Patrick Simen

Research Fellow
Princeton Neuroscience Institute
Princeton University
http://www.math.princeton.edu/~psimen

Green Hall, Washington Rd.
Princeton, NJ 08544
Phone: (609) 240-3521
email: psimen@princeton.edu

EDUCATION & RESEARCH EXPERIENCE

2004 – present: 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.

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.

PUBLICATIONS

Journal articles

Simen, P. and Polk, T. (in press). A symbolic/subsymbolic interface protocol for cognitive modeling. *Logic Journal of the Interest Group in Pure and Applied Logic (IGPL)*.

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

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

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

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.

Articles in review or in preparation

McMillen, T., Simen, P. and Behseta, S. (in review). Reward-modulated Hebbian learning leads to near-optimal performance in decision making tasks with more than two alternatives.

Mulder, M., Gold, J. I., Durston, S., Heasly, B., Millner, A., Simen, P., Getz, S., Voss, H., Ballon, D. and Casey, B. J. (in review). BOLD correlates of reward-related decision bias on a visual discrimination task.

Simen, P., Balci, F., Holmes, P. and Cohen, J. D. (in preparation). Adaptive interval timing with a variance-minimizing diffusion model.

Balci, F., Simen, P., Niyogi, R., Holmes, P. and Cohen, J. D. (in preparation). Acquisition of optimal speed-accuracy tradeoffs in humans.

Book chapters

Simen, P. (in press). Decision making and reward: computational perspectives. *Encyclopedia of Mind*, Pashler, H. (ed.), SAGE Publications.

Simen, P., Holmes, P. and Cohen, J. D. (2009). On the neural implementation of optimal decisions, *Oxford Handbook of Human Action*, 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., 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 to be presented at the 2009 meeting of Society for Neuroscience.*

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 EXPERIENCE

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 homeworks and final projects.
Instructor: 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: William Rounds (1998–2000); 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 graded essays.
Instructor: Natalie Davidson.

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: William Rounds.

HONORS & AWARDS

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.

Postdoctoral teaching/research fellowship from the Princeton University Council on Science and Technology, 2007 – 2008.

Graduate Assistance in Areas of National Need teaching fellowship, U.S. Department of Education, 2001 – 2002.

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

Society Memberships

Society for Neuroscience

Society for Neuroeconomics

Psychonomic Society