Patrick A. Simen

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PROFESSIONAL

2011 – present: Assistant Professor, Neuroscience Dept., Oberlin College.

2004 – 2011:   Postdoctoral research fellow, Princeton University.

1999 – 2003:   Graduate Student Instructor, University of Michigan.

1996 – 1998:   Desktop publishing for clients and self-serve computing consultant, Kinko's, Ann Arbor, MI.

1995 – 1996:   Managing editor of *On the Town* magazine, a Genesee County, Michigan, business publication of McVey Marketing & Advertising, circulation 5,000. Designed magazine layout, wrote restaurant reviews and edited copy.

1995:   3D animation in Strata StudioPro for children's CD-ROM prototype game at Compaq Software in San Bruno, CA. Added 2D character graphics and special effects with AfterEffects 2.0. Set up database and video documentation system at software testing lab in San Mateo, CA.

1994 – 1995:   Database setup/management at Wells Fargo Bank, San Francisco, CA.

1994:   Freelance animation. Used 3D modeling and 2D compositing software with Photoshop to create a 20-second, 3D animation for a National Geographic Explorer Series television episode. This special Halloween episode on ghost-hunters aired Oct. 31, 1995 on the Turner Broadcasting Network.

1993 – 1994:   Aldus Corporation/CoSA (now a division of Adobe Systems). Provided technical support and wrote the reference section of the manual for CoSA (Company of Science & Art) AfterEffects, a high-end video compositing and effects application for the Macintosh, in Providence, RI. Provided trade-show demonstrations of AfterEffects 1.1, and quality assurance for AfterEffects 2.0.

EDUCATION & RESEARCH

2004 – 2011:   Postdoctoral research fellow in mathematical and behavioral psychology, neuroimaging and computational neuroscience, Princeton University.
Advisors: Prof. Jonathan D. Cohen, Department of Psychology, and co-director, Princeton Neuroscience Institute; and Prof. Philip Holmes, Department of Mechanical and Aerospace Engineering and Program in Applied and Computational Mathematics.

Education & Research (continued)

2001 – 2004:   Ph.D. in Computer Science & Engineering, University of Michigan.
                Advisor: Assoc. Prof. Thad Polk, Department of Psychology, jointly appointed in the Department of Electrical Engineering and Computer Science.

1997 – 2001:   Masters in Computer Science & Engineering, University of Michigan.

1988 – 1993:   Sc.B Mathematics / A.B. Philosophy, Brown University.

HONORS & AWARDS

OKUM (Oberlin-Kalamazoo-University of Michigan) leave-support grant, 2014-2015. Supporting one year of leave for fMRI research collaboration at the University of Michigan with Thad Polk, Psychology.

National Research Service Award for postdoctoral research from the National Institutes of Health: *Dynamic evaluation and control of decision making*, MH080524, March 2008 – March 2011. Supported training in the application of electroencephalography (EEG) and functional magnetic resonance imaging (fMRI) to decision making research with advisor, Jonathan D. Cohen.

Postdoctoral teaching/research fellowship from the Princeton University Council on Science and Technology, 2007 – 2008. Research advisor: Jonathan D. Cohen. Teaching advisor: Ken Norman. Supported a semester of teaching and course development with Dr. Norman, and a semester of postdoctoral research.

Graduate Assistance in Areas of National Need teaching fellowship, U.S. Department of Education, 2001 – 2002. Supported a semester of training in collegiate science education at the University of Michigan, followed by a semester of Ph.D. research.

Electrical Engineering and Computer Science Department's Outstanding Graduate Student Instructor for 1999 – 2000.

PUBLICATIONS

Journal articles *(* indicates Oberlin College student co-author)*

Freestone, D., Balci, F., **Simen, P.,** and Church, R. (in press). Optimal response rates in humans and rats. *Journal of Experimental Psychology: Animal Behavior Processes.*

Goldfarb, S., Leonard, N. E., **Simen, P.,** Caicedo-Nunez, C. H. and Holmes, P. (2014). A comparative study of drift diffusion and linear ballistic accumulator models in a reward maximization perceptual choice task. *Frontiers in Decision Neuroscience, Research Topic on Speed-Accuracy Tradeoff 8:*148. doi: 10.3389/fnins.2014.00148.

Karsilar, H., **Simen, P.,** ***Papadakis, S.** and Balci, F. (2014). Speed-accuracy tradeoff under response deadlines. *Frontiers in Decision Neuroscience, Research Topic on Speed-Accuracy Tradeoff, 8:*248. doi: 10.3389/fnins.2014.00248

Balci, F. and **Simen, P.** (2014). A drift-diffusion account of temporal discrimination. *Acta Psychologica, 149:*157-168.

Journal articles (continued)

Van Vugt, M., **Simen, P.**, Nystrom, L., Holmes, P. and Cohen, J. D. (2014). Lateralized readiness potentials in decision making reveal properties of a neural threshold mechanism. *PLoS One*, 9(3): e90943.

Teslovich, T., Mulder, M., Franklin, N., Ruberry, E., Millner, A., Somerville, L. H., **Simen, P.**, Durston, S. and Casey, B. J. (2014). Adolescents let sufficient evidence accumulate before making a decision when large incentives are at stake. *Developmental Science, 17*:59-70.

Simen, P., Rivest, F., Ludvig, E. A., Balci, F. and Killeen, P. (2013). Timescale invariance in the pacemaker-accumulator family of timing models. *Timing and Time Perception, 1:*159-188.

van Vugt, M., **Simen, P.,** Nystrom, L., Holmes, P. and Cohen, J. D. (2012). EEG oscillations reveal neural correlates of evidence accumulation. *Frontiers in Decision Neuroscience, 6:*106. doi:10.3389/fnins.2012.00106.

Simen, P. (2012). Evidence accumulator or decision threshold – which cortical mechanism are we observing? *Frontiers in Cognitive Science, 3:*183. doi:10.3389/fpsyg.2012.00183.

Balci, F., Freestone, D., **Simen, P.,** deSouza, L., Cohen, J. D. and Holmes, P. (2011). Optimal temporal risk assessment. *Frontiers in Integrative Neuroscience, 5:*56. doi: 10.3389/fnint. 2011.00056.

Simen, P., Balci, F., deSouza, L., Holmes P. and Cohen, J. D. (2011). Interval timing by long-range temporal integration. *Frontiers in Integrative Neuroscience, 5:*28. doi: 10.3389/fnint. 2011.00028.

Simen, P., Balci, F., deSouza, L., Holmes, P. and Cohen, J. D. (2011). A model of interval timing by neural integration. *Journal of Neuroscience, 31:*9238-9253.

Simen, P. (2011). Preventing combinatorial explosion in a localist neural network architecture using temporal synchrony. *Connection Science, 22:*131-144.

McMillen, T., **Simen, P.** and Behseta, S. (2011). Hebbian learning in linear-nonlinear networks with tuning curves leads to near-optimal, multi-alternative decision making. *Neural Networks, 24:*417-426.

Balci, F., **Simen, P.,** Niyogi, R., Saxe, A., Hughes, J., Holmes, P. and Cohen, J. D. (2011). Acquisition of decision making criteria: Reward rate ultimately beats accuracy. *Attention, Perception & Psychophysics, 73:*640-657.

Mulder, M., Bos, D., Weusten, J., van Belle, J., van Dijk, S., **Simen, P.**, van Engeland, H. and Durston, S. (2010). Basic impairments in regulating the speed-accuracy tradeoff predict symptoms of ADHD. *Biological Psychiatry, 68:*1114-1119.

Simen, P. and Polk, T. (2010). A symbolic/subsymbolic interface protocol for cognitive modeling. *Special Issue: Challenges for Recurrent Neural Networks, in Logic Journal of the Interest Group in Pure and Applied Logic (IGPL), 18:*705-761.

Simen, P. and Cohen, J. D. (2009). Explicit melioration by a neural diffusion model. *Brain Research, 1299:*95-117.

Simen, P., Contreras, D., Buck, C., Hu, P., Holmes, P. and Cohen, J. D. (2009). Reward-rate optimization in two-alternative decision making: Empirical tests of theoretical predictions. *Journal of Experimental Psychology: Human Perception and Performance*, *35:*1865-1897.

Gao, J., Wong-Lin, K.F., Holmes, P., **Simen, P.** and Cohen, J. D. (2009). Sequential effects in two-choice reaction time tasks: Decomposition and synthesis of mechanisms. *Neural Computation*, 21:2407-2436.

Simen, P., Cohen, J. D., and Holmes, P. (2006). Rapid decision threshold modulation by reward rate in a neural network. *Neural Networks, 19*:1013-1026.

Polk, T., **Simen, P.**, Lewis, R., and Freedman, E. (2002). A computational approach to control in complex cognition. *Cognitive Brain Research, 15*:71-83.

Peer-reviewed conference papers

van Vugt, M. K., **Simen, P.**, and Cohen, J. D. (2011). Finding neural correlates of drift diffusion processes in EEG oscillations. *Proceedings of the 2011 meeting of the Cognitive Science Society.*

Simen, P., McMillen, T. and Behseta, S. (2010). Hebbian learning for deciding optimally among many alternatives (almost). *Proceedings of the 2010 meeting of the Cognitive Science Society*, 1816-1821.

Simen, P., Van Vugt, M., Balci, F., Freestone, D. and Polk, T. (2010). Toward an analog neural substrate for production systems. *Proceedings of the 2010 International Conference on Cognitive Modeling,* 223-228.

Simen, P., Polk, T., Lewis, R., and Freedman, E. (2004). A computational account of latency impairments in problem solving by Parkinson's patients. *Proceedings of the 2004 International Conference on Cognitive Modeling,* 590-596.

Simen, P., Polk, T., Lewis, R., and Freedman, E. (2003). Universal computation by networks of model cortical columns. *Proceedings of the 2003 International Joint Conference on Neural Networks,* 230-235.

Simen, P., Polk, T., Lewis, R., and Freedman, E. (2002). A recurrent neural network model of goal management. *Proceedings of the 2002 International Conference on Computational Intelligence,* 566-569.

Book chapters

Simen, P. (2013). Decision making and reward, computational perspectives. In: Pashler, H. (ed.), *Encyclopedia of the Mind,* Vol. 1, Sage Reference, 218-220.

van Vugt, M. K., **Simen, P.** and Cohen, J. D. (2011). Trial-by-trial adaptation of decision making performance: a model-based EEG analysis. In: Ozyurt, J., Anschutz, A., Bernholt, S., Lenk, J. (eds.), *Interdisciplinary Perspectives on Cognition, Education, and the Brain.* Hanse Studies, Vol. 7. BIS-Verlag, Oldenburg.

Book chapters (continued)

Simen, P., Holmes, P. and Cohen, J. D. (2009). On the neural implementation of optimal decisions, *Oxford Handbook of Human Action*, In: Morsella, E., Bargh, J. A. and Gollwitzer, P. M. (eds.), Oxford University Press, 534-549.

Technical reports

Simen, P., Freedman, E., Lewis, R., and Polk, T. (2003). Columnar timing mechanisms in neural models of problem solving. *University of Michigan EECS Department Technical Report CSE-TR-481-03*.

Talks/abstracts

Simen, P. (2014). Diffusion, decisions, and timing. *Talk presented at the 47th annual Winter Conference on Brain Research, in Steamboat Springs, Colorado.*

Simen, P. and Balci, F. (2013). Subdivide and conquer: A model of precise and imprecise timing. *Talk presented at the 35th annual meeting of the Brazilian Society of Neuroscience and Behavior (Sociedade Brasileria de Neurociencias e Comportamento, SBNeC) in Belo Horizonte, Brazil.*

Simen, P. (2013). Pacemaker-accumulator models, old & new. *Talk presented at the second Brazilian Meeting on Brain and Cognition (BMBC) in Sao Paulo, Brazil.*

Vlasov, K. and **Simen, P.** (2012). Thou shalt not exceed square root of 2/3: A generalized form of Weber's Law predicted by the drift-diffusion model of decision making and interval timing, plus data that support it. *Poster presented at the Mathematical Biosciences Institute, Workshop 2: Cognitive Neuroscience, Columbus, OH.*

Simen, P. (2012). A drift-diffusion account of temporal discrimination. *Talk presented at the 2012 meeting of the Society for Mathematical Psychology, Columbus, OH.*

Simen, P. and Balci, F. (2011). Subdivide and conquer: A model of precise and imprecise timing. *Talk presented at the annual meeting of the Society for Neuroscience, New Orleans, LA.*

Simen, P. and Polk, T. (2010). Toward an analog, neural substrate for production systems. *Talk presented at the 2010 International Conference on Cognitive Modeling, Philadelphia, PA.*

Simen, P., Balci, F. and Freestone, D. (2010). Reward maximization, drift-diffusion and inter-response times in instrumental conditioning. *Talk presented at the 2010 meeting of the Society for Mathematical Psychology, Portland, OR.*

Simen, P. (2010). A hybrid distributed/localist architecture for sequential decision making. *Talk presented at the second workshop on compositional connectionism, co-located with the 2010 meeting of the Cognitive Science Society, Portland, OR.*

Simen, P., McMillen, T. & Behseta, S. (2010). Hebbian learning for deciding optimally among many alternatives (almost). *Poster presented at the 2010 meeting of the Cognitive Science Society, Portland, OR.*

Simen, P., Nystrom, L., Van Vugt, M., Sederberg, P., Balci, F. and Cohen, J. D. (2009). Event-related fMRI during slow decision making can reveal temporal structure in neural activity. *Poster presented at the 2009 meeting of Society for Neuroscience.*

Talks/abstracts (continued)

Simen, P., Contreras, D., Holmes, P. and Cohen, J. D. (2009). Adaptive performance in two-alternative decision making. *Talk presented at the 2009 meeting of the Society for Mathematical Psychology.*

Simen, P., Contreras, D., Buck, C., Hu, P., Holmes, P. and Cohen, J. D. (2008). Reward-maximizing performance in two-alternative decision making. *Poster presented at the 2008 meeting of the Psychonomic Society.*

Simen, P. (2008). Ramping, ramping everywhere: an overlooked model of interval timing. *Poster presented at COSYNE 2008.*

Simen, P. and Cohen J. D. (2007). A diffusion-based neural network model of interval timing and temporal discounting. *Poster presented at the 2007 meeting for the Society for Neuroscience.*

Simen, P. and Cohen, J. D. (2007). Explicit melioration by a simple neural network. *Poster/ talk presented at the 2007 Computational Cognitive Neuroscience/Dynamical Neuroscience Conference.*

Simen, P., Cohen, J. D. and Holmes, P. (2006). Melioration by a diffusion model with response threshold adaptation. *Poster presented at the 2006 meeting of the Society for Neuroeconomics.*

Simen, P., Holmes, P. and Cohen, J. D. (2005). A model of threshold adaptation in decision making. *Poster presented at the 2005 meeting of the Cognitive Neuroscience Society.*

Simen, P., Holmes, P. and Cohen, J. D. (2005). Performance adaptation by a drift-diffusion based decision making circuit. *Talk presented at the International Conference on Cognitive & Neural Systems, Boston University.*

Simen, P., Polk, T., Lewis, R. and Freedman, E. (2003). Modeling executive control, problem-solving and sequencing in neural networks. *Poster presented at the 2003 meeting of the Cognitive Neuroscience Society.*

Simen, P., Polk, T., Lewis, R. and Freedman, E. (2002). A recurrent neural network model of executive control in the Tower of London task. *Poster presented at the 2002 meeting of the Cognitive Neuroscience Society.*

Ph.D. Thesis

Simen, P. (2004). Neural mechanisms for control in complex cognition. University of Michigan.

TEACHING

Instructor, Oberlin College

Introduction to Cognitive Neuroscience, Spring 2012, Fall 2012, Spring 2014.
Surveying the basic topics in cognitive neuroscience, focusing on the neural mechanisms underlying higher cognition.

Cognitive Neuroscience Laboratory, Spring 2012, Fall 2012, Spring 2014.
Covering basic techniques in cognitive neuroscience, including psychophysics-experiment preparation, behavioral reaction time analysis, electroencephalography, and functional magnetic resonance imaging.

The Brain: An Introduction to Neuroscience, Fall 2011, Spring 2013, Fall 2013.
Surveying the basic topics in neuroscience, from membrane potentials and synaptic transmission to large-scale circuit organization and behavior.
Co-Instructor: Dr. Lynne Bianchi, Dr. Jan Thornton, Dr. Tracie Paine (respectively).

Neuroscience Laboratory, Fall 2011, Spring 2013, Fall 2013.
Covering basic techniques in electrophysiology, histology, brain dissection/anatomy, and computational neuronal modeling, culminating in a series of labs in which rats are trained on an intra-cranial self-stimulation protocol.
Co-Instructor: Dr. Michael Loose.

Assistant Instructor, Princeton University

Introduction to connectionist models: bridging between brain and mind, Spring 2008.
Covering basic principles of connectionist neural network modeling, and an application of these principles to model development in cognitive neuroscience. Designed and implemented a computational laboratory section to supplement course lectures, structured around the Emergent programming environment and the textbook, *Computational Explorations in Cognitive Neuroscience* (O'Reilly & Munakata, 2000). Performed guest lectures, and graded homework and final projects.
Instructor: Dr. Ken Norman.

Graduate Student Instructor, University of Michigan

Introduction to the Theory of Computation, 1998 – 2000, 2002 – 2003.
Covering the theory of computability, from finite state automata to Turing machines, and introducing the theory of time complexity. Held discussion sections, office hours, exam review sessions and performed guest lectures and exam grading.
Instructors: Dr. William Rounds (1998–2000); Dr. Daniel Koditschek (2002–2003).

Introduction to Cognitive Psychology, 2000 – 2001.
Introducing theories of perception, memory, problem-solving and planning, language acquisition, brain structure, basic neuropsychology, and the use of double-dissociations. Held discussion sections, office hours and exam review sessions and helped prepare and evaluate students' research review essays.
Instructor: Dr. Natalie Davidson.

TEACHING (continued)

Discrete Mathematics, 2000.

Covering propositional logic, proof by induction, graphs, and introducing number theory and cryptography. Held discussion sections, office hours and exam review sessions and graded exams.

Instructor: Dr. William Rounds.

Professional Activities

Reviewer for:

Acta Psychologica

Brain Research

Biological Cybernetics

Cognition

Cognitive Systems Research

Cognitive Science

Frontiers in Cognitive Science

Frontiers in Integrative Neuroscience

Journal of Neuroscience

Journal of Cognitive Neuroscience

Journal of Experimental Psychology: Human Perception & Performance

Journal of Experimental Psychology: Learning, Memory & Cognition

Neural Computation

Neural Networks

Physica D

Psychonomic Bulletin & Review

Proceedings of the Royal Society: B

Proceedings of the National Academy of Sciences

The Cognitive Science Society Conference

The International Conference on Cognitive Modeling

Review Editorial Board member:

Frontiers in Decision Neuroscience

Guest Associate Editor, Frontiers in Decision Neuroscience, for the Research Topic special issue entitled:

Toward a unified view of the speed-accuracy trade-off: Behaviour, neurophysiology and modelling
(co-editors: Dominic Standage, DaHui Wang and Richard Heitz)

Society Memberships

Society for Neuroscience, Society for Mathematical Psychology, Cognitive Science Society, Psychonomic Society