

# Rachel Millin

## Curriculum Vitae

Neuroscience Graduate Program  
3641 Watt Way, HNB  
Los Angeles, CA 90089  
☎ +1 (323) 646 2744  
✉ rmillin@usc.edu

The broad aim of my research is to further the understanding of cognitive processes in order to inform and improve clinical practice. My current projects use psychophysics, functional magnetic resonance imaging (fMRI), and computational modeling to elucidate the possible mechanisms responsible for the limitations of peripheral vision as compared to foveal vision. An improved understanding of the causes of these deficiencies is an important step toward the development of clinical interventions and technological aids for patients who rely solely on their peripheral vision after central vision loss resulting from common diseases of the retina.

### Education

- 12/2015 **Ph.D.**, *Neuroscience*, University of Southern California (USC), Los Angeles.  
dissertation: fMRI characterization of peripheral form vision  
advisor: Dr. Bosco S. Tjan
- 12/2002 **B.S.**, *Physics*, University of California (UCLA), Los Angeles.

### Peer-Reviewed Publications

- MiYoung Kwon, Pinglei Bao, **Rachel Millin**, and Bosco S. Tjan. Radial-tangential anisotropy of crowding in the early visual areas. *Journal of Neurophysiology*, 112 (10): 2413-2422, 2014.
- Rachel Millin**, A. Cyrus Arman, Susana T.L. Chung, and Bosco S. Tjan. Visual crowding in V1. *Cerebral Cortex*, 24 (12): 3107-3115, 2014.
- Stefan Gazdzinski, **Rachel Millin**, Lana G. Kaiser, Timothy C. Durazzo, Susanne G. Mueller, Michael W. Weiner, and Dieter J. Meyerhoff. BMI and neuronal integrity in healthy, cognitively normal elderly: a proton magnetic resonance spectroscopy study. *Obesity*, 18(4):743-748, 2012.
- Wang Zhan, Gail A. Kang, Graham A. Glass, Yu Zhang, Cheryl Shirley, **Rachel Millin**, et al. Regional alterations of brain microstructure in Parkinson's disease using diffusion tensor imaging. *Movement Disorders*, 18(4):743-748, 2012.
- Gregory J. Gemmen\*, **Rachel Millin**\*, and Douglas E. Smith. Tension-dependent DNA cleavage by restriction endonucleases: Two-site enzymes are "switched off" at low force. *Proceedings of the National Academy of Sciences*, 103(31):11555-11560, 2006.  
\*contributed equally
- Gregory J. Gemmen, **Rachel Millin**, and Douglas E. Smith. Dynamics of single DNA looping and cleavage by Sau3AI and effect of tension applied to the DNA. *Biophysical Journal*. 91 (11): 4154-4165, 2006.
- Gregory J. Gemmen\*, **Rachel Millin**\*, and Douglas E. Smith. DNA looping by two-site restriction endonucleases: heterogeneous probability distributions for loop size and unbinding force. *Nucl. Acids Res.* 34 (10): 2864-2877, 2006.  
\*contributed equally
- Derek N. Fuller, Gregory J. Gemmen, J. Peter Rickgauer, Aurelie Dupont, **Rachel Millin**, et al. A general method for manipulating DNA sequences from any organism with optical tweezers. *Nucl. Acids Res.* 34 (2): e15, 2006.

## Peer-Reviewed Conference Proceedings

Kang-Yu Ni, James Benvenuto, Rajan Bhattacharyya, **Rachel Millin**. Feature transformation of neural activity with sparse and low-rank decomposition. *Proc. SPIE 9417, Medical Imaging 2015: Biomedical Applications in Molecular, Structural, and Functional Imaging, 94172B* (March 17, 2015).

Michael J. O'Brien, Matthew S. Keegan, Tom Goldstein, **Rachel Millin**, et al. Sparse atomic feature learning via gradient regularization: With applications to finding sparse representations of fMRI activity patterns. *Signal Processing in Medicine and Biology Symposium (SPMB)*, IEEE, 13-13 Dec. 2014: 1-6.

## Conference Presentations and Invited Talks

**Rachel Millin**, Bosco S. Tjan. Modeling Multi-voxel BOLD signal in peripheral V1. *Poster at Organization for Human Brain Mapping Annual Meeting*, 2015.

**Rachel Millin**, Bosco S. Tjan. Assessing the upper bound on performance of multi-voxel pattern analysis in peripheral V1. *Poster at Vision Sciences Society Annual Meeting*, 2015.

**Rachel Millin**, James Benvenuto, Kang-Yu Ni, Rajan Bhattacharyya, Bosco S. Tjan. Dictionary Learning for Sparse Representation of fMRI Data. *Talk at HRL Laboratories fMRI Colloquium*, 2013.

**Rachel Millin**, Bosco S. Tjan. A forward model of multi-voxel pattern analysis in primary visual cortex. *Poster at Vision Sciences Society Annual Meeting*, 2013.

**Rachel Millin**, MiYoung Kwon, Pinglei Bao, Bosco S. Tjan. Visual Crowding in V1. *Talk at Neuroscience Graduate Program Retreat*, 2012.

**Rachel Millin**, Pinglei Bao, Bosco S. Tjan. Integration across spatial frequencies reflected in early visual areas. *Poster at Vision Sciences Society Annual Meeting*, 2011.

**Rachel Millin**, A. Cyrus Arman, Bosco S. Tjan. Reduced Neural Activity with Crowding is Independent of Attention and Task Difficulty. *Talk at Vision Sciences Society Annual Meeting*, 2010.

**Rachel Millin**, A. Cyrus Arman, Bosco S. Tjan. A low-level neural origin of visual crowding. *Poster at Society for Neuroscience Annual Meeting*, 2009.

**Rachel Millin**, Gregory J. Gemmen, Douglas E. Smith. A survey of DNA looping and cleavage properties of different restriction enzymes using optical tweezers. *Poster at American Physical Society March Meeting*, 2005.

## Awards and Honors

- 2015 Travel Award for Best Cognitive or Systems Neuroscience Poster, USC Neuroscience Graduate Program Symposium
- 2012 USC Neuroscience Graduate Program Fellowship (extra year of support, merit-based)
- 2010 Elsevier/Vision Research Student Travel Award
- 2008-2010 USC Women in Science and Engineering (WiSE) Top-off Fellowship
- 2009 USC WiSE Travel Grant
- 2008-2009 USC Neuroscience Graduate Program Fellowship
- 2001 UCLA Kinsey Award (for junior physics major)

## Professional Activities

### Service

- 2014 Ad hoc peer reviewer, *Journal of Vision*
- 2012-2013 Mentor to undergraduate students, Functional and Computational Vision Laboratory

- 2009 Student mentor, Neuroscience Graduate Program
- 2008 Co-organizer, USC Neuroscience Graduate Symposium  
Training
- 2008-2013 Regular presenter and attendee, USC Vision Journal Club
- 2012 Participant, USC Neuroscience grant-writing workshop
- 2011 Participant, UCLA IPAM Probabilistic Models of Cognition summer program  
Grant Writing
- 2013 Assisted in preparation of funded R01 *Form Processing in the Periphery*
- 2012 Prepared NRSA grant application; incorporated in R01

## Research Experience

- 2008–present **Graduate Student Researcher**, *Functional and Computational Vision Laboratory, USC*, Los Angeles, CA.  
Investigate the mechanisms of peripheral form vision using psychophysics, fMRI, and biophysical modeling.
  - Establish the earliest cortical site involved in "visual crowding", an important impediment to peripheral form vision, using BOLD fMRI.
  - Develop a model of BOLD fMRI in primary visual cortex that accurately predicts data from stimulus.
  - Determine at which stages of visual processing stimulus information is degraded due to "visual crowding" through fMRI multi-voxel pattern analysis.
  - Examine the characteristics of resting state activity in early visual cortex in patients with central vision loss for comparison with control subjects.
- 2013–2015 **Research Intern**, *HRL Laboratories, LLC*, Malibu, CA.  
Develop and implement an fMRI preprocessing and analysis pipeline in Matlab.
  - Devise novel train/test implementation of existing denoising methods (GLMdenoise) to improve predictability of events from fMRI data.
  - Investigate the utility of sparse coding with dictionary learning to compress and denoise fMRI data.
  - Collaborate with team members at three universities to optimize data analysis strategies.
- 2006–2008 **Research Associate**, *Center for Imaging of Neurodegenerative Diseases, Veterans' Affairs Medical Center*, San Francisco, CA.  
Contributed to research on biomarker identification and progression of neurodegenerative diseases.
  - Initiated a study on the relationship between brain metabolite concentrations measured at 4T and body mass index (BMI); performed statistical analysis.
  - Developed methods for overlaying region of interest data on susceptibility-weighted images, for comparison of image entropy within subcortical regions in patients with Parkinson's disease and controls.
  - Acquired and analyzed structural, perfusion, spectroscopic, and diffusion-weighted images for Alzheimer's disease, HIV-associated dementia, and PTSD studies.
  - Managed studies of Parkinson's disease, which required data processing, database management, collaboration with other researchers, presentation of progress reports at monthly meetings, and training other employees.
- 2003–2006 **Research Assistant**, *University of California*, San Diego, CA.  
Investigated properties of chromatin and restriction endonucleases using single-molecule techniques (optical tweezers).
  - Assisted in experiment planning, protocol development, data analysis, and manuscript preparation.

## Teaching Experience

- Spring 2015 **Guest Instructor**, Introduction to Functional Magnetic Resonance Imaging (undergraduate course), *Department of Psychology, USC*, Los Angeles.  
Trained students in proper experimental protocol and use of the 3T Siemens Prisma scanner.
- Fall 2014 **Guest Lecturer**, Introduction to Functional Magnetic Resonance Imaging (graduate course), *Department of Psychology, USC*, Los Angeles.  
A workshop on using FSL software for fMRI data analysis.
- Spring 2012 **Teaching Assistant**, Origins of the Mind, *Department of Psychology, USC*, Los Angeles.  
Led laboratory sections to support lecture material.