

<b>Contact Information</b>	<p>Title: Postdoctoral Research Associate  Department of Electrical and Computer Engineering  <i>and the</i>  Wisconsin Institutes for Discovery (Optimization Research Theme)  Univeristy of Wisconsin-Madison</p> <p>E-mail: <a href="mailto:harmany@wisc.edu">harmany@wisc.edu</a>  Twitter: <a href="https://twitter.com/ZacHarmany">@ZacHarmany</a>  Web: <a href="http://drz.ac">http://drz.ac</a>  Phone: (919) 308-2702  Office: 4110 Wisconsin Institutes for Discovery</p>
<b>Research Interests</b>	Machine Learning, Convex Optimization, Online Learning, Statistical Learning Theory, Image and Video Processing, Statistical Signal Processing, Compressed Sensing, Inverse Problems, Medical Imaging, Spectral Imaging, Statistical and Mathematical Modeling
<b>Education</b>	<p><b>Ph.D., Electrical and Computer Engineering</b>, Oct 2012  Duke University, Durham, NC</p> <ul style="list-style-type: none"> <li>• Thesis: <i>Computational Optical Imaging Systems: Sensing Strategies, Optimization Methods, and Performance Bounds</i></li> <li>• NIH T-32 Medical Imaging Training Grant Fellow</li> <li>• Advisor: Prof. Rebecca M. Willett</li> </ul> <p><b>B.S., Electrical Engineering</b>, May 2006  The Pennsylvania State University, University Park, PA</p> <ul style="list-style-type: none"> <li>• Thesis: <i>Sampling and Reconstruction for Hybrid Digital-Optical Imaging Devices</i></li> <li>• <i>Magna cum Laude</i>, with Honors in the major of Electrical Engineering</li> <li>• Advisor: Prof. Nirmal K. Bose</li> </ul> <p><b>B.S., Physics</b>, May 2006  The Pennsylvania State University, University Park, PA</p> <ul style="list-style-type: none"> <li>• Electronics Option (emphasis on topics in electrical and computer engineering)</li> <li>• <i>Cum Laude</i>, Minor in Mathematics</li> </ul>
<b>Professional Experience</b>	<p><b>University of Wisconsin-Madison</b>, Madison, WI</p> <p><i>Postdoctoral Research Associate</i>, November 2012 – Present</p> <ul style="list-style-type: none"> <li>• Department of Electrical and Computer Engineering</li> <li>• Wisconsin Institute for Discovery (Optimization Research Theme), a transdisciplinary research institute and the public half of the joint public/private Discovery partnership</li> <li>• Studying convex optimization approaches for community detection in large-scale networks and other machine learning tasks</li> </ul> <p><b>Duke University</b>, Durham, NC</p> <p><i>Graduate Research Asistant</i>, August 2006 – October 2012</p> <ul style="list-style-type: none"> <li>• Department of Electrical and Computer Engineering</li> <li>• Research areas: machine learning and signal processing with applications to photon-limited imaging, compressed sensing, biomedical image analysis</li> <li>• Presented original research at many national and international conferences</li> <li>• Mentored two Masters students and one PhD student in signal processing research</li> </ul>

**University of Wisconsin-Madison, Madison, WI**

*Visiting Researcher, May 2012*

- Department of Electrical and Computer Engineering and the Laboratory for Computational and Optical Instrumentation (LOCI)
- Joint collaboration with Prof. Robert D. Nowak and Kevin W. Eliceiri
- Developed computational tools for denoising multiphoton fluorescence microscopy data requiring statistical and mathematical modeling of the imaging system
- Maintained a GitHub repository for large-scale imaging datasets and MATLAB code

**The University of California, Merced, Merced, CA**

*Visiting Researcher, January 2010 – May 2010*

- Department of Applied Mathematics
- Collaboration with Prof. Roummel F. Marcia
- Developed reconstruction methods for constrained sparsity-regularized inverse problems, with applications to photon-limited imaging and video reconstruction
- Mentored two Masters students with interests in signal processing and applied mathematics

**Teaching Experience**

**The University of California, Merced, Merced, CA**

*Visiting Instructor, Spring 2010*

- Math 289: *Wavelets and Multiscale Analysis* (Graduate Directed Group Study)
- Team-taught with Prof. Roummel F. Marcia, including lecturing and facilitating group discussion

**Duke University, Durham, NC**

*Teaching Assistant, Fall 2009*

- ECE 189: *Image Processing* (Undergraduate)
- Instructor: Prof. Rebecca M. Willett
- Responsible for homework grading, project report grading, and providing homework solutions
- Held twice-weekly office hours for students

*Teaching Assistant, Spring 2009*

- ECE 282: *Digital Signal Processing* (Graduate)
- Instructor: Prof. Rebecca M. Willett
- Responsible for grading homework and providing homework solutions
- Held twice-weekly office hours for students

**Refereed Journal Publications**

- [1] J. L. Mueller, **Z. T. Harmany**, J. K. Mito, S. A. Kennedy, Y. Kim, L. Dodd, J. Geradts, D. G. Kirsch, R. M. Willett, J. Q. Brown, and N. Ramanujam, "Quantitative segmentation of fluorescence microscopy images of heterogeneous tissue: Application to the detection of residual disease in tumor margins," *PLoS ONE*, vol. 8, p. e66198, June 2013. doi:10.1371/journal.pone.0066198
- [2] J. Salmon, **Z. T. Harmany**, C.-A. Deledalle, and R. M. Willett, "Poisson noise reduction with non-local PCA," *Journal of Mathematical Imaging and Vision*, pp. 1-16, 2013. doi:10.1007/s10851-013-0435-6

- [3] **Z. T. Harmany**, R. F. Marcia, R. M. Willett, “This is SPIRAL-TAP: Sparse Poisson Intensity Reconstruction ALgorithms—Theory and Practice,” *IEEE Transactions on Image Processing*, vol. 21, pp. 1084–1096, Mar. 2012. doi:10.1109/TIP.2011.2168410
- [4] M. Raginsky, S. Jafarpour, **Z. T. Harmany**, R. F. Marcia, R. M. Willett, and R. Calderbank, “Performance bounds for expander-based compressed sensing in Poisson noise,” *IEEE Transactions on Signal Processing*, vol. 59, pp. 4139–4153, Sept. 2011. doi:10.1109/TSP.2011.2157913
- [5] M. Raginsky, **Z. T. Harmany**, R. F. Marcia, and R. M. Willett, “Compressed sensing performance bounds under Poisson noise,” *IEEE Transactions on Signal Processing*, vol. 58, no. 8, pp. 3990–4002, Aug. 2010. doi:10.1109/TSP.2010.2049997

**Submitted  
Journal  
Publications**

- [1] **Z. T. Harmany**, R. F. Marcia, and R. M. Willett, “Compressive coded aperture keyed exposure imaging with optical flow reconstruction,” submitted to *IEEE Transactions on Image Processing*. arXiv:1306.6281

**Book  
Chapters**

- [1] R. F. Marcia, R. M. Willett, and **Z. T. Harmany**, “Compressive optical imaging: Architectures and algorithms,” *Optical and Digital Image Processing Fundamentals and Applications*, edited by G. Cristobal, P. Schelkens, and H. Thienpont, Wiley-VCH Verlag GmbH & Co. KGaA, 2011.

**Conference  
Publications**

- [1] A. K. Oh, **Z. T. Harmany**, and R. M. Willett, “Logarithmic total variation regularization for cross-validation in photon-limited imaging,” *IEEE International Conference on Image Processing (ICIP)*, 2013.
- [2] **Z. T. Harmany**, X. Jiang, R. M. Willett, “The value of multispectral observations in photon-limited quantitative tissue analysis,” *IEEE Statistical Signal Processing Workshop (SSP)*, 2012.
- [3] J. Salmon, C.-A. Deledalle, R. M. Willett, **Z. T. Harmany**, “Poisson noise reduction with non-local PCA,” *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2012.
- [4] **Z.T. Harmany**, A. K. Oh, R. F. Marcia, R. M. Willett, “Motion-adaptive compressive coded apertures,” *Proceedings of SPIE*, vol. 8165, pp. 81651C–81651C-5, Sept. 2011.
- [5] **Z. T. Harmany**, J. Mueller, J. Q. Brown, N. Ramanujam, R. M. Willett, “Tissue quantification in photon-limited microendoscopy,” *Proceedings of SPIE*, vol. 8138, pp. 81380F–81380F-6, Sept. 2011.
- [6] **Z. T. Harmany**, D. O. Thompson, R. M. Willett, and R. F. Marcia. “Gradient projection for linearly constrained convex optimization in sparse signal recovery,” *IEEE International Conference on Image Processing (ICIP)*, pp. 3361–3364, Sept. 2010.
- [7] D. O. Thompson, **Z. T. Harmany**, and R. F. Marcia, “Sparse video recovery using linearly constrained gradient projection,” *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 1329–1332, May 2011.
- [8] J. Hernandez, **Z. T. Harmany**, D. O. Thompson, and R. F. Marcia, “Bounded gradient projection methods for sparse signal recovery,” *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pp. 949–952, May 2011.

- [9] R. F. Marcia, **Z. T. Harmany**, and R. M. Willett. “Compressive coded apertures for high-resolution imaging,” *Proceedings of SPIE*, vol. 7723, pp. 772304–772304-11, Apr. 2010.
- [10] R. M. Willett, **Z. T. Harmany**, and R. F. Marcia. “Poisson image reconstruction with total variation regularization,” *IEEE International Conference on Image Processing (ICIP)*, pp. 4177–4180, Sept. 2010.
- [11] **Z. T. Harmany**, R. F. Marcia, and R. M. Willett. “SPIRAL out of convexity: Sparsity-regularized algorithms for photon-limited imaging,” *Proceedings of SPIE*, vol. 7533, pp. 75330R–75330R-12, Feb. 2010.
- [12] **Z. T. Harmany**, R. F. Marcia, and R. M. Willett. “Sparsity-regularized photon-limited imaging,” *IEEE International Symposium on Biomedical Imaging: From Nano to Macro (ISBI)*, pp. 772–775, Apr. 2010.
- [13] **Z. T. Harmany**, R. F. Marcia, and R. M. Willett. “Sparse Poisson intensity reconstruction algorithms,” *IEEE Workshop on Statistical Signal Processing (SSP)*, pp. 634–637, 2009.
- [14] R. F. Marcia, **Z. T. Harmany**, and R. M. Willett. “Compressive coded aperture imaging,” *Proceedings of SPIE Computational Imaging VII*, pp. 72460G–72460G-13, 2009.
- [15] **Z. T. Harmany**, R. M. Willett, A. Singh, and R. D. Nowak, “Controlling the error in fMRI: hypothesis testing or set estimation?,” *IEEE International Symposium on Biomedical Imaging (ISB)*, pp. 552–555, May 2008.

#### **Selected Presentations**

- [1] “Won’t you be my neighbor?” Systems Information Learning Optimization (SILO) Seminar Series, Wisconsin Institutes for Discovery, Dec. 4, 2013.
- [2] “Nuclear proliferation and convex relaxations: Experimental results of just-in-time research,” Systems Information Learning Optimization (SILO) Seminar Series, Wisconsin Institutes for Discovery, Feb. 19, 2013.
- [3] “Solving inverse problems in imaging: Applications to video and tissue analysis,” ECE Graduate Research Workshop, Duke University, Jan. 19, 2012
- [4] “Sparsity-based reconstruction methods in medical imaging,” Physics and Applied Mathematics Seminar Series, University of California, Merced, Jan. 29, 2010

#### **Professional Activities**

##### **Peer Reviewer**

- *Conference on Neural Information Processing Systems (NIPS)*
- *International Conference on Machine Learning (ICML)*
- *IEEE Transactions on Image Processing (TIP)*
- *IEEE International Conference on Image Processing (ICIP)*
- *IEEE Statistical Signal Processing Workshop (SSP)*
- *SIAM Journal on Imaging Sciences (SIIMS)*
- *Proceedings of the National Academy of Sciences (PNAS)*

##### **Professional Societies**

- IEEE, Graduate Student Member  
Signal Processing Society, Information Theory Society
- SIAM Student Member
- SPIE Member

**Other Activities**

- Engineering Track Cochair for Duke Engineering Entrepreneurship Week 2008

**Skills**

**Programming** MATLAB, Mathematica, C, Python, R, Ruby, HTML, CSS, JavaScript, Bash Scripting, AppleScript

**Other Software** L<sup>A</sup>T<sub>E</sub>X, Git, SVN, OS X, iOS, Adobe Creative Suite, Microsoft Office, iLife, iWork