

## CURRICULUM VITAE

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## BIOGRAPHICAL DATA

### **Education:**

- 1987-1992 B.A. in Special Major (Neuroscience), Minor: Mathematics. Cal. State University Long Beach, Long Beach, CA.
- 1992-1999 Ph.D. Neuroscience, University of Pennsylvania, Philadelphia, PA.  
Dissertation: Local translation detection: Comparison of human and model observers.

### **Professional Appointments:**

- 2008- Associate Professor, Departments of Psychology & Computer Science  
2001-2008 Assistant Professor, Departments of Psychology & Computer Science,  
1998-2001 Post-doctoral associate, Department of Psychology, University of Minnesota.

## SCHOLARSHIP/CREATIVE ACTIVITY

### **Refereed Published Journal Articles** (\* indicates advisee first author)

1. Bavelier, D., Green, C.S., Schrater, P. and Pouget, A. (2011) Brain plasticity through the life span: Learning to learn and action videogames, *Annual Review of Neuroscience*, in press.
2. Ketter, W. Collins, J., Gini, M., Gupta, A., and Schrater, P. (2011) Realtime tactical and strategic sales management for intelligent agents guided by economic regimes. *Information Systems Research*, in press.
3. Fulvio, J., Maloney, L., Schrater, P. (2011) Model selection in the extrapolation of circular motion: Observers use extrapolation models matched to their visual capabilities, *PLOS Computational Biology*, in revision.
4. Doerschner, K., Yilmaz, O., Fleming, R., Schrater, P., Kersten, D. (2011) Visual Motion and the Perception of Surface Material, *Current Biology*, in press.
5. Christopolous\*, V. and Schrater, P. (2011) An optimal feedback control framework for grasping objects with position uncertainty. *Neural Computation*, Vol. 23, No. 10: 2511–2536.
6. Johnson, A., Varberg, Z., Benhardus, J., Maahs, A., and Schrater, P. (2011) The hippocampus and exploration: dynamically evolving behavior and neural representations. *Frontiers in Neuroscience*, in press.
7. Battaglia\*, P., Kersten, D. and Schrater, P. (2011) How size improves depth perception. *PLOS Computational Biology*, 7(6), e1002080.
8. Green\*, C.S., Benson, C., Kersten, D., and Schrater, P. (2010) Alterations in choice behavior by manipulations of world-model. *Proceedings of the National Academy of Sciences*, **107**(37) 16401-16406.

9. Acuna\*, D., and Schrater, P. (2010) Structure Learning in Human Sequential Decision-making. *PLOS Computational Biology* 6(12): e1001003.doi:10.1371/journal.pcbi.1001003
10. Sundareswara\*, R., and Schrater, P. (2010) Bayesian discounting of camera parameter uncertainty for optimal 3D reconstruction from images, *Computer Vision and Image Understanding*, In Press, Corrected Proof, Available online 26 August 2010, ISSN 1077-3142, DOI: 10.1016/j.cviu.2010.07.001.
11. Doerschner, K., Kersten, D., and Schrater, P.R. (2010) Rapid classification of specular and diffuse reflection from image velocities, *Pattern Recognition*, In Press, Corrected Proof, Available online 15 September 2010, ISSN 0031-3203, DOI: 10.1016/j.patcog.2010.09.007.
12. Battaglia\* PW, Di Luca M, Ernst MO, Schrater PR, Machulla T, Kersten DJ (2010). Within- and cross-modal distance information disambiguates visual size-change perception, *PLoS Computational Biology*, In press.
13. V.N. Christopoulos\*, Paul R. Schrater (2009), “Grasping objects with environmentally induced position uncertainty”, *PLoS Comput Biol* 5(10): e1000538. doi:10.1371/journal.pcbi.1000538.
14. Sundareswara\*, R. and Schrater, P. (2008) Perceptual multistability predicted by search model for Bayesian decisions, *Journal of Vision*, <http://www.journalofvision.org/8/5/>
15. Ketter, W., J. Collins, M. Gini, A. Gupta, and P. Schrater (2009), “Detecting and Forecasting Economic Regimes in Automated Exchanges”, *Decision Support Systems*, 47(4):307–318.
16. Battaglia\*, P.W., and Schrater, P. (2007) Humans trade off viewing time and movement duration to minimize visuomotor variability in a fast reaching task. *Journal of Neuroscience*, 27 (26), 6984–6994.
17. Schlicht\*, E., Schrater, P. (2007). Impact of coordinate transformation uncertainty on human sensorimotor control. *Journal of Neurophysiology*, 97, 4203-4214.
18. Schlicht\*, E., Schrater, P. (2007). Reach-to-grasp trajectories adjust for uncertainty in the location of visual targets, *Experimental Brain Research*, 182(1):47-57.
19. Kallie\*, C., Schrater, P., Legge, G. (2007) Variability in stepping direction explains veering behavior of blind walkers. *Journal of Experimental Psychology: Human Perception and Performance* 33(1) 183–200.
20. Veeraraghavan\*, Harini, Schrater, Paul and Papanikolopoulos, Nikos (2006). Robust Target Detection and Tracking through Integration of Motion, Color, and Geometry, *Computer Vision and Image Understanding*, 103(2) 2006, 121-138.
21. Carlson\*, T. A., Schrater, P., & He, S. (2006). Floating square illusion: Perceptual uncoupling of static and dynamic objects in motion. *Journal of Vision*, 6(2), 132-144, <http://journalofvision.org/6/2/4/> , doi:10.1167/6.2.4.
22. Hartung, B., Schrater, P., Kersten, D., Bühlhoff, H., Franz, V.H. (2005) Is prior knowledge of object geometry used in visually guided reaching? *Journal of Vision*, <http://journalofvision.org/5/6/2>.
23. Olman, C. A., Ugurbil, K., Schrater, P., & Kersten, D. (2004). BOLD fMRI and psychophysical measurements of contrast response to broadband images. *Vision Res*, 44(7), 669-683.
24. Murray, S., Schrater, P. and Kersten, D. (2004) Explaining away activity in the human visual cortex. *Neural Networks*, 17, 695-705.
25. Carlson\*, T., Schrater, P., He, S. (2003). Patterns of Activity in the Categorical Representations of Objects, *Journal of Cognitive Neuroscience*. 15(5): 704-717.
26. Murray, Scott, O., Kersten, D., Olshausen, B., Schrater, P., and Woods, D. (2002) Shape perception reduces activity in human primary visual cortex. *Proc. Nat'l Acad. Sci.*, November 12, 2002, vol. 99 u no. 23, pp. 15164–15169.
27. Shekhar, S., Schrater, P.R., Vatsavai, R., Wu, W., and Chawla, S. (2002). Spatial Contextual Classification and Prediction Models for Mining Geospatial Data. *IEEE Transactions on Multimedia and Multimedia Database*, 4(2), 174-188.
28. Schrater, P.R., Knill, D.C., & Simoncelli, E.P. (2001). Perceiving visual expansion without optic flow. *Nature*, April 12, 410, 816-819.
29. Schrater, P. R., & Kersten, D. (2000). How optimal depth cue integration depends on the

- task. *International Journal of Computer Vision*, **40**(1), 71-89.
30. Schrater P R, Knill D C, and Simoncelli E.P. (2000). Mechanisms of visual motion detection. *Nature Neuroscience*, **3**(1), 64-68.
  31. Schrater P R, and Simoncelli E P (1998) Local velocity representation: evidence from motion adaptation., *Vision Research*, **38**, 3899-3912.
  32. Schrater P.R., Russo A.C., Stanton T.L., Newman J.R., Rodriguez L.M., Beckman A.L. (1993) Changes in striatal dopamine metabolism during the development of morphine physical dependence in rats: observations using in vivo microdialysis. *Life Sci.*, **52**, 1535-45.

**Refereed Conference Publications: Acceptance rate  $\leq$  28%**

1. Doerschner, K., Kersten, D., and Schrater, P. (2009), Rapid Classification of surface reflectance from image velocities. The 13th International Conference on Computer Analysis of Images and Patterns, 02/09-04/09, Accepted for publication in the Springer LNCS series.
2. Zang, D., Doerschner, K., Schrater, P. (2009), Rapid inference of object rigidity and reflectance using optic flow. The 13th International Conference on Computer Analysis of Images and Patterns, 02/09-04/09, Accepted for publication in the Springer LNCS series.
3. **Acuña, D.** & Schrater, P. (2009). Improving Bayesian Reinforcement Learning using Transition Abstraction. ICML 2009.
4. Acuña\*, D. and Schrater, P. (2008). Structure Learning in Human Sequential Decision-Making. *NIPS 21*. Cambridge, MA: MIT Press.
5. Christopoulos, V.N., Lilja, D.J., Schrater, P.R., Georgopoulos, A.(2008) "Independent Component Analysis and Evolutionary Algorithms for Building Representative Benchmark Subsets," *IEEE International Symposium on Performance Analysis of Systems and software, 2008. ISPASS 2008*, pp.169-178, 20-22 April 2008. doi:10.1109/ISPASS.2008.4510749
6. Ketter, W., Collins, J., Gini, M., Schrater, P., and Gupta, A. 2007. A predictive empirical model for pricing and resource allocation decisions. In *Proceedings of the Ninth international Conference on Electronic Commerce* (Minneapolis, MN, USA, August 19 - 22, 2007). ICEC '07, vol. 258. ACM, New York, NY, 449-458.
7. Veeraraghavan\*, H., Schrater, P.,R., Papanikolopoulos, N. (2007) Learning Dynamic Event Descriptions in Image Sequences. *IEEE Proceedings on Computer Vision and Pattern Recognition*, Minneapolis, MN, June, 2007, pp. 1-6. doi:10.1109/CVPR.2007.383075
8. Schrater, P. and Sundareswara, R. (2006) "Theory and Dynamics of Perceptual Bistability", In B. Schoelkopf, J. Platt, & T. Hofmann (Eds.), *Advances in Neural Information Processing Systems 19*. Cambridge, MA: MIT Press. pp.1242-1249.
9. Ketter, W., Collins, J., Gini, M., Gupta, A., and Schrater, P. (2005) A Computational Approach to Predicting Economic Regimes in Automated Exchanges," *Fifteenth Annual Workshop on Information Technologies and Systems*, pp. 147-152, Las Vegas, Nevada, USA, December 2005.
10. Steven Jensen\*, Daniel Boley, Maria Gini and Paul Schrater (2005), "Non-stationary Policy Learning in 2-player Zero Sum Games" Non-stationary Policy Learning in 2-player Zero Sum Games. In *Twentieth National Conf. on Artificial Intelligence*, pp. 789-794, 2005.
11. Steven Jensen\*, Daniel Boley, Maria Gini and Paul Schrater (2005), "Rapid on-line temporal sequence prediction by an adaptive agent", In *Proceedings of the Fourth international Joint Conference on Autonomous Agents and Multiagent Systems* (The Netherlands, July 25 - 29, 2005). AAMAS '05. ACM Press, New York, NY, 67-73.
12. Yuille, A., Fang, F., Schrater, P., Kersten, D.(2003). Human and Ideal Observers for Detecting Image Curves. In S. Thrun, L. Saul & B. Schoelkopf (Eds.), *Advances in Neural Information Processing Systems 16*. Cambridge, MA: MIT Press. pp.1459-1466.

**Refereed Conference Publications: Acceptance rate  $>$  28% (or unknown)**

1. Nisheeth Srivastava and Paul R Schrater. A value-relativistic decision theory predicts known biases in human preferences. In Proceedings of the 33rd Annual meeting of the Cognitive Science Society (CogSci 2011)
2. Nisheeth Srivastava, Komal Kapoor and Paul R Schrater. A cognitive basis for theories of intrinsic motivation. In Proceedings of IEEE International Conference on Development and

- Learning and Epigenetic Robotics, 2011.
3. Acuña\*, D. and Schrater, P. (2008). Bayesian modeling of human sequential decision-making on the multi-armed bandit problem. In B. C. Love, K. McRae, & V. M. Sloutsky (Eds.), *Proceedings of the 30th Annual Conference of the Cognitive Science Society* (pp. 2065-2070). Austin, TX: Cognitive Science Society.
  4. Christopoulos\*, V. and Schrater, P. Handling shape and contact uncertainty in grasping planar objects. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS'07)*, Oct. 29-Nov. 2 2007 San Diego, CA, pp. 1557-1563. doi:10.1109/IROS.2007.4399509
  5. Ketter, W., Collins, J., Gini, M., Gupta, A., and Schrater, P. (2007). Pricing and Resource Allocation for Intelligent Trading Agents using Economic Regimes. In *Second International Symposium of Information Systems*, Hyderabad, India, December 2007.
  6. Veeraraghavan\*, H., Schrater, P., Papanikolopoulos, N. (2006) Adaptive Geometric Templates for Feature Matching. *Proceedings 2006 IEEE International Conference on Robotics and Automation 2006 (ICRA-2006)*, May 15-19, 2006. pp. 3393-3398.
  7. Veeraraghavan\*, H., Papanikolopoulos, N., Schrater, P. (2006) Deterministic sampling-based switching kalman filtering for vehicle tracking. *Proceedings 2006 IEEE Conference on Intelligent Transportation Systems* Sept. 17-20, 2006. pp. 1340-1345.
  8. Battaglia\*, P. W., Schrater, P., & Kersten, D. (2005). Auxiliary object knowledge influences visually-guided interception behavior. *ACM International Conference Proceeding Series; Vol. 95. Proceedings of the 2nd symposium on Applied perception in graphics and visualization*, pp. 145 – 152.
  9. Ketter, W., Collins, J., Gini, M., Gupta, A., and Schrater, P. (2005) Identifying and Forecasting Economic Regimes in TAC SCM, TADA-05, IJCAI-05 Workshop on Trading Agent Design and Analysis, pp. 53–60, Edinburgh, Scotland, Aug. 1, 2005.
  10. Bodor, R., Schrater, P., Papanikolopoulos, N. (2005) Multi-Camera Positioning to Optimize Task Observability. *Proceedings, IEEE Conference on Advanced Video and Signal-Based Surveillance 2005*, Sept. 15-16, 552-557.
  11. Bodor, R., Drenner, A., Janssen, M., Schrater, P., and Papanikolopoulos, N. (2005), "Mobile Camera Positioning to Optimize the Observability of Human Activity Recognition Tasks", *2005 IEEE/RSJ International Conference on International Conference on Intelligent Robotics and Systems*, 2-6 Aug. 2005, pp. 1564-1569.
  12. Veeraraghavan\*, H., Schrater, P., Papanikolopoulos, N. (2005) Switching Kalman Filter-Based Approach for Tracking and Event Detection at Traffic Intersections: *Proceedings of the 2005 IEEE International Symposium on Intelligent Control*, pp. 1167-72.
  13. Veeraraghavan\*, H., Atev, S., Bird, N., Schrater, P., Papanikolopoulos, N. (2005). Driver Activity Monitoring through Supervised and Unsupervised Learning. *Proceedings 18th IEEE International Conference on Intelligent Transportation Systems*, Sept. 17-20, 2006, pp. 1340-45.
  14. Sundareswara\*, R., and Schrater, P. R. (2005). Bayesian Modelling of Camera Calibration and Reconstruction. *Fifth International Conference on 3-D Digital Imaging and Modeling, 2005*, pp. 394- 401, Ottawa, Canada June 13 - June 16th 2005.
  15. Eeckhout, L., Sundareswara, R., Yiz, J., Lilja, D.J. and Schrater, P. (2005). Accurate Statistical Approaches for Generating Representative Workload Compositions. *Proceedings of the 2005 IEEE International Workload Characterization Symposium*, pp. 56-66.
  16. Matoba\*, A. and Schrater, P. (2005) An Information-Theoretic Approach to Human Reach Path Analysis, *Computational Neural Systems 2005*, Madison, WI.
  17. Schrater, P.R. (2003). Bayesian data fusion and credit assignment in vision and fMRI data analysis. *Proc. SPIE Electronic Imaging*, 5016, 24-35.
  18. Sundareswara\*, R., and Schrater, P. R. (2003). Extensible Point Location Algorithm. *Proceedings of 2003 International Conference on Geometrical Modeling and Graphics*, pp. 84-89, July 16-18, 2003 London, England.
  19. Schrater, P. R., & Kersten, D. (1999). Statistical structure and task dependence in visual cue integration. *Workshop on Statistical and Computational Theories of Vision -- Modeling, Learning, Computing, and Sampling*. Fort Collins, Colorado, June 1999.

## Posters/Extended abstracts

1. Nisheeth Srivastava and Paul R Schrater. A cognitive principle of least effort explains many cognitive biases. Comparative Decision Making conference, University of Kentucky, 13-15 May 2011.
2. Nisheeth Srivastava and Paul R Schrater. Cognitively efficient need satisfaction: a novel intrinsic reward model explains multiple cognitive biases. 44th Annual Meeting of the Society for Mathematical Psychology, Medford, MA, Jul 15-18, 2011.
3. Srivastava, N., Kapoor, K. and Schrater, P. (2011) A cognitive basis for theories of intrinsic motivation. In Proceedings of IEEE International Conference on Development and Learning and Epigenetic Robotics, 2011
4. Srivastava\*, N and Schrater, P. (2011) A value-relativistic decision theory predicts known biases in human preferences. In Proceedings of the 33rd Annual meeting of the Cognitive Science Society (CogSci 2011)
5. Srivastava\*, N. and Schrater, P. (2011) A predictive model for self-motivated decision-making behavior. Proceedings of BRIMS (2011)
6. Acuña\*, D. and Schrater, P. (2008). Bayesian modeling of human sequential decision-making on the multi-armed bandit problem. In B. C. Love, K. McRae, & V. M. Sloutsky (Eds.), *Proceedings of the 30th Annual Conference of the Cognitive Science Society* (pp. 2065-2070). Austin, TX: Cognitive Science Society.
7. Christopoulos\*, V. and Schrater, P. Handling shape and contact uncertainty in grasping planar objects. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS'07)*, Oct. 29-Nov. 2 2007 San Diego, CA, pp. 1557-1563. doi:10.1109/IROS.2007.4399509
8. Ketter, W., Collins, J., Gini, M., Gupta, A., and Schrater, P. (2007). Pricing and Resource Allocation for Intelligent Trading Agents using Economic Regimes. In *Second International Symposium of Information Systems*, Hyderabad, India, December 2007.
9. Veeraraghavan\*, H., Schrater, P., R., Papanikolopoulos, N. (2006) Adaptive Geometric Templates for Feature Matching. *Proceedings 2006 IEEE International Conference on Robotics and Automation 2006 (ICRA-2006)*, May 15-19, 2006. pp. 3393-3398.
10. Veeraraghavan\*, H., Papanikolopoulos, N., Schrater, P. (2006) Deterministic sampling-based switching kalman filtering for vehicle tracking. *Proceedings 2006 IEEE Conference on Intelligent Transportation Systems* Sept. 17-20, 2006. pp. 1340-1345.
11. Battaglia\*, P. W., Schrater, P., & Kersten, D. (2005). Auxiliary object knowledge influences visually-guided interception behavior. *ACM International Conference Proceeding Series; Vol. 95. Proceedings of the 2nd symposium on Applied perception in graphics and visualization*, pp. 145 – 152.
12. Ketter, W., Collins, J., Gini, M., Gupta, A., and Schrater, P. (2005) Identifying and Forecasting Economic Regimes in *TAC SCM, TADA-05, IJCAI-05 Workshop on Trading Agent Design and Analysis*, pp. 53–60, Edinburgh, Scotland, Aug. 1, 2005.
13. Bodor, R., Schrater, P., Papanikolopoulos, N. (2005) Multi-Camera Positioning to Optimize Task Observability. *Proceedings, IEEE Conference on Advanced Video and Signal-Based Surveillance 2005*, Sept. 15-16, 552-557.
14. Bodor, R., Drenner, A., Janssen, M., Schrater, P., and Papanikolopoulos, N. (2005), "Mobile Camera Positioning to Optimize the Observability of Human Activity Recognition Tasks", *2005 IEEE/RSJ International Conference on International Conference on Intelligent Robotics and Systems*, 2-6 Aug. 2005, pp. 1564-1569.
15. Veeraraghavan\*, H., Schrater, P., R., Papanikolopoulos, N. (2005) Switching Kalman Filter-Based Approach for Tracking and Event Detection at Traffic Intersections: *Proceedings of the 2005 IEEE International Symposium on Intelligent Control*, pp. 1167-72.
16. Veeraraghavan\*, H., Atev, S., Bird, N., Schrater, P, Papanikolopoulos, N. (2005). Driver Activity Monitoring through Supervised and Unsupervised Learning. *Proceedings 18th IEEE International Conference on Intelligent Transportation Systems*, Sept. 17-20, 2006, pp. 1340-45.
17. Sundareswara\*, R., and Schrater, P. R. (2005). Bayesian Modelling of Camera Calibration and Reconstruction. *Fifth International Conference on 3-D Digital Imaging and Modeling*,

- 2005, pp. 394- 401, Ottawa, Canada June 13 - June 16th 2005.
18. Eeckhout, L., Sundareswara, R., Yiz, J., Lilja, D.J. and Schrater, P. (2005). Accurate Statistical Approaches for Generating Representative Workload Compositions. *Proceedings of the 2005 IEEE International Workload Characterization Symposium*, pp. 56-66.
  19. Matoba\*, A. and Schrater, P. (2005) An Information-Theoretic Approach to Human Reach Path Analysis, *Computational Neural Systems 2005*, Madison, WI.
  20. Schrater, P.R. (2003). Bayesian data fusion and credit assignment in vision and fMRI data analysis. *Proc. SPIE Electronic Imaging*, 5016, 24-35.
  21. Sundareswara\*, R., and Schrater, P. R. (2003). Extensible Point Location Algorithm. *Proceedings of 2003 International Conference on Geometrical Modeling and Graphics*, pp. 84-89, July 16-18, 2003 London, England.
  22. Schrater, P. R., & Kersten, D. (1999). Statistical structure and task dependence in visual cue integration. *Workshop on Statistical and Computational Theories of Vision -- Modeling, Learning, Computing, and Sampling*. Fort Collins, Colorado, June 1999.

### **Book Chapters**

- Battaglia, P., Kersten, D., Schrater, P. (2009). The role of generative knowledge in object perception. In: *Sensory Cue Integration*. New York, NY : Oxford University Press, to appear.
- W. Ketter, J. Collins, M. Gini, A. Gupta, and P. Schrater, Strategic Sales Management Guided By Economic Regimes. In Eric van Heck et al., editors, *Edited Volume of the 2nd Small Business Network Initiative Discovery Event*, Springer Verlag, 2007.
- W. Ketter, J. Collins, M. Gini, A. Gupta, and P. Schrater, "Identifying and Forecasting Economic Regimes in TAC SCM". In Han La Poutré, Norman Sadeh, and Sverker Janson, editors, *AMEC and TADA 2005, LNAI 3937*, pp. 113–125, Springer Verlag Berlin Heidelberg, 2006.
- Schrater P.R. & Kersten, D. (2001) Vision, Psychophysics, and Bayes. In: R. Rao, B. Olshausen, & M. Lewicki (Ed.), *Statistical Theories of the Brain*. MIT press.
- Kersten, D. & Schrater, P. R. (2001). Pattern Inference Theory: A Probabilistic Approach to Vision. In R. Mausfeld, & D. Heyer (Ed.), *Perception and the Physical World*. Chichester: John Wiley & Sons, Ltd.

### **Tech Reports**

- Wolfgang Ketter, John Collins, Maria Gini, Alok Gupta, and Paul Schrater. Detecting and Forecasting Economic Regimes in Automated Exchanges. Technical Report 07-008, University of Minnesota, Dept of Computer Science and Engineering, 2007.
- Vassilios N. Christopoulos and Paul R. Schrater (2006) Effects of Shape and Contact Location Uncertainty on Grasp Quality. *Department of Computer Science, University of Minnesota, Tech Report 06-019*.
- Paul R. Schrater, Erik J. Schlicht (2006) Internal models for object manipulation: Determining optimal contact locations. *Department of Computer Science, University of Minnesota, Tech Report 06-003*.
- Robert Bodor, Paul R. Schrater, Nikos Papanikolopoulos (2005) Multi-Camera Positioning to Optimize Task Observability *Department of Computer Science, University of Minnesota, Tech Report 05-009*
- Robert Bodor, Andrew Drenner, Michael Janssen, Paul R. Schrater, Nikos Papanikolopoulos (2005) Mobile Camera Positioning to Optimize the Observability of Human Activity Recognition Tasks *Department of Computer Science, University of Minnesota, Tech Report 05-005*
- Steven Jensen, Daniel Boley, Maria Gini, Paul R. Schrater (2004) Temporal Sequence Prediction Using an Actively Pruned Hypothesis Space. *Department of Computer Science, University of Minnesota, Tech Report 04-015*
- Shashi Shekhar, Paul R. Schrater, Ranga R. Vatsavai, Wei Li Wu, Sanjay Chawla (2002) Spatial Contextual Classification and Prediction Models for Mining Geospatial Data *Department of Computer Science, University of Minnesota, Tech Report 02-008*

**Refereed Scholarly Conference Presentations- NOT Generating Papers** (\* indicates advisee first

author)

1. Green, C.S., Fulvio, J.M., Siegel, M., Kersten, D., & Schrater, P. (2011). Action selection requires predicting future uncertainty. VSS, Naples, FL.
2. Fulvio, J.M., Green, C.S., & Schrater, P. (2011). Optimality predicts transition to specificity in perceptual learning. VSS, Naples, FL.
3. Battaglia, P., Kersten, D. & Schrater, P. (2011). How size improves depth perception, CoSyNe, Salt Lake City, UT.
4. Schrater, P. & Rothkopf, C. (2011). Coupling perception and action using probabilistic control. CoSyNe, Salt Lake City, UT.
5. Schrater, P., Rothkopf, C., Kallie, C. & (2011). Learning cue integration via control: I perceive because I control. CoSyNe, Salt Lake City, UT.
6. Green, C.S., Kersten, D., & Schrater, P. (2011). Model-based decision making in human observers. CoSyNe, Salt Lake City, UT.
7. Fulvio, J.M., Green, C.S., & Schrater, P. (2011). Control limits model learning. CoSyNe, Salt Lake City, UT.
8. Srivastava, N. & Schrater, P. (2011) Your choice models are wrong: a novel definition of rationality explains cognitive biases. CoSyNe, Salt Lake City, UT.
9. Powell, N, & Schrater, P (2010) Learning internal models for motion extrapolation, Society for Neuroscience, 2010 .
10. Schrater, P. and Churchland, A. (2010). Cue combination in time: subjects make improved judgments about a time-varying stimulus when it is presented synchronously in two modalities, Society for Neuroscience, 2010.
11. Christopoulos, V. and Schrater, P. ( 2010) Learning reward functions in grasping objects with position uncertainty via inverse reinforcement learning, Vision Sciences Society Annual Meeting, Naples FL, May 7<sup>th</sup>-12<sup>th</sup>, 2010.
12. Fulvio, J., Green, S. and Schrater, P. (2010) Promoting generalization by hindering policy learning, Vision Sciences Society Annual Meeting, Naples FL, May 7<sup>th</sup>-12<sup>th</sup>, 2010.
13. Schrater, P. and Powell, N. (2010). Learning internal models for motion extrapolation. Vision Sciences Society Annual Meeting, Naples FL, May 7<sup>th</sup>-12<sup>th</sup>, 2010.
14. Green, S., Kersten, D. and Schrater, P. (2010) Transfer in perceptual learning as extrapolation. Vision Sciences Society Annual Meeting, Naples FL, May 7<sup>th</sup>-12<sup>th</sup>, 2010.
15. Schrater, P. and Rothkopf, C. (2010) "Discounting as task termination, and its implications", Computational and Systems Neuroscience 2010 (COSYNE), Feb. 25-Mar. 2nd 2010.
16. Fulvio, J.M., Schrater, P., (2010) "Predicting the task specificity of learning" Computational and Systems Neuroscience 2010 (COSYNE), Feb. 25-Mar. 2nd 2010.
17. Johnson, A., Varberg, Z, and Schrater, P. (2010) "Hippocampal learning and cognitive maps as products of hierarchical latent variable models", Computational and Systems Neuroscience 2010 (COSYNE), Feb. 25-Mar. 2nd 2010.
18. Acuna, D., Green, S. and Schrater, P. (2010) "The rational control of aspiration in learning", Computational and Systems Neuroscience 2010 (COSYNE), Feb. 25-Mar. 2nd 2010.
19. Schrater, P., Green, C.S., Benson,C., and Kersten, D. (2009) Causal model attribution in sequential decision making. *Computational and Systems Neuroscience 2009 (COSYNE)*, Feb. 27-Mar. 2nd 2009.
20. Acuna, D., and Schrater, P. (2009) Structure learning in human sequential decision-making. *Computational and Systems Neuroscience 2009 (COSYNE)*, Feb. 27-Mar. 2nd 2009.
21. Schrater, P. and Acuna, D. (2009) Structure Learning in sequential decision making. *Vision Sciences Society Annual meeting, May 2009.*
22. Benson,C., Green, C.S., and Kersten, D., Schrater, P. (2009) The effect of reward structure on sequential decision-making. *Vision Sciences Society Annual meeting, May 2009.*
23. Fulvio, J.M., Schrater, P., Maloney, L. (2009) Reduced sampling of dynamic trajectories does not increase extrapolation bias. *Vision Sciences Society Annual meeting, May 2009.*
24. Doerschner\*, K., Zang, D., Kersten, D., and Schrater, P. (2009) Cooperative computation of shape and material from motion. *Vision Sciences Society Annual meeting, May 2009.*
25. Kalia\*, A., Schrater, P., Legge, G. (2009) Comparing the Reliability of Vision and Walking for Target Localization in a Hallway. *Vision Sciences Society Annual meeting, May 2009.*
26. Battaglia\*, P., Schrater, P. (2008) Robust Bayesian framework for modeling psychophysical tasks. Poster presented at Computational and Systems Neuroscience 2008 (COSYNE), Feb.

- 28-Mar. 1st 2008.
27. Schrater, P., Battaglia\*, P. (2008) Characterizing reach strategies in ambiguous tasks. Poster presented at Computational and Systems Neuroscience 2008 (COSYNE), Feb. 28-Mar. 1st 2008.
  28. Doerschner, K., Schrater, P., and Kersten, D. (2008) Analysis of shape-dependent specular motion - predicting shiny and matte appearance. Poster presented at Vision Sciences Society Annual meeting, May 2008.
  29. Kalia\*, A., Schrater, P., Legge, G., and Kallie C. (2008) Estimating Absolute Distances with Blurred Vision. Poster presented at Vision Sciences Society Annual meeting, May 2008.
  30. Christopoulos\*, V. & Schrater, P. (2008) Identifying strategies for grasping objects with position uncertainty using empirical cost-to-go functions. Poster presented at Vision Sciences Society Annual meeting, May 2008.
  31. Battaglia\*, P., Schrater, P. (2008) Humans use stereo and haptic distance cues to improve physical object size estimates. Talk delivered at Vision Sciences Society Annual meeting, May 2008.
  32. Christopoulos\*, V. & Schrater, P. (2007) Human grasping to 3D objects with position uncertainty. Poster presented at Society of Neuroscience Annual Meeting, Nov. 2007.
  33. Battaglia\*, P., Schrater, P., & Kersten, D. (2007) Humans control reach timing to balance sensory and motor uncertainty and maximize reach accuracy. Talk delivered at *Vision Sciences Society Annual meeting, May 2007*.
  34. Sundareswara\*, R., & Schrater, PR (2007). A perceptual inference model for bistability. Poster presented at *Vision Sciences Society Annual meeting, May 2007*.
  35. Johnson, A., Schrater, P., Redish, D. (2007) Application of multiple generative models for identifying and decoding spatial memory in the hippocampus. *Computational and Systems Neuroscience (COSYNE 2007)*, Feb. 2007. Talk
  36. Sundareswara\*, R., Kallie, CS, & Schrater, PR (2006). Perceptual bistability modulated by priming [Abstract]. *Journal of Vision*, 6(6), 53a, Poster presented at *VSS 2006*.
  37. Schrater, P., Battaglia, P., Flister, E. Motor control in tasks with solution ambiguity. Talk delivered at *ESF-EMBO Symposium on 3D Sensory and Motor Space*, Sant Feliu de Guixols, Spain, October 2005.
  38. Schrater, P., Sodomka, E., and Sloane, C. Decision-making with monetary value uncertainty. Poster presented at *2005 Society for Judgment and Decision Making, Toronto, CA*.
  39. Amiri, H. and Schrater, P. Effects of Disparity and Optic Flow Noise on Cue Combination for Motion-in-Depth. Poster presented at *VisionSciences 2005*.
  40. Battaglia\*, P., Schrater, P., Kersten, D. A Bayesian theory of intercepting moving objects in 3D. Poster presented at *VisionSciences 2005*.
  41. Schlicht\*, E. and Schrater, P. Optimal data fusion in the presence of sensorimotor transformation noise. Talk delivered at *VisionSciences 2005*.
  42. Sundareswara\*, R. and Schrater, P. (2004) Workspace Calibration via Perceptual Judgments. Poster presented at *1<sup>st</sup> Symposium on Applied Perception in Graphics and Visualization, ACM SIGGRAPH 2004*.
  43. Schlicht\*, E.J, Schrater, P. Planning for uncertainty—Bayesian model for human reach and grasp. Poster presented at *COSYNE 2004*.
  44. Schrater\*, P.R., Flister, E.D. (2004) Selecting contact points for reaching. Talk delivered at *VSS 2004, Sarasota FL*.
  45. Schlicht\*, E.J, Schrater, P., Sloane, C. (2004) Statistical decision theory for everyday tasks: A natural cost function for human reach and grasp. Talk delivered at *VSS 2004, Sarasota FL*.
  46. Amiri\*, H., & Schrater, P. (2004) Visual cue integration of motion-in-depth cues. Poster presented at *VSS 2004, Sarasota FL*.
  47. Sloane\*, C., Schlicht, E., and Schrater, P. (2004) Reach planning and accuracy depend on task difficulty. Poster presented at *VSS 2004, Sarasota FL*.
  48. Sundareswara\*, R. and Schrater, P. (2004) Simple Workspace Calibration via Perceptual Judgments. Poster presented at *VSS 2004, Sarasota FL*.
  49. Yuille, A., Fang, F., Schrater, P., Kersten, D.(2003). Human and Ideal Observers for Detecting Image Curves. Poster presented at *advances in Neural Information Processing Systems 2003*.
  50. Schlicht\*, E, Schrater, P.R. (2003) Bayesian model for reaching and grasping peripheral and occluded targets. Poster presented at *3rd annual meeting of Vision Sciences Society (VSS)*,

Sarasota FL.

51. Carlson\*, Schrater, He (2003). Second order motion is not second-class: A new illusion in Motion Perception. Poster presented at 3rd annual meeting of Vision Sciences Society (VSS), Sarasota FL.
52. Carlson\*, T. Schrater, P., and He, S. (2002). Class specific representations of objects, faces, and places in the human brain, Poster presented at second annual meeting of Vision Sciences Society (VSS), Sarasota FL.
53. Kallie\*, C., Schrater, P., Legge, G. (2002). Walking a straight line without vision. Poster presented at second annual meeting of Vision Sciences Society (VSS), Sarasota FL.
54. Olman, S., Schrater, P., Kersten, D. (2002) BOLD fMRI response to natural images. Poster presented at second annual meeting of Vision Sciences Society (VSS), Sarasota FL.
55. Kersten, D, and Schrater, P.R. (2001). The tuning of vision to natural contours: Straighter is better. Talk delivered at first annual meeting of Vision Sciences Society (VSS), Sarasota FL.
56. Carlson\*, T., Schrater, P., and He, S. (2001). Functional imaging of visually expanding motion stimuli: Toward a functional anatomy of visual motion processing. Poster presented at first annual meeting of Vision Sciences Society (VSS), Sarasota FL.
57. Punzel, S, Yonas, A., and Schrater, P.R. (2001) Grouping and Detection of Global Apparent Motion. Poster presented at first annual meeting of Vision Sciences Society (VSS), Sarasota FL.
58. Schlicht\*, E, Schrater, PS, Kersten, D and Legge, G. How well you reach depends on where you look. Poster presented at first annual meeting of Vision Sciences Society (VSS), Sarasota FL.
59. Schrater, P.R. (2001). Seeing what we touch: Recalibrating the use of visual information through haptic feedback. Talk at first annual meeting of Vision Sciences Society (VSS), Sarasota FL.
60. Hartung, B., Schrater, P., and Kersten, D. (2000). Visuo-motor and perceptual estimates of depth in concave human faces. Poster presented at the Annual Meeting of the Association of Research in Vision and Ophthalmology (ARVO). Ft. Lauderdale, Florida.
61. Schrater, P. and Kersten, D. (1999). Perceptual bistability and adaptive computational models. Talk at Neural Information Processing Systems 1999 workshop: Adaptive Computational Models and Short Time Perceptual Learning.
62. Schrater, P.R. and Kersten, D. (1999). Statistical structure and task dependence in visual cue integration. Talk at: Workshop on Statistical and Computational Theories of Vision -- Modeling, Learning, Computing, and Sampling. Fort Collins, Colorado.
63. Kersten, D., Shen, L., Ugurbil, K. & Schrater, P.R. (1999) fMRI study of perceptual grouping of a bistable target. Poster presented at the Annual Meeting of the Association of Research in Vision and Ophthalmology (ARVO). Ft. Lauderdale, Florida.
64. Schrater, P.R. (1998). Evidence for local velocity detectors: Additive and selective pooling of spatio-temporal frequencies consistent with local translations. Talk presented ARVO. Ft. Lauderdale, Florida.
65. Schrater P R, Knill D C, and Simoncelli E P (1997) Can the visual system measure expansion rates without using optic flow? Talk delivered at the European Conference on Vision and Perception, Helsinki, Finland.
66. Schrater P R, Knill D C, and Simoncelli E P (1997) Local translation detection: Evidence for velocity-tuned pooling of spatio-temporal frequencies. Talk presented ARVO. Ft. Lauderdale, Florida.
67. Schrater P R, and Simoncelli E P (1995). Biases in speed perception due to a motion after effect. Poster presented at the Annual Meeting of the Association of Research in Vision and Ophthalmology. Ft. Lauderdale, Florida.
68. Farid H, Simoncelli E P, Bravo M, and Schrater P (1995). Effect of contrast and period on perceived coherence of moving square wave plaids. Poster presented ARVO. Ft. Lauderdale, Florida.
69. Schrater P, and Simoncelli E P (1994). Motion adaptation effects suggest an explicit representation of velocity. Poster presented ARVO. Sarasota, Florida.

## ***Grants and Awards***

### ***Currently Funded***

1. ONR SBIR Phase I Contract N00014-11-M-0038, “Biologically Inspired Scene Estimation (BIS-E)”. \$ 30,000 direct costs. Principal Investigator on Subcontract, Paul Schrater, Jan 2011 – July 2011.
2. NSF National Science Foundation. “Human Spatial Guidance Principles in Robust Interactive Vehicle Tele-operation and Autonomy”. \$750,000 direct costs. Bernard Mettler, Principal Investigator, Paul Schrater, co-Principal Investigator. Sept. 2010 – Aug 2013.
3. Office of Naval Research, MURI. “Complex Learning and Skill Transfer with Video Games” (ONR MURI N 00014-07-1-0937), Dan Kersten, Principal Investigator, Paul Schrater, co-Investigator. \$731,453 total direct costs. June 2007 – Sept 2012.
4. NIH grant "Object Perception: Mechanisms for the Resolution of Ambiguity", R01 EY015261-05A1. Principal Investigator, Paul Schrater. \$553,208 total direct costs. 9/30/2009-6/30/2012.

### ***Completed***

5. National Institute of Health, Phase II SBIR. “Indoor Magnetic Wayfinding for the Visually Impaired” (2R44EY015616-03). Paul Schrater, subcontract Principal Investigator, \$81,888 total direct costs. July 2007- June 2009.
6. National Institute Health (NIH EY02857). “Object Perception Mechanisms for Resolving Ambiguity”. Total direct costs \$981,317. Daniel Kersten, Principal Investigator, Paul Schrater co-Investigator. February 2004-January 2009.
7. Digital Technology Initiative Program, Digital Technology Center, University of Minnesota. “A System for Presenting Digitally Altered Reality”. \$42,000 total direct costs. Stephen Engel, Principal Investigator. Paul Schrater, co-Investigator. May, 2008-April 2009.
8. Grant-in-Aid of Research, Artistry and Scholarship, University of Minnesota. “An Automatically Adjustable Auditory Display” \$23,837 total direct costs. Paul Schrater, Principal Investigator. June 2006 – January 2008.
9. Office of Naval Research. “Learning to see camouflaged objects”. \$149,984.00 total direct costs. Daniel Kersten, Principal Investigator, Paul Schrater co-Investigator. December 2004-November 2007.
10. National Science Foundation, ITR: “Monitoring Human Activities”. Total Direct Costs \$409,165. Principal Investigator, Nikos Papanikolopoulos, Interim Principal Investigator, Paul Schrater. August 2002- July 2005.
11. Center for Transportation Studies, “Finding what the driver does”. \$46,299 total direct costs, Nikos Papanikolopoulos, Interim Principal Investigator, Paul Schrater. January 2004-December 2004.
12. Minnesota Department of Transportation, “Development of a Tracking-based Monitoring and Data Collection system”, \$90,000, Total Direct Costs. Nikos Papanikolopoulos, Interim Principal Investigator, Paul Schrater. March 2003- February 2005.
13. Faculty Summer Research Fellowship, University of Minnesota. \$5000, total direct costs. July 2004-August 2004.
14. Grant-in-Aid of Research, Artistry and Scholarship, University of Minnesota., \$21,412.86 total direct costs. Paul Schrater, Principal Investigator. June 2002-May 2004.

### ***Submitted-Waiting decision-Resubmitted***

- National Science Foundation. “Uncertainty and Information Value in Perception/Action Coupling”. \$718,584 total direct costs requested. Paul Schrater Principal Investigator. Feb

2009 – January 2014. To be resubmitted June, 2009.

- National Institute of Health. “Object Perception: Mechanisms for Resolving Ambiguity”, Paul Schrater Principal Investigator (multi-investigator). \$1.25 Million total direct costs requested. April 2009 – March 2014. Resubmitted Feb, 2009.
- Army Research Office. “Extracting and Annotating Interesting Events from Video-Sequences”. Nikos Papanikolopoulos Principal Investigator, Paul Schrater co-Investigator. Submission September, 2008.

### ***Recent Invited Talks***

1. Rational basis for curiosity, UCLA, Nov 10<sup>th</sup>, 2011.
2. Rational basis for curiosity, Caltech, Nov 8<sup>th</sup>, 2011.
3. Only learn what you need, Baylor College of Medicine, Sept 9<sup>th</sup>, 2011
4. Hierarchical Bayesian Reinforcement Learning as a model for Human Learning, MIT, Sept 5<sup>th</sup>, 2011
5. Prediction, extrapolation and scheduling time to gather information in object motion, York University, Toronto, Canada, Dec 15<sup>th</sup>, 2010.
6. Prediction, extrapolation and scheduling time to gather information in object motion, University of California, Santa Barbara, Oct. 1<sup>st</sup>, 2010.
7. Rational approach to aspiration in learning, Umea University, Sweden, May 25<sup>th</sup>, 2010
8. Prediction as the incentive for model learning, Cambridge University, England, May 21<sup>h</sup>, 2010
9. Rational approach to aspiration in learning, Cambridge University, England, May 21<sup>h</sup>, 2010
10. Rational approach to aspiration in learning, Gatsby Center for Computational Neuroscience, University College London, England, May 17<sup>h</sup>, 2010
11. Prediction, extrapolation and scheduling time for information gathering, Invited colloquium, Department of Psychology Rutgers – New Brunswick campus.
12. Planning for uncertainty in action tasks - exploration and compensation, Invited speaker Workshop on Natural Environments Tasks and Intelligence, University of Texas, April 9<sup>th</sup>.
13. “Suboptimal decision-making as optimal learning”, COSYNE 2010 Workshop: Has Optimality Reached a Dead End? Snowbird, Utah. March 1st, 2010.
14. “Modeling conscious perception as sampling based max-product belief propagation”, COSYNE 2010 Workshop: The sampling hypothesis: relating neural variability to perception and learning. Snowbird, Utah. March 2nd, 2010.
15. “Modeling conscious perception as sampling based max-product belief propagation”, NIPS 2009 Workshop: Bounded-rational analyses of human cognition: Bayesian models, approximate inference, and the brain. Whistler, BC, Canada. Dec 12, 2009.
16. “Aspiration Learning”, MURI meeting, Washington DC, Nov. 9th, 2009.
17. “Preferences”, Workshop "Physio-Economics", Erasmus Research Institute of Management, (ERIM), Rotterdam, Netherlands, September 24th 2009
18. “Towards achieving optimal decisions using human preference modeling”, Erasmus Research Institute of Management, (ERIM), Rotterdam, Netherlands, June 23<sup>th</sup>, 2009.
19. “Structure learning in human decision making”, Frankfurt Institute for Advanced Studies, Goethe University, Frankfurt Germany June 18<sup>th</sup>, 2009.

20. "Structure learning in sequential decision problems", University of Rochester, April 15th, 2009.
21. "Scheduling information gathering and planning for uncertainty", Max Planck Institute for Biological Cybernetics, Tuebingen Germany, August 19<sup>th</sup>, 2008.
22. "Tutorial on Bayesian Reinforcement Learning", Vision Sciences Society, May 9th, 2008.
23. "Computational modeling of human perception", University of Maryland, March 25th, 2008.
24. "Scheduling information gathering and planning for uncertainty", USC, April 7<sup>th</sup>, 2008.
25. "Perceptual multistability predicted by search model for Bayesian decisions", Harvard University, Feb. 19<sup>th</sup>, 2008.
26. "Exploration and exploitation in visuo-motor control", University of Rochester, Jan, 2008.
27. "Scheduling information gathering and planning for uncertainty", University of Minnesota, Center for Cognitive Sciences held the 2007 Summer Institute: Visual Perception and Cognition Conference, July, 2007.
28. "Goal-driven perception". Rehabilitation Institute of Chicago, Northwestern University, June 2007.
29. "Uncertainty and contact selection in grasping", "Workshop on "Bridging the gap between sensation and motor control: from computation to behavior", Castle of Rauschholzhausen, Germany, July 13 to 16, 2006.
30. "Natural cost functions for contact point selection in grasping", Symposia: UCLA's IPAM -Probabilistic Models of Cognition: The Mathematics of Mind January 24 - 28, 2005.

## *TEACHING*

### Regular Courses Taught:

- |                       |   |   |
|-----------------------|---|---|
| 1. CSCI 5512          | <b>Artificial Intelligence II</b> (UNITE course)  | Fall, 2010  |
| 2. CSCI 5521          | <b>Pattern Recognition</b> (UNITE course)   | Fall, 2003, 2005, 2007, 2009  |
| 3. CSCI 5561          | <b>Computer Vision</b> (UNITE course)   | Spring, 2003, 2005, 2007, 2009  |
| 4. PSY 5018H          | <b>Mathematical Models of Human Behavior</b>  | Spring, 2004,05,06,07,08,10,11  |
| 5. PSY 5960           | <b>Introduction to Computational Psychology</b>   | Fall, 2002  |
| 6. PSY 5960/CSCI 5980 | <b>Virtual Reality: Perception &amp; Physics</b>  | Spring, 2002  |
| 7. PSY 8993/5993      | <b>Computational Perception &amp; Action Seminar</b>  | Fall & Spring 2003, Fall & Spring 2004, Fall & Spring 2005, Fall & Spring 2006, Fall & Spring 2007, Spring 2008 |
| 8. PSY 5993           | <b>Machine Learning methods in Modeling Human learning</b>  | Fall 2008   |
| 9. PSY 5993           | <b>Causal models, learning, &amp; video games</b>   | Spring 2009   |
| 10. Guest Lectures:   |   |   |
| a.                    | KIN 5722: <b>Human Factors Psychology</b> . "Perception of space" Instructor Tom Stoffregen. Fall 2003  |   |
| b.                    | HUMF 8001: <b>Special Topics: Human Factors/Ergonomics</b> . "VR technology" Instructor Tom Stoffregen. Fall 2005.  |   |
| c.                    | Psy8036: <b>Advances in Neuroimaging: Techniques for measuring timing of cognitive processes</b> . "Causal modeling for brain imaging data" Instructors, Steve Engel, Sheng He, Dan Kersten, Yang Zhang. Spring 2008. |   |

### Mentoring Courses Taught:

- 27 University of Minnesota Computer Science Directed Research advisees (2001-present)
- 13 University of Minnesota Psychology Directed Research advisees (2001-present)

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|---------------|--|------------------|
| 1. PSY 4993   | <b>Directed Research in Psychology</b> | Fall 2002 & 2003 |
| 2. CSCI 4970W | <b>Advanced Project Laboratory</b>     | Spring 2003      |

3. CSCI 5994	<b>Directed Research in Computer Science</b>	Spring 2003, Fall 2005, Spring 2006, Spring 2008
4. CSCI 5996	<b>Curricular Practical Training</b>	Fall 2004, Spring 2004, Fall 2005, Fall 2008
5. CSCI 8991	<b>Independent Study</b>	Spring 2003, Fall 2007, Fall 2008
6. CSCI 8760	<b>Plan B Project</b>	Spring 2003, Fall 2006, Spring 2007
7. CSCI 8994	<b>Directed Research in Computer Science</b>	Fall 2004, Spring 2006, Fall 2007

### Other Teaching (without course credit)

2003-2008                      Co-organizer, Machine Learning reading group  
<http://www.cs.umn.edu/machinelearning/>

### Graduate Student Mentoring

#### Completed Ph.D. Students

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- 1. Steve Jensen (Ph.D. Computer Science 2010). Matriculated Fall 2001. *Advisor Maria Gini, co-Advisor Paul Schrater, NIH Neuro-physical-computational Sciences (NPCS) Graduate Training Fellowship 2003-2005*
- 2. Daniel Acuna (Ph.D. Computer Science) Rational Bayesian Analysis Of Sequential Decision-Making Under Uncertainty In Humans And Machines, Orally defended, Dec. 18<sup>th</sup>, 2010. *Advisor Paul Schrater*
  - *NIH Neuro-physical-computational Sciences (NPCS) Graduate Training Fellowship 2008-2011.*
- 3. Christopoulos , Vassilios (Ph.D., Computer Science). Characteristic information required for human motor control: Computational aspects and neural mechanisms, July 2010. *Advisor Paul Schrater*
- 4. Amy Kalia (Ph.D., Psychology) Navigating Through Buildings with Impaired Vision: Challenges and Solutions, June, 2009. *Co-advisor Paul Schrater*
  - *NIH Visual Neuroscience Traineeship Fall 2007 – present*
  - *Graduate Research Partnership Program Fellowship Summer 2007*
  - *NICHHD Center for Cognitive Sciences Traineeship 2004 – 2007*
  - *Graduate Women in Science Mary Haga Award May 2005*
  - *Gloria J. Randahl Cognitive and Biological Psychology Fellowship Summer 2004*
  - *Department of Psychology Graduate Fellowship 2003 – 2004*
- 5. Peter Battaglia (Ph.D., Psychology) Probabilistic Sensorimotor Processing, May 2008. *Advisor Paul Schrater*
  - *Graduate School Fellowship*
  - *National Science Foundation Graduate Fellowship*
  - *Doctoral dissertation fellowship.*
- 6. Rashmi Sundaeswara (Ph.D., Computer Science) Probabilistic Inference in Human and Computer Vision, Dec. 2007. *Advisor Paul Schrater*
  - *Graduate Women in Science: Mary Haga Award - June, 2005.*
  - *“Most Promising Technological Breakthrough” award for research poster titled, “Workspace calibration using Perceptual Judgments”, 2004.*
- 5. Erik Schlicht (Ph.D., Psychology) Statistical Decision Theory for Human Perception-Action Cycles, June 2007. *Advisor Paul Schrater*
  - *University of Minnesota Graduate Research Partnership Program Award, 2005.*
- 6. Harini Veeraraghavan (Ph.D. Computer Science) *Learning to Extract Interesting Events from Outdoor Image Sequences* May 2006. *Advisor: Nikos Papanikolopoulos. Co-advisor Paul Schrater*
- 7. Thomas Carlson (Ph.D. Psychology), Interocular Conflict Resolution and Object Perception: Linking Perceptual Processes to the Functional Visual Architecture May 2004. *Advisor: Sheng He. Co-advisor Paul Schrater*

- *NIMH Center for Cognitive Sciences Graduate Student Research Fellowship, 2000-2003.*
- *University of Minnesota Graduate Research Proposal Program, 2003.*
- *Center for Cognitive Sciences J. J. Jenkins Award, 2003*
- *Center for Cognitive Sciences Turtle Award. 2003*

### **Current Ph.D. Students**

1. Ryan McCabe (Ph.D. candidate, Computer Science). Matriculated Fall 2002. **Advisor Paul Johnson, coadvisor Paul Johnson**
  - *Passed Preliminary Oral Exam*
  - *NIH Neuro-physical-computational Sciences (NPCS) Graduate Training Fellowship 2003-2005*
2. Christopher Kallie (Ph.D. candidate, Psychology). Matriculated Fall 2005. **Advisor Gordon Legge. Co-advisor Paul Schrater**
  - *CLA Instructional Technology Fellowship 2006-*

### **Completed M.S. Students**

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|--|------------|
| 1. Rashmi Sundareswara,(MS Computer Science),  | May 2002.  |
| 2. Rudrava Roy (M.S. Computer Science)         | May 2005.  |
| 3. Akira Matoba (M.S. Computer Science)        | Dec. 2006. |
| 4. Evangelos Theodorou (M.S. Computer Science) | Jan. 2007. |
| 5. Anthony Scudiero (M.S. Computer Science)    | Jun. 2007  |
| 6. Thomas Whipple (M.S. Computer Science)      | Jun. 2007  |
| 7. Mathew Senjem (M.S. Computer Science)       | Oct. 2008  |

### **Undergraduate Student Mentoring**

1. Ben Yarger, 2001-2003, University of Minnesota, Research Assistant
2. Anthony Scudiero, 2001-2004, University of Minnesota, Research Assistant
3. Chris Kallie, 2002-2003, University of Minnesota, Research Assistant
4. Alejandra Irizarry 2003, University of Minnesota Computational Neuroscience Undergraduate Summer Research Program. Minority Outreach. Project title: "Combining Vision and Touch for the Perception of Object Size." First place project led to research presentations at three other undergraduate research conferences Hawaii, Texas, and the SACNAS 2003 Conference, Albuquerque, New Mexico, October 2-5, 2003.
5. Erik Flister, 2004, University of Minnesota, Research Assistant

### **Undergraduate Honors Theses Supervised**

1. Amos Zoellner, 2004, University of Minnesota Computer Science Honors thesis "Star Field Recognition"
2. Sloane, Charles 2005, University of Minnesota Undergraduate Honors thesis "Effects of task on contact points in grasping"
3. Eric Sodomka. 2006, University of Minnesota Undergraduate Honors Thesis, "Decision-Making with Monetary value uncertainty".

## *SERVICE*

### *Appointments and Affiliations*

- *Core Faculty, Department of Psychology*
- *Core Faculty, Department of Computer Science & Eng.*
- *Core Faculty, Digital Technology Center.*
- *Center for Cognitive Sciences*
- *Graduate Faculty, Department of Psychology*
- *Graduate Faculty, Department of Computer Science & Eng.*
- *Graduate Faculty, Department of Neuroscience*

### *Academic Service*

#### *Department of Psychology:*

2006-2008	Research Infrastructure Committee
2005-2006	Colloquium Committee
2003-2005	Awards Committee
2002-2004	PsychTech Committee

#### *Department of Computer Science:*

2001 -present	Biannual Graduate Written Preliminary Exam (WPE)
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#### *University Committees*

2003-2005	CLA Info-tech committee
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#### *Center for Cognitive Science*

2005-2007	CCS Training Grant Award Committee
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#### *Neuro-Physical-Computational Training Grant Mentoring*

2006-	Mentoring committee, Audrey Royer
2006-	Mentoring committee, Blaine Schneider

#### *Thesis Committee*

<i>Acuna, Daniel</i>	Advisor
<i>Agovic, Amer</i>	Master's Final Committee reader
<i>Agovic, Amrudin</i>	PhD Prelim Oral
<i>Amiri, Hedyeh</i>	PhD Prelim Oral
<i>Battaglia, Peter</i>	Advisor, First Year Project, PhD Prelim Oral (Chair), PhD Final (Chair)
<i>Benson, Charles</i>	Advisor, First Year Project,
<i>Bodor, Robert</i>	PhD Prelim Oral (Chair), PhD Final reader (Chair)
<i>Borghetti, Brett</i>	PhD Prelim Oral (Chair), PhD Final reader (Chair)
<i>Bruggeman, Hugo</i>	PhD Prelim Oral (Chair), PhD Final reader (Chair)
<i>Carlson, Thomas</i>	Advisor, First Year Project, PhD Prelim Oral, PhD Final reader
<i>Cheung, Sing Hang</i>	First Year Project, PhD Prelim Oral, PhD Final reader
<i>Christopoulos, Vassilios</i>	Advisor, PhD Prelim Oral,
<i>Costello, Patricia</i>	PhD Final reader
<i>Damer, Steven</i>	PhD Prelim Oral
<i>Faghmous, James</i>	Advisor
<i>Fang, Fang</i>	PhD Prelim Oral, PhD Final reader
<i>Forero, Pedro</i>	PhD Prelim Oral
<i>Giudice, Nicholas A</i>	PhD Prelim Oral, PhD Final reader
<i>Hagh Shenash, Haleh</i>	PhD Prelim Oral, PhD Final reader
<i>Hartung, Bruce</i>	PhD Prelim Oral, PhD Final reader
<i>Jensen, Steven</i>	PhD Prelim Oral
<i>Johnson, Adam</i>	PhD Prelim Oral, PhD Final reader
<i>Jung, Yoon</i>	PhD Final reader
<i>Kalia, Amy</i>	First Year Project, PhD Prelim Oral
<i>Kalkstein, Yasmine</i>	PhD Final reader
<i>Kallie, Christopher</i>	Advisor, First Year Project
<i>Ketter, Wolfgang</i>	PhD Prelim Oral, PhD Final reader (Chair)

<i>Kim, Sunghee</i>	PhD Prelim Oral, PhD Final reader
<i>Matoba, Akira</i>	Advisor, Master's Final Committee
<i>McCabe, Ryan</i>	Advisor, PhD Prelim Oral
<i>Miller, Tim</i>	PhD Prelim Oral
<i>Mourikis, Anastasios</i>	PhD Final reader (Chair)
<i>Rakauskas, Michael</i>	PhD Prelim Oral
<i>Roy, Rudrava</i>	Advisor, Master's Final Committee reader
<i>Schlicht, Erik</i>	Advisor, First Year Project, PhD Prelim Oral (Chair), PhD Final (Chair)
<i>Schneider, Blaine</i>	PhD Prelim Oral
<i>Scudiero, Anthony</i>	Advisor, Master's Final Committee reader
<i>Senjem, Matthew</i>	Advisor, Master's Final Committee reader
<i>Sundaeswara, Rashmi</i>	Advisor, PhD Prelim Oral, PhD Final reader
<i>Tan, Alan</i>	PhD Final reader
<i>Theodorou, Evangelos</i>	Advisor, Master's Final Committee
<i>Vatsavai, Ranga Raju</i>	PhD Prelim Oral
<i>Veeraraghavan, Harini</i>	Advisor, PhD Prelim Oral, PhD Final reader
<i>Whipple, Thomas</i>	Advisor, Master's Final Committee

## **Professional Service**

### **Conferences/Workshops Organized**

Organized NIPS\*99 Workshop: Context and adaptation in statistical theories of vision, Dec. 2-4, 1999, Breckenridge, CO. ([http://vision.psych.umn.edu/www/people/schrater/NIPS\\*99workshop.htm](http://vision.psych.umn.edu/www/people/schrater/NIPS*99workshop.htm))

Co-organizer of Visual Processing of Natural Images: Theory, Psychophysics, Physiology, & Imaging. April, 2002 University of Minnesota. Symposium webpage: <http://gandalf.psych.umn.edu/~kersten/kersten-lab/CompNeuro2002/index.htm>

Co-organizer ONR Workshop. "Visual Learning & Brain Plasticity" April 7-9, 2005, Univ. of Minnesota.

Co-organizer Vision Sciences Society Symposium "Bayesian models applied to perceptual behavior", May 2008, Naples, FL.

Co-organizer CoSyne Workshop, March 2011

Co-organizer VSS Workshop, May 2011

### **Ad-hoc Reviewer**

#### **Grants:**

*National Science Foundation, National Institute of Health, Human Frontier Science Program (FRANCE), Swiss National Science Foundation, Wellcome Trust (United Kingdom)*

#### **Journals:**

*Science, Nature, Journal of Vision, Journal of the Optical Society of America A, Neural Information Processing Systems, Vision Research, J. Neurophysiology, IEEE Transactions on Vehicular Technology, Perception, ACM Transactions Applied Perception, Journal of Neuroscience, Journal of Neurophysiology, Experimental Brain Research, Visual Neuroscience, PLOS one, PLOS Computational Biology.*