A Polarized-Trace Solver for 2D Helmholtz and Frequency Domain Full-Waveform Inversion," *Inverse Problems: Theory and Applications*, Bristol, UK, August 2014.

R. J. Hewett, I. Jermyn, M. T. Heath, and F. Kamalabadi, "Toward Tomographic Reconstruction of CMEs with a Phase Field Method," *Solar Image Processing Workshop VI*, Bozeman, MT, August 2012.

R. J. Hewett, "Tomographic Imaging of the Solar Corona from Multi-spacecraft Measurements," *Goddard Space Flight Center Graduate Student Symposium*, Greenbelt, MD, September 2010.

R. J. Hewett and W. K. Cochran, "Computing Tomographic Projection Operators on Unstructured Meshes," *SIAM Imaging Science 2010*, Chicago, IL, April 2010.

R. J. Hewett, M. D. Butala, F. Kamalabadi, and R. A. Frazin, "Dynamic 3D Coronal Density Reconstructions with Data from Multiple Observatories," *Solar Image Processing Workshop IV*, Baltimore, MD, October 2008.

R. J. Hewett, P. T. Gallagher, R. T. J. McAteer, C. A. Young, J. Ireland, P. A. Conlon, and K. Maguire, "Multiscale Analysis of Turbulence in Active Regions Using Wavelets," *Solar Image Processing Workshop III*, Dublin, Ireland, September 2006.

Conference Posters as Primary Contributor

R. J. Hewett, I. Jermyn, F. Kamalabadi, and M. T. Heath, "Joint Tomography and Segmentation of Coronal Mass Ejections," *Solar Image Processing Workshop V*, Les Diablerets, Switzerland, September 2010.

R. J. Hewett, M. D. Butala, F. Kamalabadi, and O. C. St.Cyr, "Large Scale Dynamic Reconstruction of Coronal Density and Temperature from Multi-spacecraft Measurements," *Goddard Space Flight Center Graduate Student Symposium*, Greenbelt, MD, September 2009.

R. J. Hewett, P. T. Gallagher, R. T. J. McAteer, C. A. Young, and J. Ireland, "Multiscale Structure of Active Region Magnetic Fields: A Continuous Wavelet Approach," *American Astronomical Society: Solar Physics Division Annual Meeting*, Durham, NH, June 2006.

Other Conference Presentations

M. Taus, L. Zepeda-Núñez, **R. J. Hewett**, L. Demanet, "An Accurate, Fast, and Scalable Solver for High-frequency Wave Propagation," 13th World Congress on Computational Mechanics, New York, NY, July 2018.

L. Zepeda-Núñez, M. Taus, **R. J. Hewett**, L. Demanet, "An Accurate, Fast, and Scalable Solver for High-

frequency Wave Propagation," 25th International Domain Decomposition Conference, New York, NY, July 2018.

N. Beams, A. Gillman, **R. J. Hewett**, "A Parallel Implementation of a Hierarchical Spectral Solver for Variable Coefficient Elliptic Partial Differential Equations," International Conference on Spectral and High Order Elements, London, UK, July, 2018.

N. Beams, A. Gillman, **R. J. Hewett**, "A parallel implementation of a high order accurate variable coefficient Helmholtz solver," SIAM Conference on Applied Linear Algebra, Hong Kong, May, 2018.

N. Beams, A. Gillman, **R. J. Hewett**, "A parallel implementation of a high order accurate variable coefficient Helmholtz solver," Rice Oil & Gas HPC Conference, Houston, TX, March, 2018.

L. Demanet, L. Zepeda-Núñez, **R. J. Hewett**, M. Taus, and A. Scheuer, "The Method of Polarized Traces for the Helmholtz Equation," *SIAM Annual Meeting 2016*, Boston, MA, July 2016.

F. Kamalabadi, **R. J. Hewett**, and M. D. Butala, "Time-Dependent Tomographic Imaging of the Solar Atmosphere," *SIAM Imaging Science 2010*, Chicago, IL, April 2010.

F. Kamalabadi, **R. J. Hewett**, M. D. Butala, and R. A. Frazin, "An Assimilative 3-D Model of Coronal Density from Multi-Spacecraft Observations," *Eos Transactions of the American Geophysical Union*, Volume 90, Issue 52, Fall Meeting Supplement, San Francisco, CA, December 2009.

M. D. Butala, **R. J. Hewett**, R. A. Frazin, Y. Chen, and F. Kamalabadi, "Reconstruction of the Dynamic 3D Solar Atmosphere with the Ensemble Kalman Filter," *Solar Image Processing Workshop IV*, Baltimore, MD, October 2008.

P. A. Conlon, P. T. Gallagher, R. T. J. McAteer, C. A. Young, J. Ireland, **R. J. Hewett**, and K. Maguire, "Multifractal Analysis of Solar Magnetograms," *Solar Image Processing Workshop III*, Dublin, Ireland, September 2006.

Honors, Awards, and Outstanding Achievements

- 2005 First Place Industry Choice Award in Virginia Tech Undergraduate Research in Computer Science for "Wavelet analysis of solar active regions"
- 2005 Phi Beta Kappa
- 2004 Upsilon Pi Epsilon
- 2001 First Place Judge's Choice Award in Virginia Tech Undergraduate Research in Computer Science for "The design and implementation of a refineable keyword search engine," w/ D. Arendt and J. Giacalone

Software Contributions

PySIT: Python Seismic Imaging Toolbox, lead designer and developer. Released under BSD license, November 22, 2013. (www.pysit.org)

SunPy: A Community Python Library for Solar Physics, contributor and member of the Board of Directors. (www.sunpy.org)

Minor contributions: AstroPy, NumPy

Professional Service

Participant, SEG SEAM AI project, as academic representative and representative of CSE Dept. at TOTAL, 2018-2019.

Committee Member, Numerics and Acquisition Committee, SEG SEAM Pore Pressure Prediction project, as representative of CSE Dept. at TOTAL, 2016.

Program Committee Member, Solar Astronomy Big Data (SABiD) – 1st Workshop on Management, Search and Mining of Massive Repositories of Solar Astronomy Data, IEEE BigData 2014, October 2014.

Executive Secretary, NASA Living With a Star/NSF Collaborative Space Weather Modeling Program Review Panel, September 2012.

Article referee for *Geophysics*, *IEEE Transactions on Signal Processing*, *Applied Mathematics and Computation*, *Automatica*, *IEEE Transactions on Aerospace and Electronic Systems*, and *Journal of Systems and Control Engineering*.

University Service

Committee Member, CMDA Computation Curriculum Development Committee, August 2018 – Present.

Search Committee Member, CMDA Professor of Practice, Virginia Tech, November 2018 – Present.

Committee Member, Math Department Colloquium Committee, Virginia Tech, August 2018 – Present.

Skills, Programming Languages, and Tools

Programming Languages: Fortran, Python, C++, Matlab, LaTeX

Version Control & Project Management: git, hg, JIRA, BitBucket, GitHub, GitLab

Languages: English (native), French (basic)

Other: Woodworking, 3D printing

References

Upon request.