Daniel N. Kaslovsky

National Science Foundation Postdoctoral Fellow

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Research Interests

- Analysis of noisy, high-dimensional data sets and manifold-valued data
- Development of efficient computational algorithms using random sampling and sparse representation
- Image analysis and image processing with application to biology and medicine

Education

08/2012	Ph.D.	Applied Mathematics	University of Colorado, Boulder
12/2009	M.S.	Applied Mathematics	University of Colorado, Boulder
05/2003	B.A.	Computer Science	Colgate University

Doctoral Advisor: Francois G. Meyer
Thesis Committee: Gregory Beylkin, James Curry, Thomas Manteuffel, Per-Gunnar Martinsson, Francois Meyer, Amit Singer (Princeton University)

Experience & Employment

National Science Foundation (NSF) Postdoctoral Fellow Sept. 2012 – present
NSF Fellowship for Transformative Computational Science using Cyberinfrastructure,
Applied and Computational Mathematics Division, National Institute of Standards and Technology (NIST)

I am developing computational algorithms based on random sampling for efficient processing of compressible data. This research draws on recent advances in randomized numerical linear algebra and compressive sensing, both of which use random sampling to achieve great efficency with near optimal accuracy for sparse and low-rank data models.

University of Colorado, Boulder, Department of Applied Mathematics 2008–2012
Research Assistant with Prof. Francois Meyer

I researched the low-dimensional geometric structure underlying large, high-dimensional data sets and developed analysis for optimal approximation of the local tangent space from noisy manifold-valued data. These results find applications in dimensionality reduction, manifold learning, and image processing. I also developed a noise analysis of Empirical Mode Decomposition (EMD), an adaptive method to analyze nonstationary signals, and designed an EMD-based software package for analysis of sleep EEG data that is used by researchers at the University of Colorado Sleep and Chronobiology Laboratory.

University of Colorado, Boulder, Computational Optical Sensing & Imaging (COSI) 2008–2012
NSF-IGERT Fellowship

COSI is an interdisciplinary program in computational imaging that allowed me to extend my graduate training through specialized coursework, academic and industrial seminars, and laboratory rotations.

Los Alamos National Laboratory, Applied Mathematics and Plasma Physics Summer 2010
Graduate Research Assistant with Dr. Brendt Wohlberg

My summer research on multiscale geometric methods and sparse representation for design of novel image processing algorithms has led to a collaboration on patch-based image processing.

Publications

1. **Kaslovsky, D.N.** and Meyer, F.G. "Non-Asymptotic Analysis of Tangent Space Perturbation" *Information and Inference: A Journal of the IMA*, 3(2), pp. 134–187, 2014.
2. Chinoy, E.D., Frey, D.J., **Kaslovsky, D.N.**, Meyer, F.G., and Wright Jr., K.P. "Age-Related Changes in Slow Wave Activity Rise Time and NREM Sleep EEG With and Without Zolpidem in Healthy Young and Older Adults" *Sleep Medicine*, in press, 28 pgs, 2014.
3. **Kaslovsky, D.N.**, and Meyer, F.G. "Overcoming Noise, Avoiding Curvature: Optimal Scale Selection for Tangent Plane Recovery," *Proc. IEEE Statistical Signal Processing Workshop*, pp. 892–895, 2012.
4. **Kaslovsky, D.N.** and Meyer, F.G. "Noise Corruption of Empirical Mode Decomposition and its Effect on Instantaneous Frequency." *Advances in Adaptive Data Analysis*, 2(3), pp. 373–396, 2010.

Invited Conference Presentations

1. Meyer, F.G., **Kaslovsky, D.N.**, and Wohlberg, B. "Analysis of Image Patches: a Unified Geometric Perspective," *SIAM Conference on Imaging Science*, Philadelphia, PA, May 2012.
2. **Kaslovsky, D.N.** and Meyer, F.G. "Image Manifolds: Processing Along the Tangent Plane," *International Congress on Industrial and Applied Mathematics (ICIAM)*, Vancouver, BC, July 2011.

Conference Presentations

1. **Kaslovsky, D.N.** and Meyer, F.G. "Geometric Image Processing: A Local Approach," *SIAM Front Range Applied Mathematics Student Conference*, Denver, CO, March 2011.
2. **Kaslovsky, D.N.** and Meyer, F.G. "The Deluge of Images and Videos: Understanding the Manifold of Image Patches with Randomized Techniques" (poster), *Colorado Photonics Industry Association Annual Meeting*, Boulder, CO, November 2010.
3. **Kaslovsky, D.N.** and Meyer, F.G. "The Deluge of Images and Videos: Understanding the Manifold of Image Patches with Randomized Techniques" (poster), *NSF IGERT Project Meeting*, Washington, DC, May 2010.
4. Meyer, F.G., Taylor, K.M., **Kaslovsky, D.N.**, Procopio, M.J., and Young, C.J. "Evaluation of Empirical Mode Decomposition and Chirplet Transform for Regional Seismic Phase Detection and Identification," *Seismological Society of America Annual Meeting*, Monterey, CA, April 9, 2009.
5. **Kaslovsky, D.N.** and Meyer, F.G. "Performance of Empirical Mode Decomposition on Noisy Data." *SIAM Front Range Applied Mathematics Student Conference*, Denver, CO, March 2009.

Peer-Reviewed Abstracts

1. Chinoy, E.D., **Kaslovsky, D.N.**, Meyer, F.G., and Wright Jr., K.P. "Analysis of the Sleep EEG with the Novel Signal Analysis Technique Empirical Mode Decomposition as Compared to Spectral Analysis," *SLEEP*, Boston MA, June 2012.
2. Chinoy, E.D., **Kaslovsky, D.N.**, Meyer, F.G., and Wright Jr., K.P. "Changes in EEG Frequency Bands across the Sleep Transition Comparing Older and Young Adults as Measured by the Novel Signal Analysis Technique Empirical Mode Decomposition," *SLEEP*, Boston MA, June 2012.

Invited Seminars

1. "Tangent Plane Recovery and the Noise-Curvature Trade-off for Local Data Parameterization," *Department of Applied Mathematics and Statistics Colloquium, Colorado School of Mines*, November 2012.
2. "Optimal Tangent Plane Recovery from Noisy Manifold Samples," *Center for Geometric Analysis and Data Summer School, Washington State University & University of Idaho*, July 2012.
3. "Image Manifolds," *Computational Optical Sensing and Imaging (COSI) Seminar, University of Colorado, Boulder*, April 2012.
4. "Optimal Tangent Plane Recovery from Noisy Manifold Samples," *IDeAS Seminar, Program in Applied and Computational Mathematics, Princeton University*, September 2011.
5. "Geometric Image Processing," *Computational Optical Sensing and Imaging (COSI) Seminar, University of Colorado, Boulder*, February 2011.
6. "Uncovering Local Manifold Geometry and Processing Large Data Sets," *Computational Mathematics Seminar, Dept. of Applied Mathematics, University of Colorado, Boulder*, December 2010.
7. "Uncovering Local Manifold Geometry and Processing Large Data Sets," *Dynamics/Complex Systems Seminar, Dept. of Applied Mathematics, University of Colorado, Boulder*, December 2010.
8. "Local Manifold Geometry for Processing Large Data Sets," *SIAM Graduate Chapter Meeting, University of Colorado, Boulder* October 2010.

Honors & Service

National Science Foundation Postdoctoral Fellowship for Transformative Computational Science using Cyberinfrastructure ($240,000 / 3 years)	2012–2015
Institute for Pure and Applied Mathematics (IPAM) Visitor for "Structure and Randomness in System Identification and Learning" workshop	2013
External Expert Reviewer for French National Research Agency (ANR) "Blanc" program	2013
Referee for Digital Signal Processing, EURASIP Journal on Advances in Signal Processing, and SIAM Undergraduate Research Online	2011–2012
Invited Lecturer, Center for Geometric Analysis and Data Summer School, Moscow, ID	2012
Institute for Mathematics and its Applications (IMA) Funded visitor for "Large Graphs: Modeling, Algorithms, and Applications" workshop	2011
SIAM Travel Award for ICIAM 2011 Conference presentation	2011
President, SIAM Graduate Chapter, University of Colorado, Boulder	2008–2010
Organizer, Front Range Applied Mathematics Student Conference	2009 & 2010
Certificate of Recognition, SIAM Chapter Award	2009 & 2010
Chapter Representative, SIAM Annual Meeting	2009
Volunteer Judge, Peak-to-Peak Charter School Science Fair	2008 & 2010
Member, Society of Industrial and Applied Mathematics	2007 – present

Teaching

Instructor, Department of Applied Mathematics, University of Colorado, Boulder — Spring 2013

Developed and coordinated Special Topics Reading Course: "Recent Topics in Big Data." Lead 13 graduate students, 2 postdocs, and 1 undergraduate student from 5 departments in study of influential papers from the past decade. Representative topics include: compressive sensing, sparse representation, randomized numerical algorithms, the Johnson-Lindenstrauss lemma, and geometric data analysis.

Website: `http://www.danielkaslovsky.com/APPM7400-SPR13.html`

Invited Lecturer, Center for Geometric Analysis and Data Summer School — Summer 2012

Designed and taught three lectures on probability, high-dimensional geometry, and subspace perturbation theory.

Website: `http://geometricanalysis.org/Workshops/2012SummerSchool`

Teaching Assistant in Department of Applied Mathematics, University of Colorado, Boulder:

APPM2360 Differential Equations with Linear Algebra	Fall 2008
APPM2460 Differential Equations Laboratory	Fall 2008
APPM2350 Calculus III for Engineers	Summer 2008
APPM1350 Calculus I for Engineers	Spring 2008
APPM2350 Calculus III for Engineers	Fall 2007

Miscellaneous

Additional Education: M.E.S.S., Sports Management, University of Florida, 2004.
Citizenship: United States