

# Christopher Kanan

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<b>RESEARCH INTERESTS</b>	Computer Vision, Machine Learning, Brain-Inspired Algorithms, Active Vision, Human Eye Movements
<b>EDUCATION</b>	<p><b>Ph.D.</b>, Computer Science, 2013, <b>University of California, San Diego</b>, La Jolla, CA</p> <p><b>M.S.</b>, Computer Science, 2006, <b>University of Southern California</b>, Los Angeles, CA</p> <p><b>B.S.</b>, Philosophy and Computer Science, 2004, <b>Oklahoma State University</b>, Stillwater, OK</p>
<b>POSITIONS HELD</b>	<p><i>Assistant Professor</i>, Chester F. Carlson Center for Imaging Science <b>Rochester Institute of Technology</b>, Rochester, NY 2015 – Present</p> <p><i>Research Technologist</i>, Maritime and Aerial Perception Group <b>NASA's Jet Propulsion Laboratory</b>, Pasadena, CA 2014 – 2015 <b>Projects</b>: Machine perception algorithms for autonomous robots.</p> <p><i>Caltech Postdoctoral Scholar</i> 2013 – 2014 <b>California Institute of Technology / NASA Jet Propulsion Laboratory</b>, Pasadena, CA <b>Projects</b>: Real-time object detection and multi-grained classification for autonomous robots.</p> <p><i>Graduate Student Researcher</i> 2007 – 2013 <b>University of California San Diego</b>, La Jolla, CA <b>Projects</b>: Eye movement analysis; models of active vision; brain-inspired computer vision.</p> <p><i>Research Intern</i>, Brain Inspired Cognitive Architecture Team 2005 – 2007 <b>HRL Laboratories</b>, Malibu, CA <b>Projects</b>: Neuromorphic algorithms for attention and object recognition in scenes; multi-modal sensor fusion.</p>
<b>GRANTS &amp; AWARDS</b>	<p><i>MediSphere</i>. Christye Sisson (PI), <b>Christopher Kanan</b> (Co-PI), Ted Kinsman (Co-PI). DARPA / CIT-PAR Government System Corporation - 005264-003. 6/2/2016 – 6/1/2017, \$305,508.</p> <p><i>Periscope Imagery Ship Classification Project</i>. <b>Christopher Kanan</b> (PI). ONR / CIT Scientific Systems Company, Inc. N66604-13-C-1404/NA. 5/9/2016 – 9/25/2016, \$16,453.</p> <p><i>Perception System for Autonomous Sea Surface Ships</i>. <b>Christopher Kanan</b> (PI). NASA / CIT-Jet Propulsion Laboratory – HE NNN12AA01C/1541689. 12/18/2015 - 12/14/2016, \$64,994.</p> <p><i>Visual Question Answering and the Web</i>. <b>Christopher Kanan</b> (PI). Amazon Web Services Research Award. 03/29/2016 – 02/28/2017, \$15,000 (in kind).</p> <p><i>Object Cueing using Biomimetic Approaches to Visual Information Processing</i>. Andrew Browning (PI), Curtis Padgett (PI), <b>Christopher Kanan</b> (Co-PI). NAVAIR Phase 1 STTR FY2014A – Topic N14A-T008. 09/14/2014 – 04/14/2015, \$80,000.</p> <p><i>Inter-Science of Learning Centers Conference</i>. Garrison Cottrell (PI), <b>Christopher Kanan</b> (Co-PI). NSF SMA 1212288, 03/01/2012 – 02/28/2013, \$115,797.</p>
<b>AWARDS &amp; HONORS</b>	<p><i>RIT College of Science Rising Star Award</i> 2016</p> <p><i>TDLC Junior Investigator Award</i> 2013</p> <p><i>University of California President's Dissertation Year Fellowship</i> 2012 – 2013</p> <p><i>San Diego Diversity Fellowship</i> 2010 – 2012</p> <p><i>NSF Integrative Graduate Education and Research Traineeship</i> 2007 – 2009</p> <p><i>Eugene Cota-Robles Fellowship</i> 2007 – 2009</p> <p><i>Oklahoma State University Continuing Student Scholarship</i> 2002 – 2004</p> <p><i>Oklahoma State University Regents' Scholarship</i> 2002 – 2004</p>

**REFEREED  
PUBLICATIONS**

- Kafle, K., **Kanan, C.** (2016) Answer-Type Prediction for Visual Question Answering. In: *Proc. IEEE Conference on Computer Vision and Pattern Recognition (CVPR-2016)*.
- Yousefhussien, M., Browning, N.A., **Kanan, C.** (2016) Online Tracking using Saliency. In: *Proc. IEEE Winter Applications of Computer Vision Conference (WACV-2016)*.
- Wang, P., Cottrell, G., **Kanan, C.** (2015) Modeling the Object Recognition Pathway: A Deep Hierarchical Model Using Gnostic Fields. In: *Proc. 36th Annual Conference of the Cognitive Science Society (CogSci-2015)*.
- Zhang, M.M., Choi, J., Daniilidis, K., Wolf, M.T., **Kanan, C.** (2015) VAIS: A Dataset for Recognizing Maritime Imagery in the Visible and Infrared Spectrums. In: *Proc of the 11th IEEE Workshop on Perception Beyond the Visible Spectrum (PBVS-2015)*.
- Kanan, C.**, Bseiso, D., Ray, N., Hsiao, J., & Cottrell, G. (2015) Humans Have Idiosyncratic and Task-specific Scanpaths for Judging Faces. *Vision Research*. doi:10.1016/j.visres.2015.01.013
- Kanan, C.** (2014) Fine-Grained Object Recognition with Gnostic Fields. *IEEE Winter Applications of Computer Vision Conference (WACV-2014)*. doi:10.1109/WACV.2014.6836122
- Kanan, C.**, Ray, N., Bseiso, D., Hsiao, J., & Cottrell, G. (2014) Predicting an Observer's Task Using Multi-Fixation Pattern Analysis. *ACM Symposium on Eye Tracking Research and Applications (ETRA-2014)*. doi: 10.1145/2578153.2578208
- Khosla, D., Huber, D.J., & **Kanan, C.** (2014) A Neuromorphic System for Visual Object Recognition. *Biologically Inspired Cognitive Architectures*, 8: 33-45.
- Kanan, C.** (2013) Active Object Recognition with a Space-Variant Retina. *ISRN Machine Vision*, 2013: 138057. doi:10.1155/2013/138057
- Kanan, C.** (2013) Recognizing Sights, Smells, and Sounds With Gnostic Fields. *PLoS ONE*, 8(1): e54088. doi:10.1371/journal.pone.0054088
- Birmingham, E., Meixner, T., Iarocci, G., **Kanan, C.**, Smilek, D., & Tanaka, J. (2012) The Moving Window Technique: A Window into Age-Related Changes in Attention to Facial Expressions of Emotion. *Child Development*, 84: 1407-1424. doi:10.1111/cdev.12039
- Kanan, C.** & Cottrell, G. W. (2012) Color-to-Grayscale: Does the Method Matter in Image Recognition? *PLoS ONE*, 7(1): e29740. doi:10.1371/journal.pone.0029740
- 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)*, pp. 2472-2479. [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.

**PATENTS**

- Khosla, D., **Kanan, C.**, Huber, D., Chelian, S., & Srinivasa, N. (2012) Visual Attention and Object Recognition System. *U.S. Patent No. 8,165,407*. Washington, DC: U.S.

**INVITED  
TALKS**

- Kanan, C.** (2016) Deep Learning: Overview & Applications. *Kodak Alaris*.
- Kanan, C.** (2015) Gnostic Fields for Image Recognition, Active Vision, and Tracking. *Xerox PARC*.
- Kanan, C.** (2014) Gnostic Fields for Object Classification. *NASA Jet Propulsion Laboratory*. [Job Talk]
- Kanan, C.** (2014) Image Recognition and Active Vision in Humans and Machines. *Rochester Institute of Technology*. [Job Talk]

**CONTRIBUTED  
TALKS**

- Kanan, C.** (2012) Recognizing Sights, Smells, and Sounds with Gnostic Fields. *25th Meeting of the Perceptual Expertise Network*, Austin, TX.

- Kanan, C.** (2011) Recognizing Objects, Faces, and Flowers using Fixations. *Vision Sciences Society Annual Meeting (VSS 2011)*, Naples, FL.
- Kanan, C.** (2010) Image Recognition Using Fixations. *The 2010 Inter-Science of Learning Conference*, Boston, MA.
- Kanan, C.** (2010) Recognizing Objects Using Fixations. *Kavli Institute for Brain and Mind Symposium*, San Diego, CA.
- Kanan, C.** (2009) SUN: Top-down saliency using natural statistics. *The 2009 Inter-Science of Learning Conference*, Seattle, WA.

**ABSTRACTS &  
POSTERS  
WITHOUT  
PROCEEDINGS**

- Kanan, C., Bseiso, D., Ray, N., Hsiao, J., & Cottrell, G.** (2014) Predicting an Observer's Task Using Multi-Fixation Pattern Analysis. *21st Joint Symposium on Neural Computation. UC Irvine.*
- Kanan, C.** (2013) Image, Sound, and Odor Classification with Gnostic Fields. *Society for Neuroscience (SFN 2013).*
- Chukoskie, L., **Kanan, C.**, Albrecht, K., Wiles, J., Townsend, J. (2013) Comparing Saccade Sequences in Typical and Autistic Children. *Society for Neuroscience (SFN 2013).*
- Kanan, C.** (2013) Recognizing Sights, Smells, and Sounds With Gnostic Fields. *17th International Conference on Cognitive and Neural Systems (ICONS). Boston University.*
- Kanan, C.** (2013) Recognizing Sights, Smells, and Sounds With Gnostic Fields. *20th Joint Symposium on Neural Computation. Caltech.*
- Kanan, C.** (2013) Recognizing Sights, Smells, and Sounds With Gnostic Fields. *Jacobs Research Expo 2013.* [Semi-Finalist in Best Poster Competition]
- Kanan, C. & Cottrell, G. W.** (2012) A Neural Network Model of the Primate Visuo-Motor System. *Computational and Systems Neuroscience (COSYNE 2012).*
- Chukoskie, L., Miller, M., **Kanan, C.**, Dorai, M., Townsend, J., & Trauner, D. (2012) Did you see that change? A study of dyspraxia, eye movement, and visual perception in autism. *International Meeting for Autism Research (IMFAR-2012).*
- Kanan, C.** (2011). A Training Program in Grantsmanship. *NSF Science of Learning Center 2011 PI Meeting.*
- Kanan, C., Chukoskie, L., & Sejnowski, T.** (2011) Shifting from a Stimulus-driven to a Task-driven Saccadic Policy. *18th Joint Symposium on Neural Computation.*
- Kanan, C. & Cottrell, G. W.** (2011) Robust Classification of Objects, Faces, and Flowers Using Natural Image Statistics. *Jacobs Research Expo 2011.* [Semi-Finalist in Best Poster Competition]
- 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 Sciences Society Annual Meeting (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. *Vision Sciences Society Annual Meeting (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.*

**OTHER  
PUBLICATIONS**

- Kanan, C.** (2012) Turing: Beyond the original concept. *Nature*, 483: 275.

<b>PHD STUDENTS ADVISED</b>	<b>Kushal Kafle</b> , Ph.D. (in progress), Imaging Science, RIT <b>Project:</b> Algorithms for Visual Question Answering	2015-Present
	<b>Mohammed Yousefhussien</b> , Ph.D. (in progress), Imaging Science, RIT <b>Project:</b> Using Deep Learning for Tracking	2015-Present
	<b>Ronald Kemker</b> , Ph.D. (in progress), Imaging Science, RIT <b>Project:</b> Semantic Segmentation of Hyperspectral Imagery using Deep Learning	2015-Present
<b>INTERN PROJECTS SUPERVISED</b>	<b>Maya Rau-Murthy</b> , B.S., Computer Science, CMU <b>Project:</b> Evaluation of tracking algorithms in aerial imagery	2015
	<b>Victor Kwak</b> , B.S., Computer Science, Cal Poly Pomona <b>Project:</b> Smooth Pursuit - Vehicle Tracking in Aerial Video	2015
	<b>Homam Chamas</b> , B.S., Physics, CSU Long Beach <b>Project:</b> Smooth Pursuit - Vehicle Tracking in Aerial Video	2015
	<b>Samuel Munoz</b> , B.S., Computer Engineering, CSU Long Beach <b>Project:</b> Smooth Pursuit - Vehicle Tracking in Aerial Video	2015
	<b>Emelie Oiknine</b> , A.S., Aerospace Engineering, Los Angeles Valley College <b>Project:</b> Smooth Pursuit - Vehicle Tracking in Aerial Video	2015
	<b>Mabel Zhang</b> , Ph.D. (in progress), Computer Science, University of Pennsylvania <b>Project:</b> Multi-Modal Object Recognition: Transfer Learning from RGB to IR Imagery	2014
	<b>Jean Choi</b> , B.S., Electrical Engineering, Gwangju Inst. Sci. Tech (GIST) <b>Project:</b> Multi-Modal Object Recognition: Transfer Learning from RGB to IR Imagery	2014
	<b>Juan Diego Palomino</b> , B.S., Computer Science, Caltech <b>Project:</b> Segmenting Land, Sky, and Sea in Maritime Imagery	2014
	<b>Dina Bseiso</b> , B.S., Cognitive Science, UC San Diego <b>Project:</b> Eye tracking analysis using Multi-Fixation Pattern Analysis	2012 – 2013
	<b>Nicholas Ray</b> , B.S., Kinesiology, San Diego State University <b>Project:</b> Eye tracking analysis using Multi-Fixation Pattern Analysis	2012 – 2013
<b>Felix Schüler</b> , B.S., Cognitive Science, UC San Diego / University of Osnabrück <b>Project:</b> Scene classification using active vision	2012 – 2013	
<b>TEACHING</b>	IMGS 789 @ RIT – <b>Deep Learning for Vision</b>	Fall 2016
	IMGS 682 @ RIT – <b>Image Processing and Computer Vision</b>	Spring 2016
<b>SERVICE &amp; OUTREACH</b>	<b>Organizer of RIT’s Center for Imaging Science Seminar Series</b> Organizer for departmental seminar series featuring prominent researchers from around the world.	2016-Present
	<b>General Chair, Fifth NSF Inter-Science of Learning Center (iSLC) Conference</b> Awarded \$115,797 NSF grant to organize a three day conference for more than 100 graduate students and post-docs from the six NSF-sponsored Science of Learning centers. Conference was hosted at UC San Diego on April 21-23, 2012. See: nsf-islc.org	2012

**Fellow & Trainee Chair, NSF Temporal Dynamics of Learning Center (TDLC)** 2009 – 2012  
Led TDLC's student training committee, organized activities, and served on the TDLC Executive committee. Improved TDLC's \$20,000 Small Grant program. Regularly spoke to NSF program directors.

**California Forum for Diversity in Graduate Education** 2009, 2010, 2011, 2012, 2013  
Invited to speak with underrepresented minorities attending California colleges about how to get accepted into and succeed in graduate school.

**Workshop Chair, NSF Inter-Science of Learning Center (iSLC) Conferences** 2009, 2010, 2011  
Acted as workshop chair for three NSF sponsored conferences for graduate students and post-docs at the University of Washington, Boston University, and Gallaudet University. Responsibilities included grant writing, planning, soliciting and reviewing workshop proposals, and handling logistical issues.

**Preuss School Internship Supervisor** 2008 – 2009  
Supervised and mentored research projects conducted by three students from the Preuss School, a charter school devoted to preparing low-income students for college. All three students went to college, and one of them is now a Ph.D. student at Stanford.

**Graduate Diversity Outreach** 2008  
Spoke at California State University Dominguez Hills on how to gain admittance to Ph.D. programs.

**Going for the Goal** 2005 – 2006  
Mentored English as a second language (ESL) students at Camino Nuevo, a middle school in downtown Los Angeles. Encouraged them to attend college by alleviating their misconceptions and anxieties.

**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).

**OK State University Association for Computing Machinery (ACM) Vice President** 2003 – 2004  
Developed software and problems for programming contests, arranged student outings, promoted ACM, and served as webmaster.

<b>REVIEWER</b>	Cerebral Cortex	Journal of Machine Learning Research (JMLR)
	Journal of Vision (JoV)	IEEE Trans Pat. Analysis Machine Intelligence (TPAMI)
	Neural Information Processing Systems (NIPS)	IET Image Processing
	PLoS ONE	Cognitive Science Society (CogSci)
	Visual Cognition	Journal of Imaging Science and Technology
	Optics and Lasers in Engineering	IEEE Winter Applications of Computer Vision (WACV)
	Physical Review Letters	Eye Tracking Research and Applications (ETRA)
	Biological Cybernetics	AAAI

**COMMITTEES** Program Committee, AAI-2017  
Organizing Committee, Western NY Image and Signal Processing Workshop (WNYISPW-2016)  
Program Committee, 3rd Workshop on EgoCentric Vision at CVPR-2014

**TECHNIQUES** Eye Tracking

**CITIZENSHIP** United States of America

<b>MEMBERSHIP</b>	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 – 2013
	Perceptual Expertise Network (PEN)	2007 – 2013