

# CURRICULUM VITAE

## Kenway Louie

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Born: October 5, 1973; New York, NY

## Research Interests

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Decision-making, rational and irrational choice behavior, cortical computation, efficient coding in neural value representations, computational psychiatry

## Education

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|                                       |            |      |                               |
|---------------------------------------|------------|------|-------------------------------|
| Harvard Medical School                | M.D.       | 2004 | Medicine ( <i>cum laude</i> ) |
| Massachusetts Institute of Technology | Ph.D.      | 2002 | Biology                       |
| Massachusetts Institute of Technology | S.B., S.B. | 1993 | Biology, Chemical Engineering |

## Research Experience

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|                                 |              |   |
|---------------------------------|--------------|---|
| Research Assistant<br>Professor | 2012-present | New York University, Center for Neural Science<br>Decision-making, cortical circuit computations, efficient coding in valuation and decision circuits   |
| Postdoctoral Fellow             | 2004-2012    | New York University, Center for Neural Science<br>Advisor: Paul W. Glimcher, Ph.D.<br>Neurophysiology of decision-making in nonhuman primates, computational modeling, human psychophysics  |
| Predocctoral Fellow             | 1995-2002    | Massachusetts Institute of Technology, Department of Biology<br>Advisor: Matthew A. Wilson, Ph.D.<br>Thesis: <i>Mnemonic information in the rodent hippocampus during wake and sleep states</i> . Demonstrated reactivation of experience-dependent information in REM sleep using large tetrode arrays |
| Research Assistant              | 1994-1995    | Harvard Medical School, Department of Genetics<br>Advisor: David Beier, M.D. Ph.D.<br>Genetics of mouse model of juvenile polycystic kidney disease   |
| Research Assistant              | 1991-1994    | Massachusetts Institute of Technology, Whitehead Institute<br>Advisor: Robert A. Weinberg, Ph.D.<br>Interaction between cell cycle proteins and tumor suppressor Rb   |

## **Publications**

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### In progress

Zimmermann J, Glimcher PW, **Louie K**. Matched adaptation in economic choice behavior and orbitofrontal value coding. *In preparation*.

Steverson K, Riepe J, Glimcher PW, **Louie K**. Adaptive value coding and the optimality of choice. *In preparation*.

Steverson K, Chung H-K, Zimmermann J, **Louie K**, Glimcher PW. The costs of time: testing evidence accumulation models of value-based decision making. *Under review*.

Cohen D, Volovich M, Zeevi Y, **Louie K**, Levy DJ, Rechavi O. Asymmetric overlap in neuronal sensation constrains rational choice in *C. elegans*. *bioRxiv*, 257535 (2018). *Under review*.

Webb R, Glimcher PW, **Louie K**. Rationalizing context-dependent preferences: divisive normalization and neural constraints. *Under review*.

**Louie K**, Glimcher PW. Normalization principles in computational neuroscience. *Under review*.

### Peer-reviewed

Zimmermann J, Glimcher PW, **Louie K**. Multiple timescales of normalized value coding mediate adaptive choice behavior. *Nat Commun*, 9(1): 3206 (2018).

Konova A, **Louie K**, Glimcher PW. The computational form of craving: selective multiplication of economic value. *Proc Natl Acad Sci U S A*, 115(16): 4122-4127 (2018).

Lopez-Guzman S, Konova A, **Louie K**, Glimcher PW. Risk preferences impose a hidden distortion on measures of choice impulsivity. *PLoS one* 13(1): e0191357 (2018).

Yamada H, **Louie K**, Tymula A, Glimcher PW. Free choice shapes normalized value signals in medial orbitofrontal cortex. *Nat Commun*, 9(1): 162 (2018).

Khaw MW, Glimcher PW, **Louie K**. Divisive normalization explains dynamic adaptation in the human valuation process. *Proc Natl Acad Sci U S A*, 114: 12696-12701 (2017).

Holper L, Van Brussel LD, Schmidt L, Schulthess S, Burke CJ, **Louie K**, Seifritz E, Tobler PN. Adaptive value normalization in the prefrontal cortex is reduced by memory load. *eNeuro*, 4(2) e0365-17.2017: 1-20 (2017).

Zimmermann J, Vazquez Y, Glimcher PW, Pesaran B, **Louie K**. Oculomatic: high speed, reliable, and accurate open-source eye tracking for humans and non-human primates. *J Neurosci Meth*, 270: 138-146 (2016).

**Louie K**, LoFaro T, Webb R, Glimcher PW. Dynamic divisive normalization predicts time-varying value coding in decision-related circuits. *J Neurosci*, 34: 16046-16057 (2014).

LoFaro T, **Louie K**, Webb R, Glimcher PW. The temporal dynamics of cortical normalization models of decision-making. *Lett Biomath*, 1: 209-220 (2014).

Yamada H, Tymula A, **Louie K**, Glimcher PW. Thirst-dependent risk preferences in monkeys identify a primitive form of wealth. *Proc Natl Acad Sci U S A*, 110: 15788-15793 (2013).

**Louie K**, Khaw MW, Glimcher PW. Normalization is a general neural mechanism for context-dependent decision making. *Proc Natl Acad Sci U S A*, 110: 6139-6144 (2013).

**Louie K**, Grattan L, Glimcher PW. Reward value-based gain control: divisive normalization in parietal cortex. *J Neurosci*, 31: 10627-10639 (2011).

Yamada H, **Louie K**, Glimcher PW. Controlled water intake: a method for objectively evaluating thirst and hydration state in monkeys by the measurement of blood osmolality. *J Neurosci Meth*, 191: 83-9 (2010).

**Louie K**, Glimcher PW. Separating value from choice: delay discounting activity in the lateral intraparietal area. *J Neurosci*, 30: 5498-5407 (2010).

**Louie K**, Wilson MA. Temporally structured replay of awake hippocampal ensemble activity during rapid eye movement sleep. *Neuron*, 29: 145-156 (2001).

Dowdy SF, Hinds PW, **Louie K**, Reed SI, Arnold A, Weinberg RA. Physical interaction of the retinoblastoma protein with human D cyclins. *Cell*, 73: 499-511 (1993).

#### Other writing

**Louie K**, Glimcher PW. Computational principles of value coding in the brain. In *Decision Neuroscience*. Dreher JC, Tremblay L, eds. Cambridge, MA: Academic Press (2016).

**Louie K**, Glimcher PW, Webb R. Adaptive neural coding: from biological to behavioral decision-making. *Curr Opin Behav Sci*, 5:91:99 (2015).

**Louie K**. Exploiting exploration: past outcomes and future actions. *Neuron*, 80: 6-9 (2013).

**Louie K**. Integrating salience and value in decision making. *Proc Natl Acad Sci U S A*, 110: 15853-15854 (2013).

De Martino B, **Louie K**. The neurobiology of context-dependent valuation and choice. In *Neuroeconomics: Decision Making and the Brain*. 2nd ed. Glimcher PW, Fehr E, eds. Cambridge, MA: Academic Press (2013).

Paton JJ, **Louie K**. Illuminating reward and punishment. *Nat Neurosci* 15: 807-809 (2012).

**Louie K**, Glimcher PW. Efficient coding and neural representation of value representation. *Ann NY Acad Sci* 1251: 13-32 (2012).

**Louie K**, Glimcher PW. Set size effects and the neural representation of value. In *Neuroscience of Preference and Choice*. Dolan R, Sharot T, eds. Waltham, MA: Academic Press (2011).

Glimcher PW, Kable J, **Louie K**. Neuroeconomic studies of impulsivity: Now or just as soon as possible? *Am Econ Rev* 97, 142-147 (2007).

Madsen JR, **Louie K**. Treatment of refractory epilepsy: general approach and nonresective strategies. In *Principles and Practice of Pediatric Neurosurgery*. Albright AL, Adelson PD, Pollack IF, eds. New York: Thieme (2007).

**Louie K**. The reactivation of mnemonic information in hippocampal spiking activity. *Cell Technology (Saibou Kougaku)* 21, 1004-1010 (2002).

## Grants

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- NIH/NIMH, Research Project Grant, R01 DA043676.  
*Computational neuroeconomic models of addiction: quantifying progression and treatment in opioid use disorder*. Co-I, 2017-2022.
- NIH/NIMH, Research Project Grant, R01 MH104251.  
*Adaptation in decision circuits: temporal history and the efficiency of choice*. PI, 2015-2020.
- NIH/NINDS, National Research Service Award, F32 NS051914.  
*Choices in time and neural activity in parietal cortex*. PI, 2006-2008.

## Awards

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- Ruth L. Kirschstein National Research Service Award Individual Fellowship 2006-2008
- Dr. Sirgay Sanger Prize, best paper in psychiatry, Harvard Medical School 2004
- Harvard Medical School, Cum Laude 2004
- NIH GMS Medical Scientist Training Program 2002-2004
- Whitehead Undergraduate Research Award 1993
- Phi Beta Kappa, Tau Beta Pi 1993

## Professional Service

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### Society Governance

Board Member, Society for Neuroeconomics 2017-2020

### Conference Organization

|                         |   |           |
|-------------------------|---|-----------|
| Program committee       | Society for Neuroeconomics Annual Meeting   | 2017-2018 |
| Program committee       | Computational and Systems Neuroscience Meeting  | 2015      |
| Minisymposium organizer | Society for Neuroscience Annual Meeting<br><i>Context-dependent neural representations of value: gain control, adaptation, and efficient coding</i> | 2011      |

## Editorial Positions

*PLOS ONE* (Academic Editor, 2018)

*Frontiers in Computational Neuroscience* (Guest Associate Editor, Research Topic: Mathematical Modeling toward Understanding Humans and Animals: from Decision Making to Motor Controls, 2018)

*Journal of Neuroscience, Psychology, and Economics* (Editorial Board, 2018-2020)

## Ad Hoc Reviewer

*Cognitive Affective and Behavioral Neuroscience, Decision, eLife, eNeuro, Frontiers in Behavioral Neuroscience, Journal of Neuroscience, Journal of Neurophysiology, Nature Communications, Nature Human Behaviour, Nature Neuroscience, Neural Networks, Neuron, PLOS ONE, PLOS Biology, Proceedings of the National Academy of Sciences, Psychological Review, Science, Scientific Reports*

## Professional Affiliations

Society for Neuroscience, 1996-present

Society for Neuroeconomics, 2005-present

## **Teaching Experience**

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New York University, Center for Neural Science

- Behavioral and Cognitive Neuroscience, Course organizer and lecturer 2019
- Behavioral and Cognitive Neuroscience, Guest lecturer 2013-2018
- Honors Seminar, Course organizer and lecturer 2013-present

Champlimaud Foundation Neuroscience Program, Lisbon, Portugal

- Sensory Systems, Course organizer and lecturer 2008-2012

Massachusetts Institute of Technology, Department of Biology

- Human Physiology, Teaching assistant 1998
- Cellular Neurobiology, Teaching assistant 1996

## **Select presentations**

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*Adaptive value coding in brain and behavior.*

Invited talk, Neuroeconomics and the Evolution of Economic Behavior Conference in Vancouver, Canada. May 2018.

*Multiple timescales of valuation mediate adaptive choice behavior.*

Selected talk, Society for Neuroeconomics meeting in Berlin, Germany. August 2016.

*Adaptive value coding and context-dependent choice.*

Invited talk, Symposium on Biology of Decision-Making in Paris, France. May 2015.

*Adaptive value coding and the optimality of choice.*

Selected talk, Society for Neuroscience meeting in Washington, D.C. November 2014.

*A dynamical model of normalization: the interaction between time, value, and choice.*

Selected talk, Society for Neuroeconomics meeting in Miami, FL. September 2014.

*Neural variability and normalization drive biphasic context-dependence in decision-making.*

Selected talk, Computational and Systems Neuroscience meeting in Salt Lake City, UT. March 2013.

*Cortical normalization is a general neural mechanism for context-dependent choice.*

Selected talk, Society for Neuroscience meeting in New Orleans, LA. October 2012.

*Divisive normalization in neural circuits drives context-dependent choice.*

Invited talk, Army Conference on Applied Statistics in Monterey, CA. October 2012.

*Computational models of stochastic choice behavior in value-guided decision-making.*

Selected talk, Society for Neuroeconomics meeting in Evanston, IL. September 2011.

*The effect of value normalization and cortical variability on rational choice.*

Poster, Society for Neuroscience meeting in San Diego, CA. November 2010.

*Decision, value, and context: divisive normalization and relative reward coding.*

Invited talk, University College London, Functional Imaging Laboratory. December 2009.

*Divisive normalization and relative reward representation in parietal cortex*

Invited talk, California Institute of Technology, Brain, Mind, and Society seminar. October 2009.

*Value-based gain control: relative reward normalization in parietal cortex.*

Selected talk, Society for Neuroeconomics meeting in Park City, UT. September 2008.

*Temporal discounting activity in parietal neurons during intertemporal choice.*

Selected talk, Computational and Systems Neuroscience meeting in Salt Lake City, UT. March 2006.

*Intertemporal choice behavior in monkeys: interaction between delay to reward, subjective value, and area LIP.*

Poster, Society for Neuroscience meeting in Washington, D.C. November, 2005.

*Temporally-structured reactivation of hippocampal patterns during REM sleep.*

Invited talk, American Professional Sleep Society meeting in Seattle, WA. June 2002.

*Reward bias of neuronal activity in the rodent hippocampus.*

Poster, Society for Neuroscience meeting in San Diego, CA. November 2001.

*Temporally structured REM sleep replay of awake hippocampal ensemble activity.*

Selected talk,

Society for Neuroscience meeting in New Orleans, LA. October 2000.