

Yael Niv
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Affiliations

- from 2008 **Assistant Professor**, Princeton Neuroscience Institute & Psychology Department, **Princeton University**
- 2007-2008 **Princeton University** – Post-doctoral Fellow, Lab of Jonathan Cohen

Education

- 2002-2007 **The Hebrew University of Jerusalem, Interdisciplinary Center for Neural Computation & UCL, Gatsby Computational Neuroscience Unit – PhD *summa cum laude*, Jan 2008**
- Thesis research: "*The effects of motivation on habitual instrumental behavior*"
Supervisors: Peter Dayan (Gatsby Computational Neuroscience Unit), Daphna Joel (Psychology Department, Tel-Aviv University) and Hanoach Guttfreund (Interdisciplinary Center for Neural Computation)
- 1999-2001 **Tel-Aviv University, Psychology Department – MA *summa cum laude*, Dec 2001**
- Thesis research: "Evolution of Reinforcement Learning in Uncertain Environments"
Supervisors: Eytan Ruppin (Computer Science), and Daphna Joel (Psychology)
- 1995-1999 **Tel-Aviv University, the Adi Lautman Interdisciplinary Program for Fostering Excellence (cross-disciplinary BA-bypass program)**
- Undergraduate studies according to an individually designed interdisciplinary curriculum focused on computational neuroscience.
- July 2004 **RIKEN BSI Lecture Course, *Learning and Memory***, Saitama, Japan
- Aug 2001 **EU Advanced Course in *Computational Neuroscience***, Trieste, Italy
- July 2000 **Neuromorphic Engineering Workshop**, Telluride, Colorado

Fellowships and Funding

- 2007-2008 Human Frontiers Science Program, Long term post-doctoral fellowship "*How we learn what is relevant: fMRI of prefrontal-basal ganglia interactions in uninstructed tasks*"
- 2007 Rothschild post-doctoral fellowship (declined)
- 2004-2006 Rector's Excellence PhD fellowship, Hebrew University
- 2001-2004 Merit based scholarship, Interdisciplinary Center for Neural Computation
- 2004 Dan David Scholarship for PhD Graduate Students in the field of Brain Sciences

- 2003 EC Thematic Network Fellowship for short-term academic visit to the Gatsby Computational Neuroscience Unit, UCL
- 1995-1999 Merit based scholarship, Adi Lautman Interdisciplinary Program for Fostering Excellence

Awards

- 2008 The Hebrew University of Jerusalem – Max Schlomiuk award for outstanding PhD thesis
- 2005 NIPS Outstanding Student Paper award, “*How fast to work: Response vigor, motivation and tonic dopamine*”
- 2004 CNS Best Talk award, “*The Effects of Uncertainty on TD Learning*”
- 1996-1997 Adi Lautman Interdisciplinary Program for Fostering Excellence - two years outstanding achievements award

Peer reviewed Publications

- 2008 **MT Todd, Y Niv & JD Cohen (in press)** – *Learning to use working memory in partially observable environments through dopaminergic reinforcement*, Neural Information Processing Systems
- Y Niv (in press)** – *Reinforcement learning and the brain*, Journal of Mathematical Psychology (special issue on partially observable Markov decision processes)
- P Dayan & Y Niv (2008)** – *Reinforcement learning: The Good, The Bad, and The Ugly*, Current Opinion in Neurobiology, 18(2), 185-196 (special issue on Cognitive Neuroscience)
- Y Takahashi, G Schoenbaum & Y Niv (2008)** – *Silencing the Critics: Understanding the effects of cocaine sensitization on dorsal and ventral striatum in the context of an Actor/Critic model*, Frontiers in Neuroscience 2, 86-99
- D Schiller, I Levy, Y Niv, JE LeDoux & EA Phelps (2008)** – *From fear to safety and back – Reversal of fear in the human brain*, The Journal of Neuroscience 28(45), 11517-11525
- Y Niv & G Schoenbaum (2008)** – *Dialogues on prediction errors*, Trends in Cognitive Sciences 12(7): 265-272
- MM Botvinick, Y Niv & AC Barto (2008)** – *Hierarchically organized behavior and its neural foundations: A reinforcement-learning perspective*, Cognition (online prepublication)
- 2006 **Y Niv, ND Daw, D Joel & P Dayan (2006)** – *Tonic dopamine: Opportunity costs and the control of response vigor* – Psychopharmacology 191(3), 507-520 (special issue on dopamine)
- Y Niv, D Joel & P Dayan (2006)** – *A normative perspective on motivation* – Trends in Cognitive Sciences 10(8), 375-381
- P Dayan, Y Niv, B Seymour & ND Daw (2006)** – *The misbehavior of value and the discipline of the will* – Neural Networks 19(8), 1153-1160 (special issue on decision making)
- 2005 **Y Niv, ND Daw & P Dayan (2005)** – *How fast to work: Response vigor, motivation and tonic dopamine* – In: Y. Weiss, B. Schölkopf and J. Platt, eds., Neural Information Processing Systems

18, 1019-1026, MIT Press (Conference Talk, Outstanding Student Paper Award)

ND Daw, Y Niv & P Dayan (2005) – *Uncertainty based competition between prefrontal and dorsolateral striatal systems for behavioral control* – Nature Neuroscience, 8(12),1704-1711

Y Niv, MO Duff & P Dayan (2005) – *Dopamine, uncertainty and TD learning* – Behavioral and Brain Functions 1:6

2002 Y Niv, D Joel, I Meilijson & E Ruppin (2002) – *Evolution of reinforcement learning in uncertain environments: A simple explanation for complex foraging behaviors* – Adaptive Behavior 10(1), 5-24

D Joel, Y Niv & E Ruppin (2002) – *Actor-critic models of the basal ganglia: New anatomical and computational perspectives* – Neural Networks 15, 535-547

2001 Y Niv, D Joel, I Meilijson & E Ruppin (2001) – *Evolution of reinforcement learning in foraging bees: A simple explanation for risk averse behavior* – Neurocomputing 44(1), 951-956

Commentaries, chapters and technical reports

2008 Y Niv & PR Montague (2008) – *Theoretical and Empirical Studies of Learning* – In: P.W. Glimcher, C.F. Camerer, E. Fehr & R.A. Poldrack, eds., Neuroeconomics: Decision making and the brain, Chapter 22, pp. 329-349, Elsevier

2007 Y Niv & M Rivlin-Etzion (2007) – *Parkinson's disease: Fighting the will?* – Journal of Neuroscience, 24(44), 11777-11779

Y Niv (2007) – *Cost, Benefit, Tonic Phasic: What do response rates tell us about dopamine and motivation?* – Annals of the New York Academy of Science 1104, 357-376

P Dayan, ND Daw, and Y Niv (in press) – *Theoretical and computational neuroscience: Learning, action, inference and neuromodulation* – In: L. Squire et al, eds., New Encyclopedia of Neuroscience, Elsevier, Amsterdam

2006 Y Niv, ND Daw & P Dayan (2006) - *Choice values* - Nature Neuroscience 9(8), 987-988

ND Daw, Y Niv & P Dayan (2006) - *Actions, policies, values, and the basal ganglia* – In: Bezdard, E. editor, Recent Breakthroughs in Basal Ganglia Research, Nova Science Publishers Inc., New York, USA

Y Niv, P Dayan & D Joel (2006) - *The effects of motivation on extensively trained behavior* - Leibniz Technical Report, Hebrew University, 2006-6

Abstracts

2008 Y Niv, J Edlund, P Dayan & JP O'Doherty (2008, talk) – *Neural prediction errors reveal risk sensitivity in instrumental choice* – Israeli Human Brain Mapping 2008, Tel Aviv, Israel

Y Niv, P Dayan & JP O'Doherty (2008, poster and spotlight presentation) – *Decision making: Neural prediction errors show risk sensitivity* – COSYNE 2008: Computational and Systems Neuroscience, Salt Lake City, Utah

2007 D Schiller, Y Niv, I Levy, JE LeDoux & EA Phelps (2007, poster and featured short presentation) – *Reversal of fear learning in the human brain* – Linking Affect to Action: Critical

Contributions of the Orbitofrontal Cortex, NYAS Symposium, New York, NY

- 2006 **Y Niv, JA Edlund, P Dayan & JP O'Doherty (2006, poster)** – *Neural correlates of risk sensitivity: An fMRI study of instrumental choice behavior* – Society for Neuroscience Abstracts 32:664.8, Atlanta, Georgia
- 2005 **Y Niv, ND Daw & P Dayan (2005, poster)** – *The effects of motivation on rates of responding: A reinforcement learning approach* – European Brain and Behavior Society Meeting 2005, Dublin, Ireland
- Y Niv, P Dayan & D Joel (2005, talk)** – *The effects of motivation on habitual behavior* – Associative Learning Symposium 2005, Gregynog, Wales
- Y Niv, ND Daw, D Joel & P Dayan (2005, poster)** – *Motivational effects on behavior: Towards a reinforcement learning model of rates of responding* – COSYNE 2005: Computational and Systems Neuroscience, Salt Lake City, Utah
- ND Daw, Y Niv & P Dayan (2005, talk)** – *Uncertainty-based competition between prefrontal and striatal systems for behavioural control* – COSYNE 2005: Computational and Systems Neuroscience, Salt Lake City, Utah
- 2004 **Y Niv, MO Duff & P Dayan (2004, poster)** – *Asymmetric coding of temporal difference errors: Implications for dopamine firing patterns* - IBAGS VIII: The 8th Triennial Meeting of the International Basal Ganglia Society, Crieff, Scotland
- Y Niv, MO Duff & P Dayan (2004, talk)** – *Dopamine, uncertainty and TD learning* - CNS2004: The 13th Annual Computational Neuroscience Meeting, Baltimore, Maryland
- Y Niv, MO Duff & P Dayan (2004,talk)** - *The effects of uncertainty on TD learning* - COSYNE 2004: Computational and Systems Neuroscience, New York, NY
- 2001 **Y Niv, D Joel, I Meilijson & E Ruppin (2001)** – *Evolution of reinforcement learning in uncertain environments: Emergence of risk aversion and probability matching* – In: J. Kelemen and P. Sosik eds., *Advances in Artificial Life - Proceedings of the 6th European Conference, ECAL 2001*, Prague, 252-261

Theses

- 2007 **PhD Thesis – Interdisciplinary Center for Neural Computation, The Hebrew University of Jerusalem:** *The effects of motivation on habitual instrumental behavior*
- 2001 **MA Thesis – Psychology Department, Tel Aviv University:** *Evolution of Reinforcement Learning in Uncertain Environments*

Workshops/Conferences organized

- 2009 (planned) **“Reward and Decision Making in the Brain”**, November 3-7, Jerusalem, Israel (co-organizers: Hagai Bergman, Daphna Joel)
- 2007 **NIPS Workshop: “Hierarchical organization of behavior: Computational, psychological and neural perspectives”**, December 7-8 (co-organizers: Matthew Botvinick and Andrew Barto)

2005 Gatsby Foundation Workshop: “**Motivation and action selection**”, June 20-22
(co-organizers: Nathaniel Daw and Peter Dayan)

Invited talks/Seminars

2009 Invited lecturer, **14th Advanced Course in Computational Neuroscience**, Freiburg,
(planned) Germany (August 2009)

Invited feature presentation, **Annual meeting of the Sloan-Swartz Centers for Computational Neuroscience**, Harvard University (July 2009)

Programme Gulbenkian Champalimaud Neuroscience Course on Basal Ganglia, Reinforcement and Reward, invited lecturer, Lisbon, Portugal (April 2009)

“Risk sensitivity: What does reinforcement learning have to do with it?” Invited seminar, **Yale University School of Medicine** (February 2009)

2008 “Reconciling reinforcement learning and risk sensitivity: a model-based
fMRI study” Invited talk, **NIPS 2008 Workshop on Machine Learning Meets Human Learning** <http://pages.cs.wisc.edu/~jerryzhu/nips08.html> (December 2008)

“Dealing with risk in the perception-action cycle” Invited talk, **NIPS 2008 Minisymposium on Principled Theoretical Frameworks for the Perception-Action Cycle** http://homepages.feis.herts.ac.uk/~comqdp1/NIPS_2008/NIPS_Symposium_Workshop.html (December 2008)

“Better safe than sorry? Neural prediction errors reveal subjective risk sensitivity” Invited seminar, **Center for Cognitive Sciences colloquium series**, University of Minnesota <http://www.cogsci.umn.edu/calendar/colloquia.htm> (November 2008)

“Attitudes to risk: what does reinforcement learning have to do with it?”, Invited talk, **Workshop on Open Problems in Neuroscience of Decision Making**, Okinawa, Japan <http://www.irp.oist.jp/nc/odm/> (October 2008)

“Silencing the critics: An Actor/Critic view on substance abuse”, Invited talk, **International Symposium on Drug Addiction: Mechanisms and Therapeutic Approaches**, Kunming, China (October 2008)

“Reinforcement learning”, invited lecturer, **13th Advanced Course in Computational Neuroscience**, Freiburg, Germany (August 2008)

“Neural prediction errors reveal risk-sensitivity in instrumental choice”, invited seminar, Industrial Engineering, **Technion** (August 2008)

“Optimal decision making: from dopamine to habits and back”, invited seminar, Biological Networks Group, **Technion** (July 2008)

“Neural Reinforcement learning: Dopamine and reward”, **Programme Gulbenkian Champalimaud Neuroscience Course on Reinforcement Learning**, invited talk, Lisbon, Portugal (May 2008)

“How we (might) use reinforcement learning to decide how fast to move” in: “*How fast?*” *Trajectory control, movement energy, and the basal ganglia*, Symposium in the **Annual Meeting of**

the Society for the Neural Control of Movement, Naples, Florida (May 2008)

“How animals (might) use RL to decide how fast to work”, *Fast Reinforcement Learning* meeting, Barbados (April 2008)

“Tonic dopamine, motivation and the optimal choice of response rates”, *Neural circuits and decision making in rodents*, Invited talk, Janelia Farm, (April 2008)

Neurotheory Seminar Series, Columbia University (February 2008)

2007 “Opportunity costs and response rates: How dopamine helps us choose how hard to work”, invited seminar, *BMS seminar series, Caltech* (November 2007)

“Reinforcement learning and free operant behavior: from motivation to optimal selection of response vigor”, invited seminar, *Hofstra University, NY* (October 2007)

“Hierarchical reinforcement learning: What is it, and why should we care?”, *Champalimaud Neuroscience Workshop: Neural bases of reward and decision making 2.0*, Invited talk, Lisbon, Portugal (September 2007)

“Contrasting risk-sensitive and risk-neutral learning in an fMRI study of instrumental choice”, *Neurofinance symposium on The neural bases for human decision making under uncertainty*, Invited talk, University of Zurich (July 2007)

“Computationally linking dopamine and vigor: motivation bridges the gap”, Schoenbaum/O'Donnell labs' Systems journal club, invited seminar, *University of Maryland* (May 2007)

2006 “Cost, benefit, tonic, phasic: What does response vigor tell us about dopamine and motivation?”, invited seminar, *Neuroeconomics seminar series, NYU* (Nov 2006)

“Cost, benefit, tonic, phasic: What does response vigor tell us about dopamine and motivation?”, *Workshop on Reward and decision making in cortico-basal ganglia networks*, invited talk, Lake Arrowhead, California (June 2006)

“Choosing how hard to work: A normative account of response vigor, motivation and tonic dopamine”, Psychology department, invited seminar, *Cambridge University* (July 2006)

“Dealing with change: Learned and immediate effects of changes in subjective reward utility, on behavior”, *Symposium on Choice and the Brain*, invited talk, California Institute of Technology (June 2006)

Tsodyks Lab, invited seminar, *Weizmann Institute* (April 2006)

“Dopamine and reward”, *Course on Schizophrenia: A Systems Neuroscience Perspective*, invited lecture, Weizmann Institute (April 2006)

Rushworth Lab, invited seminar, *Cambridge, UK* (Jan 2006)

2005 Montague Lab, invited seminar, *Baylor College of Medicine* (Nov 2005)

“Deciding how hard to work: A normative account of response vigor, motivation and tonic dopamine”, invited talk, *Computational Cognitive Neuroscience Conference* (Nov 2005)

Phelps Lab, invited seminar, **NYU** (Nov 2005)

“Uncertainty based competition between multiple reinforcement learning systems in the brain”, **Interdisciplinary Center for Neural Computation Annual Retreat** (Jan 2005)

2004 “Reinforcement Learning in Unpredictable Environments: A new perspective on Risk Aversion and Probability Matching”, Glimcher-Heeger Lab meeting, invited seminar, **NYU** (July 2004)

2003 Psychology department colloquium, invited seminar, **Tel Aviv University** (Feb 2003)

2001 Beehave group, invited seminar, **The Hebrew University** (Jan 2001)

“Evolution of Reinforcement Learning in Bees: A Simple Explanation for Complex Foraging Behaviors”, **Panel series in neurosciences: A Multidisciplinary Overview of Brain Research, The Adams Super Center for Brain Research**, invited talk, Tel Aviv University (Jan 2001)

2000 Floreano Lab, invited seminar, **EPFL** (Oct 2000)

Computational neuroscience colloquium, invited seminar, **University of Bern** (Oct 2000)

Computer science colloquium, invited seminar, **Haifa University** (May 2000)

Teaching

2008 **Hebrew University, Interdisciplinary Center for Neural Computation** – Mini course on Reinforcement Learning and Decision Making (with Nathaniel Daw)
<http://alice.nc.huji.ac.il/icnccms/course/view.php?id=15>

2006 **Hebrew University, Interdisciplinary Center for Neural Computation** – Lecturer in graduate course "Introduction to Learning and Behavior: Conditioning and the Brain". Novel course that brought together psychological theories and data on animal conditioning, computational models of these same data, and underlying neural substrates.
<http://www.princeton.edu/~yael/LearningCourse>

July 2005 **Okinawa Computational Neuroscience Course, Predictions and Decisions** – Tutor, Computational Modeling Group.
<http://www.irp.oist.jp/ocnc/2005/projects/modeling/niv.html>

2003 **Hebrew University, Interdisciplinary Center for Neural Computation** – Lecturer in graduate course "Introduction to Learning and Behavior".
<http://www.princeton.edu/~yael/LearningCourse/LearningCourse2004.htm>

1999-2000 **Tel-Aviv University, department of psychology** – Teaching Assistant in undergraduate seminar "Modeling of Rats' Spatial Behavior". Assistance to students in designing and modeling different aspects of rats' spatial behavior, using Matlab.
<http://www.princeton.edu/~yael/PsychSeminar.htm>

1994-1996 **Guide in the Society for the Preservation of Nature in Israel**. Nature classes for elementary school children, guide of youth and family field trips

Thesis committees/General exam committees

Umar Syed (Advisor: Rob Schapire, Princeton) – nonreader thesis committee member

Bingni Brunton (Advisor: Carlos Brody, Princeton) – thesis committee member
Stephanie Goldfarb (Mechanical Engineering, Princeton) – general exam committee

Other committees/Advisory boards

- from 2009 EU funded Integrated Project (contract n. ICT-231722) “IM-CLeVeR – Intrinsically Motivated Cumulative Learning Versatile Robots” – International Scientific Advisory Board
- from 2008 The Franklin Institute, Philadelphia – Scientific Advisory Board for exhibit on “The Brain”

Reviewing activities

(alphabetical order) Adaptive Behavior, Behavior and Brain Functions, Cognition, European Journal of Neuroscience, Frontiers in Computational Neuroscience, Frontiers in Integrative Neuroscience, ICML, Journal of Computational Neuroscience, Journal of Mathematical Psychology, Journal of Neurophysiology, Journal of Neuroscience, Learning & Memory, Nature Neuroscience, Neural Computation, Machine Learning, Neuroimage, NIPS, NSF, PLoS Biology, Psychopharmacology, Scholarpedia

Programming and Management

- 1999-2001 **Israel Ministry of Defense – Team leader and project manager of a large data-mining and data-warehouse project**, involving in-house development (team of eight software engineers), and outsourcing. Analysis and design of the software, supervision and management of the development, integration and field implementation of the project. Visual Basic, PL/I, Oracle database. The project was granted the Service Chief of Staff Distinction Award.
- 1998 **IE Taldor – Project manager of a small data-processing project**. Analysis and design of the software, development of the software along with a team of two software engineers. Natural, Adabas database
- 1994-1998 **IE Taldor – Software engineer** - Natural, Adabas
- 1994-1995 **Society for the Preservation of Nature in Israel** – co-management of ~20 youth guides and their activities at schools, in extra-curricular activities and in field trips
- 1991-1994 **Israeli Defense Forces, Intelligence Corps** – algorithmic research and software development (special program for outstanding individuals)

Other

- 2004 **Tel-Aviv Emergency Shelter, the Israel Association for Child Protection from Abuse and Neglect (E.L.I)** – Shiatsu treatment of resident children
- 2002-2004 **Tmurot, Israel** - Shiatsu studies, Qualified Shiatsu practitioner
- 2003 **Alon Social Involvement Organization** – Teaching assistant in extra-curricular "English Enhancement" class for elementary school children
- 2000-2001 **Ness-Ziyonna Boarding House for abused and neglected children** – Guide of extra-curricular nature classes

