

# Xinying Cai

## Curriculum Vitae

**Current position:** Assistant Professor of Neural and Cognitive Sciences, NYU Shanghai  
Global Network Assistant Professor, NYU

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### EDUCATION AND TRAINING

Washington University in St Louis	Post-doctorate	2014	Neurobiology
Yale University	Post-doctorate	2009	Neurobiology
Arizona State University	Ph.D.	2007	Bioengineering
Zhejiang University, Hangzhou, China	B.S.	1999	Control Science and Engineering

### EMPLOYMENT

2014 – present Assistant Professor of Neural and Cognitive Sciences, NYU Shanghai, China  
2014 – present Global Network Assistant Professor, New York University

### OTHER ACADEMIC POSITIONS

2015 – present Affiliated Faculty, Shanghai Key Laboratory of Brain Functional Genomics (Ministry of Education), School of Psychology and Cognitive Science, East China Normal University.

### AWARDS

2005 Travel award, 27th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS)  
2004 Excellence in Neural Engineering Award, 2nd IEEE/EMBS International Conference on Neural Engineering

### PROFESSIONAL ACTIVITIES

#### Conference organization

2018 Shanghai Neuroeconomics Workshop

#### Appointments and Committees (external only)

Ad hoc Reviewer, NSFC general program (2016)  
Ad hoc Reviewer, NSFC book publication program (2018)

## Reviewer for Journals (past 5 years)

Behavioral and brain functions, Behavioural Brain Research, Journal of Neuroscience, Journal of Neurophysiology, Nature Neuroscience, Neuron, Cerebral Cortex, Scientific Reports, Nature Communications, eLife.

## **PROFESSIONAL AFFILIATIONS**

2003 – present Society for Neuroscience  
2011 – present Society for Neuroeconomics  
2011 – present Sigma Xi, The Scientific Research Society

## **PUBLICATIONS**

### Peer-Reviewed Publications

Yim, M., **Cai, X.\*** and Wang, X.\* (2019) "Transforming choice outcome to action plan in monkey lateral prefrontal cortex: a neural circuit model." Neuron 103: 1-13. \*co-corresponding author.

**Cai, X.\*** and C. Padoa-Schioppa (2019). "Neuronal evidence for good-based economic decisions under variable action costs." Nature Communications 10(1): 393. \*, corresponding author

Rustichini, A., K. E. Conen, **Cai, X.** and C. Padoa-Schioppa (2017). "Optimal coding and neuronal adaptation in economic decisions." Nature Communications 8(1): 1208.

Seo, H., **Cai, X.**, C. H. Donahue and D. Lee (2014). "Neural correlates of strategic reasoning during competitive games." Science 346(6207): 340-343.

Murray, J. D., A. Bernacchia, D. J. Freedman, R. Romo, J. D. Wallis, **Cai, X.**, C. Padoa-Schioppa, T. Pasternak, H. Seo, D. Lee and X. J. Wang (2014). "A hierarchy of intrinsic timescales across primate cortex." Nature Neuroscience 17(12): 1661-1663.

**Cai, X.** and C. Padoa-Schioppa (2014). "Contributions of orbitofrontal and lateral prefrontal cortices to economic choice and the good-to-action transformation." Neuron 81(5): 1140-1151.

Maoz, U., U. Rutishauser, S. Kim, **Cai, X.**, D. Lee and C. Koch (2013). "Predeliberation activity in prefrontal cortex and striatum and the prediction of subsequent value judgment." Frontiers in Neuroscience 7: 225.

Kim, S., **Cai, X.**, J. Hwang and D. Lee (2012). "Prefrontal and striatal activity related to values of objects and locations." Frontiers in Neuroscience 6: 108.

**Cai, X.** and C. Padoa-Schioppa (2012). "Neuronal encoding of subjective value in dorsal and ventral anterior cingulate cortex." Journal of Neuroscience 32(11): 3791-3808.

Padoa-Schioppa, C. and **Cai, X.** (2011). "The orbitofrontal cortex and the computation of subjective value: consolidated concepts and new perspectives." Ann N Y Acad Sci 1239: 130-137.

**Cai, X.**, S. Kim and D. Lee (2011). "Heterogeneous coding of temporally discounted values in the dorsal and ventral striatum during intertemporal choice." Neuron 69(1): 170-182.

**Cai, X.**, Y. Shimansky and J. He (2005). "Learning-induced Dependence of Neuronal Activity in Primary Motor Cortex on Motor Task Condition." Conf Proc IEEE Eng Med Biol Soc 2: 2114-2117.

**Cai, X.**, Y. P. Shimansky, D. J. Weber and J. He (2005) Reorganization of Neural Activity in Cerebral Cortex during Adaptation to External Force Perturbations of Reaching Movement. Conf Proc 2<sup>nd</sup> International IEEE/EMBS Conference on Neural Engineering, Page(s): 388 – 391.

**Cai, X.**, Y. P. Shimansky, D. J. Weber and J. He (2004). "Disassociation between primary motor cortical activity and movement kinematics during adaptation to reach perturbations." Conf Proc IEEE Eng Med Biol Soc 6: 4665-4668.

Shimansky, Y.P., **Cai, X.**, Weber, D.J., He, J. (2003), Modifications of motor cortical activity induced by adaptation to movement perturbations as revealed by chronic multielectrode recordings in monkeys, Conf Proc 25th Annual International Conference of the IEEE/EMBS, Page(s):1766 – 1769.

#### Book Chapter

Seo H, Kim S, **Cai, X.**, Donahue CH, and Lee D (2016) Neural correlates of strategic decision making in the primate prefrontal cortex. In: Watanabe M (ed) Prefrontal cortex as an executive, emotional and social brain. Springer.

#### Abstracts

K. NI, Y. LIU, X. CAI (2019) Prefrontal mechanisms of economic decisions with sequential offers. Program No. 514.23. 2019 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2019. Online.

C. XU, X. CAI (2019) Contrasting neural representations in the orbitofrontal cortex under single and multi-attribute decisions. Program No. 514.19. 2019 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2019. Online

Y. SUN, X. CAI, Y. KU (2019) The neural mechanism of reward and punishment modulation on visual working memory. Program No. 324.25. 2019 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2019. Online.

E. SHIN, Y. JANG, S. KIM, H. KIM, X. CAI, D. LEE, M. JUNG (2019) Exploring value-related signals in the rodent and primate striatum. Program No. 336.05. 2019 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2019. Online.

Wu Z, Cai X, Chen, A (2018) Independent coding of reward and perceptual salience in the lateral intraparietal area in value-based decisions. Program No. 688.12. 2018 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2018. Online.

Wu Z, Cai X, Chen, A (2017) Encoding of reward and perceptual salience in the lateral intraparietal area. The 12<sup>th</sup> Biennial Conference of Chinese Neuroscience Society (CNS 2017), Tianjin, China.

M. Yim, X. Cai, X.-J. Wang, A (2016) circuit model for the interplay between orbitofrontal cortex and lateral prefrontal cortex in value-based economic decision-making. Program No. 354.05. 2016 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2016. Online.

Cai X and Padoa-Schioppa C (2011). The role of orbitofrontal and lateral prefrontal cortex in economic choice and choice-guided behavior. *Society for Neuroscience Abstract* 515.08.

Padoa-Schioppa C, Cai X and McCall J (2011). Neuronal activity in dorsal and ventral anterior cingulate cortex during economic choice. *Society for Neuroscience Abstract* 515.09.

Padoa-Schioppa C. Cai X, (2011). Contribution of orbitofrontal cortex and lateral prefrontal cortex to economic choice and good-to-action transformation. *Symposium on Critical Contribution of Orbitofrontal Cortex to Behavior. The New York Academy of Sciences, 2011.*

Cai X, Padoa-Schioppa C. (2010). Dissociating economic choice from action selection. *Society for Neuroscience Abstract* 813.1

Seo H, Cai X, and Lee D (2009) Computation of value functions based on gains and losses in the cortico-striatal network. Computational and Systems Neuroscience Meeting. Salt Lake City, UT

Cai X, Kim S, and Lee D (2008) Coding of temporally discounted values in the primate striatum during inter-temporal choice. *Society for Neuroscience Abstract* 691.16

Seo H, Cai X, and Lee D (2008) Signals related to gains and losses of conditioned reinforcements in the primate striatum *Society for Neuroscience Abstract* 691.15

Cai X, Kim S, and Lee D (2008) Role of prefrontal cortex and striatum in inter-temporal choice. 2nd Annual Social & Affective Neuroscience Conference, Boston, MA.

Cai X, Shimansky Y. P., Loeb G. E., He J. (2006) Recruitment and tuning of motor cortical neurons during adaptation to perturbations of arm reaching movement in monkeys. *Society for Neuroscience Abstract* 560.12

Cai X., Shimansky Y. P., He J. (2006) Neural Correlates of Difference in Strategy of Adaptation to Force Perturbations. Computational and Systems Neuroscience Meeting. Salt Lake City, UT

Cai X., Shimansky Y.P., He J. (2005) Neural Correlates of Difference in Adaptation Strategy to Force Perturbations. *Society for Neuroscience Abstract* 707.14

Shimansky, Y.P., Cai, X., He, J. (2005) Recruitment and setting of chronically recorded cerebral cortical neurons during adaptation to reach perturbations. *Abstracts of the Fifteenth Annual Meeting of The Neural Control of Movement Society*, 10:E-08.

Cai X., Shimansky Y.P., Weber D.J., He J. (2004) Dissociation between modifications of arm kinematics and motor cortical activity during adaptation to reach perturbations, *Society for Neuroscience Abstract* 263.11

Cai X., Shimansky Y.P., Weber D.J., He J. (2003) Slow Modifications of Neuronal Activity in Primary Motor Cortex during Adaptation to External Force Perturbations of Reaching Movement in Monkeys, *Society for Neuroscience Abstract* 920.11

## INVITED LECTURES

- Oct. 2017 The 13th Biennial Conference of Chinese Neuroscience Society, Suzhou, China
- Jun. 2019 The 1<sup>st</sup> Chinese Computational and Cognitive Neuroscience Conference, Chengdu, China
- Oct. 2017 The 12<sup>th</sup> Biennial Conference of Chinese Neuroscience Society, Tianjin, China
- Nov. 2017 Chinese Biophysics Congress, Shanghai, China
- Aug. 2016 The Brain Cognition and Brain Disease Institute of Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen, China
- Jun. 2017 Cold Spring Harbor Asia Meeting, Primate Neuroscience: From Perception to Cognition & Disease Models, Suzhou, China

Apr. 2016 International Symposium on the Science of Brain Functions, Hong Kong, China  
 Nov. 2014 DongFang Forum, Shanghai, China  
 Nov. 2014 The 4th International Conference on Neuroeconomics and Neuromanagement, Zhejiang, China  
 Mar. 2014 The 14th Kavli Futures Symposium on Neuroeconomics, Shanghai, China  
 Oct. 2013 Center for Neuroeconomics, New York University  
 Jun. 2013 Institute of Cognitive Neuroscience, East China Normal University.  
 Jun. 2013 IDG-McGovern Institute for Brain Research, Beijing Normal University.  
 Jun. 2013 Zhejiang University Interdisciplinary Institute of Neuroscience and Technology, Zhejiang University.  
 May 2013 Institute of Neuroscience, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences.  
 May 2013 Center for Neural Science, New York University.  
 Aug. 2009 Institute of Neuroscience, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences.  
 Aug. 2009 Qiushi Academy for Advanced Studies, Zhejiang University.  
 Jun. 2009 Department of Anatomy & Neurobiology, Washington University in St. Louis.

#### **RESEARCH SUPPORT (ACTIVE)**

Title: Nonhuman primate whole brain connectome and disease models  
 Number: 2018SHZDZX05  
 Role: PI  
 Agency: Shanghai Municipality  
 Duration: 07/2018 – 06/2023  
 Total Amount: RMB 3,740,000 to X. Cai

Title: Encoding of working memory for reward and aversion by orbitofrontal cortex amygdala circuit  
 Number: 91632106  
 Role: PI  
 Agency: National Natural Science Foundation of China  
 Duration: 01/01/2017 – 12/31/2019  
 Total Amount: RMB 600,000

#### **RESEARCH SUPPORT (COMPLETED)**

Title: Neural processes underlying the interplay between affective information and working memory  
 Number: N/A  
 Role: Co-PI with Yixuan Ku  
 Agency: NYU-ECNU Joint Research Institute Seed Grants for Research Collaboration  
 Duration: 03/17/2017 – 03/16/2019  
 Total Amount: RMB 230,000 to X. Cai

Title: Large-scale neuronal activity recording and brain neural network decoding  
 Number: N/A  
 Role: Co-PI (PI: Longnian Lin, ECNU)  
 Agency: Science and Technology Commission of Shanghai Municipality  
 Duration: 07/01/2016 – 06/30/2019  
 Total Amount: RMB 800,000 to X. Cai

Title: Distribution of attribute coding neural ensembles in the orbitofrontal cortex during multi-attribute decision-making  
Number: N/A  
Role: Co-PI with Paul Glimcher  
Agency: New York University Global Seed Grants for Collaborative Research  
Duration: 04/01/2016 – 03/31/2019  
Total Amount: USD 105,000 (fully funded) to X. Cai

Title: Encoding and integration of effort cost by prefrontal cortex – nucleus accumbens circuit  
Number: 31571102  
Role: PI  
Agency: National Natural Science Foundation of China  
Duration: 01/01/2016 – 12/31/2017  
Total Amount: RMB 250,000 (RMB 828,000 requested)

Title: Neural network mechanism and computational principles of cognitive function  
Number: 15JC1400104  
Role: Co-PI (PI Xiao-Jing Wang)  
Agency: Science and Technology Commission of Shanghai Municipality  
Duration: 07/01/2015 – 06/30/2018  
Total Amount: RMB 600,000 to X. Cai

Title: Contribution of the lateral prefrontal cortex to economic choice  
Number: 14JC1404900  
Role: Co-PI with Xiao-Jing Wang  
Agency: Science and Technology Commission of Shanghai Municipality  
Duration: 09/01/2014 – 08/31/2017  
Total Amount: RMB 500,000 to X. Cai

## **TEACHING**

### Undergraduate Course

2015 – NEUR-SHU 201 Introduction to Neural Science  
2016 – NEUR-SHU 261 Neurobiology of Decision Making

### Graduate Course

2018 – NEURL-GA 3042 Special Topics in Neuroscience: Neurobiology of Decision Making

### External Teaching

2016 – Guest lecture, Cognitive Neuroscience II, Master Program of ICN at ECNU  
2015 Guest lecture, Duke Neuroeconomics Program in China, Duke Kunshan  
2015, 2019 Guest lecture, Shanghai Neuroeconomics Summer School, NYU Shanghai

## **MENTORING**

### Post-doctoral Fellows

2017 – present Kuntan Ni, postdoctoral fellow

2015 – 2017 Manyi Yim, postdoctoral fellow, Co-mentor with Xiao-Jing Wang (current position: postdoctoral fellow, UT Austin)

#### Graduate Students

2015 – present Chengze Xu, PhD student (Neural Science, NYU Shanghai track)  
2015 – 2018 Xuetao Xu, Master student (ECNU School of Psychology and Cognitive Science)  
2016 – 2019 Yu Xue, Master student (ECNU School of Psychology and Cognitive Science)  
2016 – present Ziqi Wu, PhD student (ECNU School of Life Sciences), Co-mentor with Aihua Chen  
2017 – present Yalun Peng, PhD student (Neural Science, NYU Shanghai track)

#### Undergraduate Students

2018 Xinyue Chen, undergraduate research assistant (Neural Science, NYU Shanghai)  
2017 Ziyu Zhao, undergraduate research assistant (Neural Science, NYU Shanghai)

#### Other Trainees

2016 – 2017 Chan Xu, research assistant

#### Member of Graduate Thesis Committee

2017 – present Josh Moller-Mara, PhD student (Neural Science, NYU Shanghai track)  
2018 – present Xiaoyue Zhu, PhD student (Neural Science, NYU Shanghai track)

#### Member of Graduate Thesis Defense Committee

2018 Jing Guang, PhD (University of the Chinese Academy of Sciences)  
2018 Cong Zhang, PhD (University of the Chinese Academy of Sciences)  
2018 Gongchen Yu, PhD (University of the Chinese Academy of Sciences)  
2018 Xuefei Yu, PhD (University of the Chinese Academy of Sciences)  
2016 Kuntan Ni, PhD (University of the Chinese Academy of Sciences)

#### Summer Undergraduate Research

2018 Sitan Liu (Sichuan University)

#### Rotation Student

2018 Jintao Gu, PhD student (Neural Science, NYU Shanghai track)

### **SERVICES**

#### Service to the Division and University

2014 – present NYU Shanghai coordinator of “the Shanghai Neuroeconomics Collective”  
2014 Neuroscience Faculty Search Committee  
2015 – present Vice-chair of NYU Shanghai’s Institutional Animal Care and Use Committee  
2017 – 2018 Presentation at NYU Shanghai STEM seminar  
2017 Working Group: Teaching and Learning Center  
2018 Sample Course, Candidate Weekend

### Division Grant Writing

- 2014 Application, Shanghai Key Lab of Computational Neuroscience
- 2015 Major Basic Science Program, Science and Technology Commission of Shanghai Municipality (funded)
- 2015 111 project, jointly funded by Ministry of Education of PRC and State Administration of Foreign Experts Affairs of PRC (funded)

### External Service

- 2015 – 2016 ECNU Institute of Cognitive Neuroscience Master Program Admissions Committee
- 2011 – present Reviewing editor, Frontiers in Decision Neuroscience
- 2016 – present Reviewing editor, Frontiers in Neuroscience