

# Jacob M Olson, Ph.D.

Postdoctoral Fellow

Neuroscience Program/Psychology Department

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## **Education**

### **PhD – Cognitive Science**

Awarded June 2017

**Chair:** Douglas A Nitz

**Committee:** Andrea Chiba, Robert Clark, Virginia De Sa, Takaki Komiyama, Jeffrey Krichmar, Eran Mukamel.

**University of California, San Diego**

San Diego, CA

### **MS – Cognitive Science**

Awarded March 2012

**University of California, San Diego**

San Diego, CA, USA

### **BS – Computer Engineering**

Awarded May 2009

**University of Kansas**

Lawrence, KS, USA

## **Research Experience**

### **Postdoctoral Fellow (June 2019-Current)**

Dr. Shantanu Jadhav Laboratory

Investigation of Dynamic Period Phase Precession in Dorsal Subiculum with a novel behavioral apparatus.

**Brandeis University**

Neuroscience Program/Psychology Department

**Waltham, MA, USA**

### **Postdoctoral Fellow (June 2017-May 2019)**

Dr. Kay Tye Laboratory

Investigation of neurotensin in basolateral amygdala as a mechanism for emotional and motivated behavior.

**Massachusetts Institute of Technology**

Picower Institute for Learning and Memory

**Cambridge, MA, USA**

### **Graduate Student (September 2013 – May 2017)**

Dr. Douglas Nitz Laboratory

In-vivo electrophysiology recordings in rats of spatial representations in subiculum and planning activity in the medial precentral cortex.

**University of California, San Diego**

Cognitive Science Department

**La Jolla, CA, USA**

### **Graduate Student (Sept 2009 – June 2012)**

Dr. Angela Yu Laboratory

Perceptual decision making using Bayesian probability theory. Focus on temporal influences and representations in decision-making.

**University of California, San Diego**

Cognitive Science Department

**La Jolla, CA, USA**

## **Research Grants and Fellowships Awarded**

**Fellow on Institutional NRSA T32.** NINDS. 2019-current.

**BRAIN Initiative Fellow:** Ruth L. Kirschstein NRSA F32. NIMH. 2017-2019.

**Kavli Institute for Brain and Mind Innovative Research Grant PI.** UC San Diego. 2015.

## **Publications**

**Olson JM, Li JK, Montgomery SE, Nitz DA.** (2020). Secondary Motor Cortex Transforms Spatial Information into Planned Action during Navigation. *Current Biology*.

**Olson JM, Tongprasearth K, Nitz DA.** (2017) Subiculum neurons map the current axis of travel. *Nature Neuroscience*.

Namburi P, Hitora-Imamura N, **Olson JM**, Beyeler A, Calhoon GG, Choudhury SR, Shi X, Felix-Ortiz AC, King HO, Borio M, Izadmehr E, Silvestre M, Siciliano CA, McCulloch KM, Ressler K, Zhang F, Tye KM. Neurotensin gates valence-specific plasticity underlying associative learning. (In Revisions).

**Olson JM, Tao E, Nitz DA.** Functional analogy in the dorsal subiculum. (In Prep).

**Olson JM, Tongprasearth K, Nitz DA.** Phase precession of axis-tuned neurons in subiculum. (In Prep).

## **Select Awards**

**Graduate Student Association Travel Award.** UC San Diego, 2016.

**Cognitive Science Travel Award.** UC San Diego, 2015 & 2016.

**Excellence in Teaching Award.** Neurobiology of Cognition. Cognitive Science UC San Diego. 2015.

**Summer Graduate Teaching Scholarship.** UC San Diego. 2015.

**Graduate Summer School Scholarship: Probabilistic Models of Cognition.** UCLA. July 2011.

**Graduate Excellence Award,** Cognitive Science, UC San Diego. 2011.

**Central European University Summer School Scholarship - Beliefs and Decisions: of Minds and Machines.** Budapest, Hungary. July 2010.

## **Presentations**

### **Lectures**

**Olson JM.** (December 2019). Spatial Representations in Dorsal Subiculum. *Jadhav Lab Meeting Invited Lecture.* Brandeis University Neuroscience Program, Waltham, MA, USA.

**Olson JM.** (December 2016). Functional Spatial Analogies in Dorsal Subiculum. *Tye Lab Meeting Invited Lecture.* MIT Picower Institute for Learning and Memory, Boston, MA, USA.

**Olson JM.** (September 2016). Unique Features of Spatial Representations in Dorsal Subiculum. *Buzsaki Lab Meeting Invited Lecture.* NYU Neuroscience Institute, New York, NY, USA.

**Olson JM.** (May 2016). Axis and Analogy in the Subiculum. *KIBM Symposium on Innovative Research.* UC San Diego, La Jolla, CA, USA.

**Olson JM.** (April 2016). A Systems Neuroscience Perspective on Spatial Cognition. Invited lecture for *Introduction to Cognitive Science* (Instructor: Steve Barrera). UC San Diego.

**Olson JM.** (March 2016). Systems Neuroscience and Spatial Cognition. Invited lecture for *Introduction to Cognitive Science* (Instructor: Mary Boyle). UC San Diego.

**Olson JM.** (January 2015). Brain Research Techniques. Invited lecture for *Neurobiology of Cognition* (Instructor: Chris Johnson). UC San Diego.

- Olson JM.** (October 2014). Using Generalized Linear Models for Neural Data Modeling. Invited lecture for *Modeling and Data Analysis* (Instructor: He ‘Crane’ Huang). UC San Diego.
- Olson JM.** (June 2013). Spatial Navigation: From Cognitive Map to Action. *Cognitive Science Departmental Research Presentations*. UC San Diego, La Jolla, CA, USA.
- Olson JM.** (September 2012). Introduction to Probability. Invited lecture for *IGERT Graduate Student Orientation* (Prof. Virginia de Sa). UC San Diego.
- Olson JM.** (February 2012). Decision Making: A Principled Investigation from Information Acquisition to Action. *IGERT Mini-Symposium*. UC San Diego, La Jolla, CA, USA.
- Olson JM.** (September 2011). Introduction to Machine Learning. Invited lecture for *IGERT Graduate Student Orientation* (Prof. Virginia de Sa). UC San Diego.
- Olson JM.** (June 2011). Investigating Temporal Integration of Sensory Evidence with a Novel Perceptual Decision-Making Task. *Cognitive Science Departmental Research Presentations*. UC San Diego, La Jolla, CA, USA.

### **Selected Conference Posters - Presenter only**

- Namburi P, Hitora-Imamura N, **Olson JM**, Beyeler A, Calhoon GG, Choudhury SR, Shi X, Felix-Ortiz AC, Yorozu S, de la Fuente V, Lemieux M, Wichmann R, Borio M, Page V, King HO, Izadmehr E, Cum M, Leppla CA, Li KY, McCulloch K, Gray JM, Ressler K, Zhang F, Tye KM. (April 2019). Neurotensin in the basolateral amygdala limits valence-specific plasticity underlying associative learning through outgoing projector populations. *5th Annual Brain Initiative Investigators Meeting*. Bethesda, MD.
- Olson JM**, Namburi P, Hitora-Imamura N, Beyeler A, Calhoon GG, Choudhury SR, Shi X, Felix-Ortiz AC, King HO, Borio M, Izadmehr E, Silvestre M, Siciliano CA, McCulloch K, Ressler K, Zhang F, Tye KM. (November 2018). Neurotensin in the basolateral amygdala gates valence-specific plasticity underlying associative learning. *2018 Neuroscience Meeting Planner*. Society for Neuroscience Annual Meeting. San Diego, CA.
- Olson JM**, Chen K, Tao EL, Tongprasearth K, Nitz DA. (April 2018). Subiculum axis neurons exhibit well-defined phase/space firing fields. *UC Irvine Intl. Conference on Learning and Memory*. Huntington Beach, CA.
- Namburi P, Hitora-Imamura N, **Olson JM**, Beyeler A, Calhoon GG, Choudhury SR, Shi X, Felix-Ortiz AC, Yorozu S, King HO, Borio M, Izadmehr E, Leppla CA, Li KY, McCulloch K, Gray JM, Ressler K, Zhang F, Tye KM. (April 2018). Neurotensin differentially modulates positive and negative associations in upstream basolateral amygdala circuits. *4th Annual Brain Initiative Investigators Meeting*. Bethesda, MD.
- Olson JM**, Tongprasearth K, Tao EL, Wooten A, Lo HC, Nitz DA. (November 2016). Dorsal subiculum encodes functionally analogous path locations. *2016 Neuroscience Meeting Planner*. Society for Neuroscience Annual Meeting. San Diego, CA.
- Tongprasearth K, **Olson JM**, Tao EL, Nitz DA. (November 2016). Phase precession in subicular axis cells modulates with field size within individual neurons. *2016 Neuroscience Meeting Planner*. Society for Neuroscience Annual Meeting. San Diego, CA.
- Olson JM**, Tao EL, Tongprasearth K, Nitz DA. (July 2016). Axis and Analogy in the dorsal subiculum of the navigating rat. *FENS Forum of Neuroscience*, Copenhagen, Denmark.
- Olson JM**, Tao EL, Tongprasearth K, Nitz DA. (June 2016). The Subiculum Maps Current Axis of Travel in the Navigating Rat. *Interdisciplinary Navigation Symposium*, Bad Gastein, Austria.

- Olson JM**, Li JK, Tongprasearth K, Tao EL, Nitz DA. (April 2016). Axis, analogy, and planning in the dorsal subiculum maps path components to environmental space. *International Cognitive Science Conference*. San Diego, CA, USA.
- Olson JM**, Li JK, Tongprasearth K, Tao EL, Nitz DA. (October 2015). Axis, analogy, and planning in the dorsal subiculum maps path components to environmental space. *2015 Neuroscience Meeting Planner*. Society for Neuroscience Annual Meeting. Chicago, IL, USA.
- Olson JM**, Li JK, Nitz DA. (November 2014). Encoding of actions, action planning, and position in the medial precentral cortex. *2014 Neuroscience Meeting Planner*. Society for Neuroscience Annual Meeting. Washington, DC, USA.
- Nitz DA, **Olson JM**, Kappel A, Overoye A, Montgomery S. (May 2014). Medial precentral cortex neurons mediate the transformation of spatial information into action and planning. *Joint Symposium on Neural Computation*. Irvine, CA.
- Nitz DA, **Olson JM**, Kappel A, Overoye A, Montgomery S. (November 2013). Medial precentral cortex neurons mediate the transformation of spatial information into action and planning. *2013 Neuroscience Meeting Planner*. Society for Neuroscience Annual Meeting. San Diego, CA.
- Olson JM**, Yu AJ. (November 2011). Investigating temporal integration of sensory evidence with a novel perceptual decision-making task. *2011 Neuroscience Meeting Planner*. Society for Neuroscience Annual Meeting. Washington, DC, USA.
- Olson JM**, Yu AJ. (July 2011). Investigating temporal integration of sensory evidence with a novel perceptual decision-making task. *UCLA IPAM Summer School*. Los Angeles, CA.

## **Teaching Experience**

### **Instructor**

**UC San Diego**

Modeling and Data Analysis (Fall 2016, Summer 2016, Summer 2015)

### **SGTS Peer Mentor**

**UC San Diego  
Summer 2016**

During the summer session I mentored two graduate students who were instructors-of-record for the first time. In this role, I gave feedback and advice on curriculum planning, student engagement, and presentation style through multiple in-person meetings and classroom observations.

### **Teaching Assistant**

**UC San Diego**

Intro. to Cognitive Science (Instructor: Mary Boyle, 2013; Ben Amsel, 2014; Steve Barrera, 2016)  
 Intro. to Research Methods (Instructor: Federico Rossano, 2016)  
 Neurobiology of Cognition (Instructor: Chris Johnson, 2015)  
 Modeling and Data Analysis (Instructor: He ‘Crane’ Huang, 2014)  
 Systems Neuroscience (Instructor: Doug Nitz, 2014)  
 Intro. to Programming for Cognitive Science (Instructor: Rik Belew, 2011)  
 Neuroanatomy & Physiology (Instructor: Jaime Pineda, 2010)  
 Learning, Memory, and Attention (Instructor: Sarah Creel, 2010, 2011)  
 Language (Instructor: Rafael Núñez, 2010)

## **Professional Outreach**

### **MIT Mentor Advocate Partnership (MAP) (2018-2019)**

The MAP program is a volunteer program designed to complement the current advisor system by helping first-year students to build relationships with staff, faculty, graduate students, and post-docs; to monitor their academic performance and personal well-being; to offer encouragement; and to provide a proactive support network.

### **Science Pen Pal Partnership (2013-2016)**

Participation in a pen pal program that matches students at middle schools with local underrepresented populations in college with graduate students.

### **San Diego Brain Bee (2010-2012)**

The Bee is an international neuroscience competition for high school students with local bees nationwide. The goal of the Bee is to expose students to a subject they might not otherwise get at the high school level and encourage them to think about careers in science. More than 30% of students participating in the San Diego Brain Bee are minority or economically disadvantaged students. My main tasks were to write questions and evaluate results.

### **Professional Service**

**Invited Speaker Postdoc Happy Hour Coordinator.** Brandeis University. Mar. 2020-current.

Prospective Graduate Student Interviewer – Neuroscience Program. Brandeis University 2020.

**Cowriter of the Cognitive Science Department Advising Grant Application.** UC San Diego. 2015.

**Organizer of the “Wa” Speaker Series.** Cognitive Science, UC San Diego. 2010-2011.

**Departmental Graduate Student Representative.** Cognitive Science, UC San Diego. 2010-2011.

### **Professional Memberships**

Society for Neuroscience (2010-present)

Cognitive Science Society (2010-2011)

### **Professional Conferences Attended**

**BRAIN Initiative Investigators Meeting** **Bethesda, MD, USA**

April 11-13, 2019

**Society for Neuroscience Annual Meeting** **San Diego, CA, USA**

November 3-7, 2018

**UC Irvine Intl. Conference on Learning and Memory** **Huntington Beach, CA, USA**

April 18-22, 2018

**BRAIN Initiative Investigators Meeting** **Bethesda, MD, USA**

April 9-11, 2018

**Amygdala Function in Emotion, Cognition and Disease: GRC** **Easton, MA, USA**

August 6-11, 2017

**Society for Neuroscience Annual Meeting** **San Diego, CA, USA**

November 12-16, 2016

**FENS Forum of Neuroscience** **Copenhagen, Denmark**

July 2-6, 2016

**International Navigation Symposium** **Bad Gastein, Austria**

June 26-30, 2016

<b>KIBM Symposium on Innovative Research</b> May 7, 2016	<b>San Diego, CA, USA</b>
<b>Society for Neuroscience Annual Meeting</b> October 17-21, 2015	<b>Washington, DC, USA</b>
<b>KIBM Symposium on Innovative Research</b> May 9, 2015	<b>San Diego, CA, USA</b>
<b>Society for Neuroscience Annual Meeting</b> November 15-19, 2014	<b>Washington, DC, USA</b>
<b>Joint Symposium on Neural Computation</b> May 17, 2014	<b>Irvine, CA, USA</b>
<b>KIBM Symposium on Innovative Research</b> May 10, 2014	<b>San Diego, CA, USA</b>
<b>Society for Neuroscience Annual Meeting</b> November 9-13, 2013	<b>San Diego, CA, USA</b>
<b>Society for Neuroscience Annual Meeting</b> November 11-17, 2011	<b>Washington, DC, USA</b>
<b>Temporal Dynamics of Learning All Hands Meeting</b> January 21-23, 2010	<b>La Jolla, CA, USA</b>
<b>Cognitive Science Society Annual Meeting</b> August 11-14, 2010.	<b>Portland, OR, USA</b>
<b>Society for Neuroscience Annual Meeting</b> November 13-17, 2010.	<b>San Diego, CA, USA</b>

### **Mentoring Experience**

**Graduate student advisor for Undergraduate Honors Project** **2014-2015**

**Mentee:** Jamie K Li.

**Title:** Characterizing the Role of Posterior Parietal Cortex Efferents During Navigation.

**Graduate student advisor for Undergraduate Grant & Award Winners** **2015-2016**

**Mentee:** Kanyanat Tongprasearth

**Award:** 2015 UCSD NEW Scholars Program (Non-traditional Experiential Work)

**Presentation Title:** Neural activity of the subiculum in navigating rats

**Award:** 2016 UCSD NEW Scholars Program (Non-traditional Experiential Work)

**Presentation Title:** Subiculum axis-tuned neurons exhibit theta phase precession

**Award:** Warren College Undergraduate Research Scholarship

**Mentee:** Emily Tao

**Award:** 2016 UCSD Ledell Family Scholarship

**Title:** Encoding of analogous path segments in subiculum and CA1 of hippocampus

**Visiting Masters Student Advisor** **2018**

**Mentee:** Vanessa Page

**Lab Technician Research Advisor** **2018-2019**

**Mentee:** Mackenzie Lemieux

### **Undergraduate Research Advisor**

**2009 - Present**

**Mentees:** Emily Casiello, Chelsea Pattee, Winny Huang, Michelle Widjaja, Rebecca Roseman, Anton Zadorozhny, Garrett Kono, Chase Reuter, Jason O'Connor, Eliene Bao, Jamie Li, Nicholas Woo-VonHoogenstyn, Elias Wagner, Natalie Tongprasearth, Emily Tao, Alex Wooten, Hannah Lo, Lillian Chang, Siyuan Gao, Meghan Cum, Matilde Borio.

### **Additional Awards**

**University Honors Graduate.** University of Kansas. May 2009.

**National Society of Collegiate Scholars member.** 2009.

**Summerfield Scholarship.** University of Kansas. 2005-2009.

**School of Engineering Dean's Scholarship.** Univ. of Kansas School of Engineering. 2005-2009.

**Computer Engineering Departmental Scholarship.** University of Kansas. 2005-2009.

**Dane G. Hansen Honors Scholar.** Dane G. Hansen Foundation. 2005-2006.

### **Additional Training**

#### **Brandeis NSF I-Corps Program**

**Waltham, MA, USA**

Funded by The National Science Foundation (NSF), the I-Corps program prepares scientists to extend their focus beyond the university laboratory, accelerating the economic and societal benefits of basic research. The program provides training, resources and funding for innovative startups and technologies developed by Brandeis students, faculty and staff.

#### **UC San Diego Center for Teaching Development**

**La Jolla, CA, USA**

The College Classroom

January-March, 2015

The College Classroom is a 15-hour, seminar-style course which, following the mission and goals of the Center for the Integration of Research, Teaching and Learning (CIRTL) Network, prepares graduate students and postdocs at the CIRTL Associate\* level for a positive teaching experience as a future faculty member by developing their expertise in evidence-based teaching practices that support student learning. \* see [www.cirtl.net/associate](http://www.cirtl.net/associate)

#### **UCLA Institute for Pure & Applied Mathematics Summer School** **Los Angeles, CA, USA**

Probabilistic Models of Cognition

July 6-16, 2011

Summer school on how machine learning and artificial intelligence concepts and techniques are being applied in cognitive modeling.

#### **CEU Summer University**

**Budapest, Hungary**

Beliefs and Decisions: of Minds and Machines

July 5-9, 2010

Summer school on probability and decision theory as a unifying framework for understanding representation of uncertainty and belief states, learning of internal models, and decision-making in humans and machines.

### **Other Experience**

**Web Developer - Quark Studios****Kansas City, KS, USA**

July 2012 – September 2014

Independent contractor web developer designing and implementing websites using the principles of progressive enhancement and responsive design.

**Research Assistant - University of Kansas****Lawrence, KS, USA**

August 2008 - April 2009 (Stephen Ilardi)

Undergraduate research assistant on psychology study of happiness from an evolutionist perspective. Experience administering study participants, data collection, and analysis.

August 2008 - March 2009 (Erik Perrins)

**Lawrence, KS, USA**

Undergraduate research assistant on efficient hardware implementation of iterative forward error correcting decoders project. MATLAB programming to analyze performance using simulation.

**Technology Research Intern - ICOP Digital, Inc.****Lenexa, KS, USA**

May 2007 - August 2008

Design and implementation of procedures for testing new surveillance technologies.

**Select Skills**

**Animal Behavior (Rat & Mouse)** - Handling and training for track running with varying reward contingencies, freely-moving Pavlovian conditioning paradigms, head-fixed reward and punishment associative learning paradigms, behavioral scoring, novel behavioral task design.

**In Vivo Electrophysiology** - Microdrive construction and design for simultaneous multiple brain region targeting, stereotactic surgery, surgical microdrive implantation, single unit recordings in awake and behaving rats (Plexon SortClient), head-fixed mice (Intan/Open-Ephys), spike sorting (Plexon Offline Sorter).

**Optogenetic Manipulations** – Stereotactic surgery, viral injection, optical fiber and optrode implantations.

**Calcium Imaging** – Multisite Cell body and terminal projection photometry.

**Specific Data Analysis Techniques** - Circular Statistical Analysis and Modeling, Information Analyses, Bayesian Modeling, custom behavioral GUIs, custom software for data processing pipelines.

**Programming Experience** - Matlab, HTML5, CSS, Javascript, PHP, C++, Python.

**Miscellaneous** - Tissue slicing and preparation, Nissl Staining, psychophysical paradigms for human subjects.