erikpeterson

Education

2010–2012 **PhD in Cognitive and Computational Neuroscience**, *Colorado State University, Department of Psychology*, Fort Collins, CO.
ADVISOR: Carol A Seger, TITLE: Reinforcement learning mechanisms underlying rewarding inferences. Graduation is anticipated in July 2012.

2010 **MS in Psychology**, *Colorado State University, Department of Psychology*, Fort Collins, CO.
TITLE: Many Hats: Intra-Trial and Reward-Level Dependent BOLD Activity in the Striatum and Premotor Cortex.

2004 **BS in Chemistry and BS in Biochemistry, with a minor in Philosophy**, *California Polytechnic State University*, San Luis Obispo, CA.
SENIOR THESIS: Transport Mechanisms of Alkanethiol inks in Dip Pen Nanolithography (DPN).

Scientific Interests

The big picture, briefly, in first person

I am interested in the math inside my head. Specifically, I am very curious how cellular and network-level learning ultimately intertwine. This curiosity lead to my work on the neural correlates of reinforcement learning, and model-based fMRI in general. I have also been working with machine learning methods as I believe they are a most potent approach to comparing and isolating a network's computations across tasks. On a personal level, the days I spend reading theory and writing code about it – those are my favorite days.

Current Projects

Reinforcement Learning (1) **Dissertation:** a fMRI and computational study aimed at understanding the mechanisms underlying rewarding inferences.

(2) A study of RL neural correlates at intra-trial resolution, comparing the fit of separate models for category label versus category response.

Machine learning Developing new methods for analyzing rapid event-related designs in the context of multivoxel pattern analysis (MVPA) then employing these methods to explore "pattern reinstatement" during learning within the striatum, across both tasks, subjects and regions of interest.

Behavioral toolbox Developing a simpler-to-use interface for Psychtoolbox, the (frustrating) Matlab toolbox for behavioral experiments.

#! Code for current and past projects is available at https://github.com/andsoandso/.

Publications and Posters

Neuroscience

fMRI simulation Peterson EJ and Seger CA, *Reinforcing Reliability: Some Simulations of Model-Based fMRI to examine model quality and robustness*, NeuroImage, under preparation.

Univ of Pittsburgh. • *Wheeler Lab, LRDC, Dept. of Psychology, Pittsburgh, PA*
✉ *erik.exists@gmail.com*

Visuomotor learning — Peterson EJ, Seger CA and Anderson CA, *Many Hats: Changes in the Striatal Bold Signal Across Stimulus, Preparation, Response and Feedback*, Journal of Neurophysiology (2012), under review.

Categorization — Seger CA and Peterson EJ, *Categorization = Decision Making + Generalization*, Neuroscience and Biobehavioral Reviews (2011), under review.

Memory and categorizaiton — Seger CA, Dennison CM, Lopez-Paniagua DL, Peterson EJ, and Roark AA, *Dissociating Hippocampal and Basal Ganglia Contributions to Category Learning Using Stimulus Novelty and Subjective Judgments*, Neuroimage (2011), 55(4), pp1739-53.

Reinforcement and connectivity — Seger CA, Peterson EJ, Cincotta C, Lopez-Paniagua DL and Anderson C, *Dissociating the Contributions of Independent Corticostriatal Systems to Visual Categorization Learning Through the Use of Reinforcement Learning Modeling and Granger Causality Modeling*, NeuroImage (2010), 50(2) pp644-656.

Visuomotor learning — Peterson EJ and Seger, CA, Reward-level dependent activity proceeding and following response selection: an fMRI study, presented at SFN2009, Chicago, IL, 2009.

Reinforcement learning — Peterson EJ and Seger, CA, *To Do the Right Thing: Temporal Difference Learning As Tool to Dissect the Role of Feedback in the Striatum*, presented at Cognitive Neuroscience Society Meeting (CNS), San Francisco (CA), May 2007.

Glutamate receptor trafficking — Bedoukian MA, Whitesell J, Peterson EJ, Clay C and Partin KM, The *Stargazin C Terminus Encodes an Intrinsic and Transferable Membrane Sorting Signal*, J. Biol. Chem. (2008), 283(3), pp1597-1600.

Biochemistry, Nanotechnology and Surface Science

Enzymology — Johansson HE, Johansson MK, Wong AC, Armstrong ES, Peterson EJ, Grant RE, Roy MA, Reddington MV and Cook RM, *BTI1, an Azoreductase with pH Dependent Substrate Specificity*, Applied Environmental Microbiology (2012), under review.

Surface science — Cheung CL, Rubinstein AI, Peterson EJ, Chatterji A, Sabirianov RF, Mei W, Lin T, Johnson JE and DeYoreo JJ, *Steric and Electrostatic Complementarity in the Assembly of Two-Dimensional Virus Arrays*, Langmuir (2010), 26 (5), pp3498–3505.

Biotechnology — Wong MK, Armstrong ES, Peterson EJ, Grant RE, Cook RM, and Johnanssen HJ, *The BIT1 Azoredustase Colormatric and Fluormetric Reporter System*, presented at Experimental Biology 2009, New Orleans, April 2009.

Biotechnology — Sowers BA, Peterson EJ, Grant RE, Lin WY, Dick DJ and Cook RM, *Optimization of Probe Performance in Real-Time PCR through an Understanding of Synthesis Impurities*, presented at Quantitative PCR, San Diego (CA) March, 2005.

Nanotechnology — Peterson, EJ, Weeks BL, De Yoreo JJ, and Schwartz PV, Effect of *Environmental Conditions on Dip Pen Nanolithography of Mercaptohexadecanoic* Acid, J. Phys. Chem B (2004), 108 (39), pp15206-15210.

Awards

2010 — **Editor's Choice Award, Systems Neuroscience Section**, *NeuroImage*, see Seger *et al* (2010) above.

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2003 — **Undergraduate Summer Research Fellowship**, *Lawrence Livermore National Laboratory*, Livermore CA.

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Other Research Experience

2004–2006 **Research Assistant II, final position**, *Biosearch Technologies*, Novato CA.
Optimized high-throughput HPLC purification, mass spectrographic analysis of oligonucleotides (2004-2005) and, separately, assisted in the development of a novel reporter gene system (2005-2006).

Summer 2003 **Undergraduate Fellowship**, *Lawrence Livermore National Laboratory*, Livermore CA.
Developed techniques to self-assemble virus particles into crystalline arrays then characterized these arrays by Atomic Force Microscopy

Summer 2002 **Internship**, *Biosearch Technologies*, Novato CA.

Computational Skills

Languages Fluent in R and Python, comfortable with Matlab and Perl, with an ever-growing knowledge of Haskell.

Machine learning Working knowledge of machine learning methods as applied to fMRI data analysis, specifically SVMs using PyML and PyMVPA.

Reinforcement learning Wrote an extremely flexible and extensible object-oriented Reinforcement Learning library (python).

In the cloud Increasing experienced with cloud computing in python (on Amazon's EC2 via StarCluster). Much of my current code is or will be soon easily parallelizable using iPython, or as appropriate, dumbo (the pythonic Hadoop interface).

Teaching

Fall 2011, Spring 2012 **Teaching assistantship**, taught two upper-division laboratories – Sense and Perception (PSY 457) and the neuroanatomy section of Cognitive Neuroscience (PSY 459).