

# Christopher Kanan

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**RESEARCH INTERESTS** Building computational models to study task-driven saccadic decision making during visual search, object recognition, and face identification. More generally, I am interested in active vision, machine learning, object recognition, face identification, visual attention, and computational neuroscience.

**EDUCATION** **Ph.D.**, Computer Science, 2013 (expected)  
**University of California, San Diego**, La Jolla, CA  
*Advisor:* Garrison Cottrell  
*Relevant Coursework:* statistical pattern recognition; neural networks; algorithms; computational complexity; object recognition; Bayesian models of perception, probabilistic reasoning and decision making; epipolar geometry; sensation and perception

**M.S.**, Computer Science, 2006  
**University of Southern California**, Los Angeles, CA  
*Advisor:* Michael Arbib  
*Relevant Coursework:* artificial intelligence; machine learning; artificial neural networks; computational neuroscience; robotics; functional MRI

**B.S.**, Double Major: Computer Science and Philosophy, 2004  
**Oklahoma State University**, Stillwater, OK

**AWARDS** TDLC San Diego Fellowship      2010 – 2012  
Eugene Cota-Robles Fellowship      2007 – 2009  
Integrative Graduate Education and Research Traineeship (IGERT)      2007 – 2009  
OSU Continuing Student Scholarship      2003 – 2004  
OSU Regents' Transfer Scholarship      2003 – 2004

**RESEARCH EXPERIENCE** *Graduate Student Researcher*      **University of California, San Diego**  
*Supervisor:* Garrison Cottrell, Ph.D.      2007 – Present  
**Vision Algorithms:** Investigating how humans and primates acquire and process visual information using sequential eye movements. Created a system that uses a model of early visual cortex and simulated eye movements to recognize objects, faces, and flowers in real-world scenes, which improved over the state-of-the-art in computer vision. Developed SUN, a model of visual attention, which is able to accurately predict people's eye movements during goal-directed visual search. Ongoing work is focused on elegantly combining visual attention and object recognition with applications in machine vision and real-time robotic active vision.

*Research Assistant*      **University of Southern California**  
*Supervisor:* Michael Arbib, Ph.D.      2005 – 2007  
**Modeling Visual Receptive Field Formation:** Developed a neural network that uses reinforcement learning, which allowed a simulated monkey to learn when reaching actions with its hand or a tool are executable. The learned visual receptive fields dynamically change based on the length of the end-effector (e.g., its hand or a rake).

*Supervisor:* Mihail Bota, Ph.D.      2005 – 2006  
**Neurohomology Database III:** Assisted in the construction of a system that would enable scientists to quantitatively compare brain region definitions across nomenclatures and species.

Junior Researcher

HRL Laboratories, LLC.

Supervisor: Deepak Khosla, Ph.D.

2005 – 2007

**Vision Algorithms:** Developed neuromorphic algorithms that integrate computational models of attention and object recognition to parse scenes.

**Sensor-Fusion:** Built a dynamic Bayesian network that integrates information from multiple modalities to predict the behavior of adversaries.

## PUBLICATIONS

**Kanan, C. & Cottrell, G. W. (2010).** Robust Classification of Objects, Faces, and Flowers Using Natural Image Statistics. In: *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2010*. [26.4% Accept Rate]

**Kanan, C., Flores, A., & Cottrell, G. (2010).** Color Constancy Algorithms for Object and Face Recognition. *Lecture Notes in Computer Science, 6453 (ISVC 2010)*: 199-210.

**Kanan, C., Tong, M. H., Zhang, L., & Cottrell, G. W. (2009).** SUN: Top-down saliency using natural statistics. *Visual Cognition, 17*:979-1003.

## CONTRIBUTED TALKS

**Kanan, C. (2011).** Active Neuromorphic Image Recognition. *TDLC All Hands Meeting, San Diego, CA, Jan 2011*.

**Kanan, C. (2010).** Image Recognition Using Fixations. *The 2010 Inter-Science of Learning Conference, Boston, MA, May 2010*.

**Kanan, C. (2010).** Recognizing Objects Using Fixations. *Kavli Institute for Brain and Mind Symposium, San Diego, CA, April 2010*.

**Kanan, C. (2009).** SUN: Top-down saliency using natural statistics. *The 2009 Inter-Science of Learning Conference, Seattle, WA, February 2009*.

## POSTERS

**Kanan, C. & Cottrell, G. W. (2010).** Robust Classification of Objects, Faces, and Flowers Using Natural Image Statistics. *Society for Neuroscience (SFN 2010)*.

Cottrell, G. & **Kanan, C. (2010).** Robust Object and Face Recognition Using a Biologically Plausible Model. *Vision Science Society (VSS 2010)*.

**Kanan, C. & Cottrell, G. W. (2009).** Robust Classification of Objects, Faces, and Flowers Using Natural Image Statistics. *NSF Science of Learning Center 2009 PI Meeting*.

Tong, M.H., **Kanan, C.**, Zhang, L., & Cottrell, G. (2009). Task-driven Saliency Using Natural Statistics (SUN). *9th Annual Meeting of the Vision Sciences Society (VSS 2009)*.

Tong, M.H., **Kanan, C.**, Zhang, L., & Cottrell, G.W. (2009). Task-driven Saliency Using Natural Statistics (SUN). *MIT Scene Understanding Symposium*.

Tong, M. H., **Kanan, C.**, Zhang, L., & Cottrell, G. W. (2009). Task-driven saliency using natural statistics (SUN). *Computational and Systems Neuroscience (COSYNE 2009)*.

**Kanan, C.**, Tong, M. H., Zhang, L., Cottrell, G. W. (2008). SUN: Top-down saliency using natural statistics. *NSF Science of Learning Center 2008 PI Meeting*.

## SERVICE

**2009, 2010, and 2011 Inter-Science of Learning Center (iSLC) Conferences** 2008 – Present

Assisted with organizing three NSF sponsored conferences for graduate students and post-docs at the University of Washington, Boston University, and Gallaudet University. Responsibilities included budget management, soliciting and reviewing workshop proposals, and handling logistical issues.

See: <http://nsf-islc.org/>

**Temporal Dynamics of Learning Center (TDLC)**

2008 – Present

Served as Chair on the student training committee, which organizes TDLC student trainee activities and serves as the interface between hundreds of trainees and the TDLC Executive committee.

**California Forum for Diversity in Graduate Education**

2009, 2010

Invited to speak with underrepresented minorities attending California colleges about how to get accepted into and succeed in graduate school.

**Preuss School Internship Supervisor** 2008 – 2009  
Supervised three research projects conducted by students from the Preuss School, a school that prepares low-income students for college.

2008

**Graduate Diversity Outreach**

Spoke with students at California State University Dominguez Hills on how to gain admittance to Ph.D. programs.

**Going for the Goal**

2005 – 2006

Volunteer mentor for English as a second language middle school students in downtown Los Angeles, California.

**University of Southern California Parkside Area Government**

2004 – 2006

Created a student program called “Small World” aimed at breaking cultural stereotypes. “Small World: Afghanistan” was awarded Best Diversity Program of October 2005 in the Pacific region of the National Association of College and University Residence Halls (NACURH).

**Oklahoma State University ACM Vice President**

2003 – 2004

Developed software and problems for programming contests, arranged student outings, promoted ACM, and served as webmaster.

**AD HOC  
REVIEWER**

Visual Cognition; IET Image Processing; IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI); Journal of Machine Learning Research (JMLR)

**SKILLS**

*Programming:* MATLAB, C, C++, C#, JavaScript  
*Mathematics:* probability, statistics, linear algebra, multivariate calculus

**CITIZENSHIP**

United States of America

**MEMBERSHIP**

Institute of Electrical and Electronics Engineers (IEEE)	2010 – Present
Society for Neuroscience (SFN)	2010 – Present
Vision Sciences Society (VSS)	2010 – Present
NSF Temporal Dynamics of Learning Center (TDLC)	2007 – Present
Perceptual Expertise Network (PEN)	2007 – Present