

Curriculum Vitae

Misha Elena Kilmer

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Interests

Numerical Linear Algebra, Scientific Computing, Inverse Problems, Multilinear Algebra

Current Status

William Walker Professor of Mathematics (since 8/16)
Chair of Mathematics, Tufts University (since 8/13)
Adjunct Professor of Computer Science, Tufts University (since 9/05)

Education

Dec. 1997 Ph.D. in Applied Mathematics, University of Maryland, College Park
May 1994 M.A. in Mathematics, Wake Forest University
May 1992 B.S. in Mathematics, Magna Cum Laude, Computer Sci. Minor, Wake Forest University

Employment History

09/05 – 08/16 Professor, Mathematics, Tufts University (**direct promotion to Full**)
09/99-08/05 Assistant Professor, Mathematics, Tufts University
01/98-08/99 Visiting Scientist, ECE Dept., Northeastern University, Boston, MA
09/95-12/97 Research Assistant, University of Maryland, College Park, MD.

Citation information: h-index 25, i10-index 39
<https://scholar.google.com/citations?user=y4ZFdcYAAAAJ>

Plenary/Keynote Talks and Recent Invited Seminars:

- Advancing Women's Impact in Mathematics Symposium, New England (AWIMS), WPI, Apr. 2018.
- PCH 60: Computational Inverse Problems, Denmark, Aug. 2017.
- Manitoba Workshop on Mathematical Imaging Science, May 2017.
- Distinguished Lecture Series in Computational Science and Engineering, MIT, April 2017.
- SIAM Computational Science and Engineering, Atlanta, Feb. 2017. (See July 2017 SIAM News Article <https://sinews.siam.org/Details-Page/a-computationally-efficient-solution-of-large-scale-image-reconstruction-problems>, which contains a link to the talk.)
- Distinguished Lecture Series, Algorithm and Theory, IBM TJ Watson, Dec. 2016.
- Keynote speaker, Mid-Atlantic Numerical Analysis Day, Temple University, Nov. 2015.
- Householder Symposium, XIX, Spa, Belgium, June 2014.
- SIAM Applied Linear Algebra Meeting, Valencia, Spain, June 2012.
- Householder Symposium XVIII, June 2011.
- Householder Symposium XVII, Zuethen, Germany, June 2008.
- Preconditioning 2005, Emory University, Atlanta, May 2005.
- Householder Symposium XVI, PA, May 2005.
- SIAG-LA speaker, ILAS Annual Meeting, Auburn University, June 2002.

Other Selected Honors

- William Walker Professor of Mathematics, effective Sept. 1, 2016
- Interviewed for AWM's Mathematics Live!, Nov-Dec 2014 issue of the AWM Newsletter

- Invited Minisymposium organizer to represent the SIAG/LA, SIAM Annual Meeting, July 2016
- Tufts Undergraduate Initiative on Teaching Award, May 14, 2001
- SIAM Student Paper Prize, 1997

Funding History

- NSF DMS- 1720291, 9/1/2017 – 8/30/2020. “Collaborative Proposal: NoFRILS Inversion: Novel Feature-Based, Randomized Methods for Large Scale Inversion. Co-PI. Total to Tufts: \$284,131.
- Subcontract to Univ. of Southern California, Janus-GLAIVE, IARPA award, Phase I, Jan 2015 and Phase II, March 2016. PI. Total award to Tufts: \$363,577.
- NSF:CIF:SMALL 1319653, 9/1/2013 – 8/30/2016: “Optimal Sampling and Recovery for Multilinear Signals and Systems”. Co-PI. Total Award to Tufts: \$483,000.
- NSF DMS 1217161, 9/1/2012 – 8/30/2015. “Collaborative Research: Innovative, Integrated Strategies for Nonlinear Parametric Inversion.” PI. Total Award to Tufts \$190,001.
- NIH R01-CA154774 7/12/2011-6/30/2016. “Near-infrared spectral imaging of the breast for cancer detection and monitoring.” PI: Fantini, Tufts BME. Total Award to Tufts: \$2,223,119
- NSF-DMS 0914957, “Collaborative Research: Multilinear Algebra Computations with Higher-Order Tensors”, 8/1/2009 – 07/31/2012. PI. Total Award to Tufts: \$221,217.
- DARPA grant subcontracted through BAE Systems: Interior Intelligence by Networked Sensing, Imaging and Global Hierarchical Tomography (I2NSIGHT). 2006-2007.
- NSF: BCP Supplement to current CCF grant to initiate Computing Undergraduate Scholars Program (CUSP) jointly with other faculty from Tufts. \$20,000. 2006-2008.
- Senior Personnel: NSF grant for Acquisition of a Scientific Visualization Facility, Fall 2006.
- NSF 0631054 S-STEM: CSEMS Scholars Program, 8/16/2006-8/15/2010. co-PI
- NSF 0342559 ACR Grant “Collaborative Research: Tuning Libraries to Effectively Exploit the Memory Hierarchy”, 9/01/04- 8/08. PI.
- NSF 0139968 “Inverse Scattering Models and Algorithms for Functional Brain Imaging with Diffuse Optical Wavefields,” 9/01/02 – 8/31/05. co-PI.
- NSF 0208548, “Toward a Unified Approach to Diffuse Wave Inverse Problems,” 8/01/02 – 7/31/05. co-PI.
- NSF 0220651, “Tufts-CSEMS Scholars Program,” 9/15/02-9/14/06. co-PI.
- Subcontract award from Northeastern University to work designing preconditioners for 3D-vector Maxwell’s equations with PML boundary conditions, Summer 2000.
- Awarded Northeastern University seed funding for research related to the Center for Subsurface Sensing and Imaging Technologies, June 1998.

Editorial Work

- SIAM Review, Research Spotlights, Section Editor, Jan 2018 --
- SIAM Journal for Matrix Analysis and Applications, Assoc. Editor, Jan. 2012 – Dec. 2017.
- SIAM Journal for Scientific Computing, Associate Editor, Jan. 2009 – current
- SIAM Undergraduate Research On-line, Jan. 2008 – Jan 2014
- Linear Algebra and its Applications, Special Issue Editor (In Honor of G. W. Stewart’s 70th birthday), Jan. 2009 – Fall 2010

Selected Synergistic Activities

- Gene Golub SIAM Summer School Committee, Jan. 2018 – Dec. 2021.
- Panelist, SIAM Career Panel, SIAM CS&E Meeting, 2017 and SIAM Annual Meeting 2016.
- Program Committee Member: SIAM Annual Meeting 2012, SIAM Conference on Imaging Science, 2012; Copper Mountain Conference on Iterative Methods, 2008-current: SIAM Computational Science and Engineering Meeting 2009; SIAM Linear Algebra Meeting 2009; Preconditioning 2007

- Co-organizer, Session on Career Development, SIAM Annual 2008, SIAM CS&E Mar. 2009
- Co-organizer, Schlumberger-Tufts Computational and Applied Math Seminar, 2006 – present
- SIAM CSE Early Career Prize Committee, 2016-2017
- SIAM Activity Group on Linear Algebra, Best LA Paper Prize Committee, 2015
- American Mathematical Society Centennial Fellowship Committee, 2010-2012
- Tufts Univ. Special Advisor to the President and Interim Provost on Matters of Academic Appointments Sept. 2011 – July 2012
- AWM/SIAM Sonia-Kovalesky Lecture Prize Selection Committee, Fall 2007 – Spring 2009
- NSF Site Visit Team member, Institute for Computational and Experimental Research in Mathematics (ICERM), Brown University, Fall 2009
- Panelist, Computational Science and Engineering Education, SIAM CS&E meeting, Mar. 2009
- Secretary, SIAM Activity Group on Linear Algebra, 2004-2006; Nominating Cmte. Chair, 2006

Patents

- Kilmer (Tufts) and Hoge (Brigham and Women’s Hospital, Boston), “Magnetic Resonance Imaging by Subspace Projection” Awarded 2010.
- Horesh (IBM), Hao (Oracle), and Kilmer (Tufts), PENDING, “Non-intrusive method for supplementation of mis-specified simulation models” - Disclosure YOR8-2013-0474

Selected Publications (of over 60 in total)

I. Journal or Refereed Conference Publications/Submissions since 2011

1. Elizabeth Newman, Misha E. Kilmer, Lior Horesh, “Image classification using local tensor singular value decompositions,” IEEE CAMSAP Proceedings, 2017, to appear. See also <https://arxiv.org/abs/1706.09693>.
2. Meghan O’Connell, Misha E. Kilmer, Eric de Sturler, Serkan Gugercin, “Computing Reduced Order Models via Inner-Outer Krylov Recycling in Diffuse Optical Tomography,” SIAM J. Sci. Comput., April 2017. See also <http://arxiv.org/abs/1602.00138>.
3. Jiani Zhang, Arvind Saibaba, Misha Kilmer, Shuchin Aeron, “A Randomized Tensor Singular Value Decomposition Based on the t-Product,” accepted subject to minor revision, Num. Lin. Alg. Appl., Nov. 2017. See <https://arxiv.org/abs/1609.07086> for an earlier version.
4. Selin Aslan, Eric de Sturler, Misha Kilmer, “Randomized Approach to Nonlinear Inversion Combining Simultaneous Random and Optimized Sources and Detectors,” Submitted, 2017.
5. E. Kernfeld, N. Majumder, S. Aeron, M. Kilmer “Multilinear Subspace Clustering,” IEEE Statistical Signal Processing, Aug. 2016. See also <http://arxiv.org/abs/1512.06730> for an earlier version.
6. Sara Soltani, Misha E. Kilmer, Per Christian Hansen, “A Tensor-Based Dictionary Learning Approach to Tomographic Image Reconstruction,” BIT Numer Math, Volume 56, Issue 4, pp 1425–1454, 2016.
7. Julianne Chung, Misha E. Kilmer, and Dianne P. O’Leary, “A Framework for Regularization via Operator Approximation,” SIAM J. Sci. Comput., Vol. 37, No. 2, B332-B359, 2015.
8. Serkan Gugercin, Eric de Sturler, Misha E. Kilmer, Saifon Chaturantabut, Christopher Beattie and Meghan O’Connell, “Nonlinear Parametric Inversion Using Interpolatory Model Reduction”, SIAM J. Sci. Comput., Vol 37, No. 3, A1139-C438, 2015.
9. Arvind Saibaba, Misha E. Kilmer, Eric L. Miller and Sergio Fantini, “Fast algorithms for hyperspectral Diffuse Optical Tomography,” SIAM J. Sci. Comput., 37(5), B712–B743, 2015.
10. Gregory Ely, Shuchin Aeron, Ning Hao, Misha Kilmer, “5D seismic data completion and de-noising using a novel class of tensor decompositions,” Geophysics, vol 80, issue 4, V83-V95, July 2015.
11. Eric Kernfeld, Misha E. Kilmer, Shuchin Aeron, “Tensor-Tensor Products with Invertible Linear Transforms,” Linear Algebra and its Applications, Vol 485, 545-570, Nov 2015.

12. Masoud Sanayei, Christopher J. DiCarlo, Peeyush Rohela, Eric L. Miller, Misha E. Kilmer, "Sensor Placement using Fisher Information Matrix for Robust Finite Element Model Updating," SRESA Journal of Life Cycle Reliability and Safety Engineering, Vol. 4, Issue 2, 2015.
13. Malena I. Espanol and Misha E. Kilmer, "A Wavelet-Based Multilevel Approach for Blind Deconvolution Problems," SIAM J. on Scientific Computing, Vol. 36, A1432–A1450, 2014.
14. Z. Zhang, G. Ely, S. Aeron, N. Hao, M. Kilmer, "Novel methods for multilinear data completion and denoising based on tensor-SVD," Computer Vision and Pattern Recognition (CVPR), (also accepted for oral presentation **5.45% acceptance rate**), July 2014.
15. Oguz Semerci, Ning Hao, Misha E. Kilmer, Eric L. Miller, "Tensor Based Formulation and Nuclear Norm Regularization for Multienergy Computed Tomography," IEEE Tran. Image Processing, Vol. 23, 2014.
16. Donghui Chen, Misha E. Kilmer, Per Christian Hansen, "Plug-and-Play' Edge-Preserving Regularization," Electronic Transactions on Numerical Analysis, Vol 41, 465 -- 477, 2014.
17. G. Ely, S. Aeron, N. Hao and M. E. Kilmer, "5D and 4D pre-stack seismic data completion using tensor nuclear norm (TNN)", SEG 2013, Houston, TX, USA.
18. Fridrik Larusson, Pamela G. Anderson, Elizabeth Rosenberg, Misha E. Kilmer, Angelo Sassaroli, Sergio Fantini, Eric L. Miller, "Parametric Estimation of 3D tubular Structures for Diffuse Optical Tomography," Biomedical Optics Express, Vol 4, 271-- 286, 2013.
19. Alexander Nectow, Misha E. Kilmer and David Kaplan, "Quantitative Assessment of Nerve Cell Alignment," Tissue Engineering Part C: Methods, 2013.
20. Ning Hao, Misha E. Kilmer, Karen Braman and Randy C. Hoover, "Facial Recognition using Tensor-Tensor Decomposition," SIAM Journal on Imaging Science, 6(1), 437-463, 2013.
21. Misha E. Kilmer, Karen Braman, Ning Hao and Randy C. Hoover, "Third Order Tensors as Operators on Matrices: A Theoretical and Computational Framework with Applications in Imaging," SIAM J. Matrix Analysis and Applications, 34(1), pages 148-172, 2013.
22. Alexander Nectow, Eun Seok, David Kaplan and Misha E. Kilmer, "A Statistical Algorithm for Assessing Cellular Alignment," Journal of Biomedical Materials Research: Part A, 101 (3), pages 884-91, 2012.
23. Donghui Chen, Scott MacLachlan, and Misha E. Kilmer, "Iterative Parameter Choice & Algebraic Multigrid for Anisotropic Diffusion Denoising," Copper Mountain 2010 special issue, SIAM J. Sci. Comput. 33, 2011, pp. 2972-2994.
24. Alireza Aghasi, Misha E. Kilmer, Eric Miller, "Parametric Level Set Methods for Inverse Problems," SIAM J. Imaging Sci. 4, 2011, pp. 618-650.
25. Eric de Sturler and Misha E. Kilmer, "A Regularized Gauss-Newton Trust Region Approach to Imaging in Diffuse Optical Tomography," SIAM J. Sci. Comput. 33, 2011, pp. 3057-3086.
26. Misha E. Kilmer and Carla D. Martin, "Factorization Strategies for Third-Order Tensors," Linear Algebra and its Applications" (special issue in honor of G.W. Stewart), Aug. 2011, pp 641-658.

II. Books

Selected Works of G. W. Stewart, with Commentaries, Misha E. Kilmer and Dianne P. O'Leary, Editors. Birkhauser. July, 2010.

III. Book Chapters (Invited)

Ning Hao, Lior Horesh, and Misha E. Kilmer, *Nonnegative Tensor Decomposition*, in Compressed Sensing and Sparse Filtering, Springer Series on Signals and Communication Technology, Avisha Y. Carmi, Lyudmila Mihaylova, Simon J. Godsill, Eds., 2014.
<http://www.springer.com/engineering/signals/book/978-3-642-38397-7>

Ning Hao, Lior Horesh, and Misha E. Kilmer, *Nuclear norm optimization and its application to observation model specification*, in Compressed Sensing and Sparse Filtering, Springer Series on Signals and Communication Technology, Avisha Y. Carmi, Lyudmila Mihaylova, Simon J. Godsill, Eds., 2014.
<http://www.springer.com/engineering/signals/book/978-3-642-38397-7>

Students and Postdocs Supervised:

1 Postdoc, 5 PhD students + 2 current, 2 MA (thesis option), 15 undergraduate RAs, 7 visiting students