

BGGN 246: Computational Neurobiology

Glimcher, P. (Ed.) *Neuroeconomics: Formal Models Of Decision-Making And Cognitive Neuroscience*, Academic Press (2009)

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Wednesday, January 7: (Al Kaye)

1. Decision Making

Chapter 4, Aldo Rustichini

Neuroeconomics: Formal Models of Decision-making and Cognitive Neuroscience

Ratcliff R, McKoon G., [The diffusion decision model: theory and data for two-choice decision tasks](#). *Neural Computation* 2008 Apr;20(4):873-922 (**Sophie Liu**)

Beck JM, Ma WJ, Kiani R, Hanks T, Churchland AK, Roitman J, Shadlen MN, Latham PE, Pouget A., [Probabilistic population codes for Bayesian decision making](#). *Neuron*. 2008 Dec 26;60(6):1142-52. (**Adam Calhoun**)

Thursday, January 15: (Dave Peterson)

2. Movement

Chapter 8, Julia Trommershäuser , Laurence T. Maloney and Michael S. Landy

The Expected Utility of Movement

Platt , M.L. and Glimcher , P.W. (1999). Neural correlates of decision variables in parietal cortex. *Nature* 400 , 233 (**Adrian Wanner**)

Körding , K.P. and Wolpert, D.M. (2004). Bayesian integration in sensorimotor learning. *Nature* 427, 244 – 247 (**Minjoon Kouh**)

Tuesday, January 20: (Steve Deiss)

3. Value

Chapter 12, Peter Dayan and Ben Seymour

Values and Actions in Aversion

Sutton, R.S. and Barto , A.G. (1981). Toward a modern theory of adaptive networks: expectation and prediction . *Psychol. Rev.* 88 , 135 – 170 (**Brandon Burdge**)

Montague , P.R. , Dayan , P. , and Sejnowski , T.J. (1996). A framework for mesencephalic dopamine systems based on predictive Hebbian learning . *J. Neurosci.* 16 , 1936 – 1947 (**Ben Huh**)

Thursday, January 29 (Aleena Garner)

4. Games

*Chapter 13, Colin F. Camerer
Behavioral Game Theory and the Neural Basis of Strategic Choice*

Dorris, M.C. and Glimcher, P.W. (2004). Activity in posterior parietal cortex is correlated with the subjective desirability of an action. *Neuron* 44, 365 – 378
(Teddy Yu)

Hampton, A., Bossaerts, P., and O’Doherty, J. (2008). Neural correlates of mentalizing-related computations during strategic interactions in humans. *Proc Natl Acad Sci U S A*. 2008 May 6;105(18):6741-6. **(Paxon Frady)**

Wednesday, February 4: (Teddy Yu)

5. Learning

*Chapter 22, Yael Niv and P. Read Montague
Theoretical and Empirical Studies of Learning*

Dayan, P., Kakade, S., and Montague, P.R. (2000). Learning and selective attention. *Nat. Neurosci.* 3, 1218 – 1223 **(Matt Tong)**

Niv, Y., Duff, M.O., and Dayan, P. (2005). Dopamine, uncertainty and TD learning. *Behav. Brain Func.* 1, 6 **(Mulloy Morrow)**

Thursday, February 12:

6. Basal Ganglia

*Chapter 26, Kenji Doya and Minoru Kimura
The Basal Ganglia and the Encoding of Value*

Reynolds, J.N. and Wickens, J.R. (2002). Dopamine-dependent plasticity of corticostriatal synapses. *Neural Networks* 15, 507 – 521 **(Dave Peterson)**

Tanaka, S.C., Doya, K., Okada, G. *et al.* (2004). Prediction of immediate and future rewards differentially recruits cortico-basal ganglia loops. *Nat. Neurosci.* 7, 887 – 893 **(Leif Gibb)**

Wednesday, February 18: (Terry Sejnowski)

7. Matching

*Chapter 30, Greg S. Corrado, Leo P. Sugrue, Julian R. Brown and William T. Newsome
The Trouble with Choice: Studying Decision Variables in the Brain*

Sugrue , L.P. , Corrado , G.S. , and Newsome , W.T. (2004). Matching behavior and the representation of value in the parietal cortex . *Science* 304 , 1782 – 1787
(Jason McInerny)

Gallistel , C.R. , King , A.P. , Gottlieb , D. *et al.* . (2007). Is matching innate? *J. Exp. Anal. Behav.* 87 , 161 – 199 **(Christian Bick)**

Wednesday, February 25: (Adam Calhoun and Christian Bick)

8. Decision Models

Chapter 31, Daeyeol Lee and Xiao-Jing Wang
Mechanisms for Stochastic Decision-making in the Primate Frontal Cortex: Single-neuron Recording and Circuit Modeling

Machens , C.K. , Romo , R. , and Brody , C.D. (2005). Flexible control of mutual inhibition: a neural model of two-interval discrimination. *Science* 18, 1121 – 1124. **(Samat Moldakarimov)**

[Berns, G. S.](#); [Sejnowski, T. J.](#); A Computational Model of How the Basal Ganglia Produce Sequences, *Journal of Cognitive Neuroscience*, 10(1), 108-121, 1998 **(Mariano Gabbito)**

Wednesday, March 4:

9. Loss

Chapter 32, Paul W. Glimcher
Choice: Towards a Standard Back-pocket Model

Daw , N.D. , Kakade , S. , and Dayan , P. (2002). Opponent interactions between serotonin and dopamine. *Neural Networks* 15, 603 – 616 **(Aleena Garner)**

Tom , S.M. , Fox , C.R. , Trepel , C. , and Poldrack , R.A. (2007). The neural basis of loss aversion in decision-making under risk. *Science* 315 , 515 – 518 **(Hanghao Shan)**

Wednesday, March 11:

10. Birdsong Learning

[Doya, K.](#); [Sejnowski, T. J.](#); A Computational Model of Avian Song Learning [Gazzaniga, M. S.](#); (Ed.), In: *The New Cognitive Neurosciences*, 2nd edition, 469-482, MIT Press, Cambridge, MA, 2000

An ultra-sparse code underlies the generation of neural sequences in a songbird, R.H.R. Hahnloser, A.A. Kozhevnikov, M.S. Fee , *Nature*,419: 65-70 (2002). **(Alfred Kaye)**

A specialized forebrain circuit for vocal babbling in the juvenile songbird. D. Aronov, A.S. Andalman, M.S. Fee, *Science*, 320(5876):630– 4 (2008) **(Ryan Natan)**