

## Xinying Cai

Assistant Professor of Neural and Cognitive Sciences  
Shanghai New York University

### 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 Engineering

### Academic Positions

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

### Editorial Boards

- 2021 – Editorial Advisory Board Member: *Oxford Open Neuroscience*

### Professional Activities

#### Conference organization

- 2018 Shanghai Neuroeconomics Workshop
- 2021 Symposium (Co-chair): Neural Mechanisms of Decision-making: From Perceptual to Value-based Choices. The 14th Biennial Conference of Chinese Neuroscience Society, Chongqing, China

#### Societies

- Society for Neuroscience
- Society for Neuroeconomics
- Chinese Neuroscience Society
- Sigma Xi, The Scientific Research Society

## Preprints

- 2022 Xu, C., Ni, K., & **Cai, X.** Specialized neuronal modules for economic and single-attribute choice in the orbitofrontal cortex. *under review at Nature Neuroscience*. preprint doi: <https://doi.org/10.1101/2022.07.02.498538>

## Peer Reviewed Articles

- 2022 Wu, Z., Chen, A.<sup>#</sup>, & **Cai, X.**<sup>#</sup> Neuronal response to reward and luminance in Macaque LIP during saccadic choice.<sup>#</sup>, co-corresponding author, Neuroscience Bulletin, *Accepted*.
- 2021 **Cai, X.** The neural instantiation of an abstract cognitive map for economic choice. Neuroscience, Vol. 477:106 - 114.
- 2021 **Cai, X.**<sup>#</sup>, & Padoa-Schioppa, C. Neuronal activity in the dorsal anterior cingulate cortex in economic decisions under variable action costs. eLife, 10:e71695.<sup>#</sup>, corresponding author.
- 2021 Shin, E.J., Jang, Y., Kim, S., Kim, H., **Cai, X.**, Lee, H., Sul, J.H., Lee, S.H., Chung, Y., Lee, D.<sup>#</sup>, & Jung, M.W.<sup>#</sup> Robust and distributed neural representation of action values. eLife 10.<sup>#</sup>, co-corresponding author.
- 2019 Yim, M., **Cai, X.**<sup>#</sup>, & Wang, X.<sup>#</sup> Transforming choice outcome to action plan in monkey lateral prefrontal cortex: a neural circuit model. Neuron 103: 1-13.<sup>#</sup>, co-corresponding author.
- 2019 **Cai, X.**<sup>#</sup>, & Padoa-Schioppa, C. Neuronal evidence for good-based economic decisions under variable action costs. Nature Communications 10(1): 393.<sup>#</sup>, corresponding author.
- 2017 Rustichini, A.<sup>#</sup>, Conen, K.E., **Cai, X.**, & Padoa-Schioppa, C. Optimal coding and neuronal adaptation in economic decisions. Nature Communications 8(1): 1208.<sup>#</sup>, corresponding author.
- 2014 Seo, H., **Cai, X.**, Donahue C.H., & Lee, D. Neural correlates of strategic reasoning during competitive games. Science 346(6207): 340-343.
- 2014 **Cai, X.**, & Padoa-Schioppa, C. Contributions of orbitofrontal and lateral prefrontal cortices to economic choice and the good-to-action transformation. Neuron 81(5): 1140-1151.
- 2013 Maoz, U., Rutishauser U., Kim, S., **Cai, X.**, Lee, D., & Koch, C. Predeliberation activity in prefrontal cortex and striatum and the prediction of subsequent value judgment. Frontiers in Neuroscience 7: 225.
- 2012 Kim, S., **Cai, X.**, Hwang, J., & Lee, D. Prefrontal and striatal activity related to values of objects and locations. Frontiers in Neuroscience 6: 108.
- 2012 **Cai, X.**, & Padoa-Schioppa, C. Neuronal encoding of subjective value in dorsal and ventral anterior cingulate cortex. Journal of Neuroscience 32(11): 3791-3808.
- 2011 Padoa-Schioppa, C., & **Cai, X.** The orbitofrontal cortex and the computation of subjective value: consolidated concepts and new perspectives. Ann N Y Acad Sci 1239: 130-137.

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

### Peer Reviewed Conference Articles

- 2005 **Cai, X.**, Y. Shimansky, Y., & He, J. Learning-induced Dependence of Neuronal Activity in Primary Motor Cortex on Motor Task Condition. Conf Proc IEEE Eng Med Biol Soc 2: 2114-2117.
- 2005 **Cai, X.**, Shimansky, Y.P., Weber, D.J., & He, J. 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.
- 2004 **Cai, X.**, Shimansky, Y.P., Weber, D.J., & He, J. Disassociation between primary motor cortical activity and movement kinematics during adaptation to reach perturbations. Conf Proc IEEE Eng Med Biol Soc 6: 4665-4668.
- 2003 Shimansky, Y.P., **Cai, X.**, Weber, D.J., & He, J. Modifications of motor cortical activity induced by adaptation to movement perturbations as revealed by chronic multielectrode recordings in monkeys. Conf Proc 25<sup>th</sup> Annual International Conference of the IEEE/EMBS. Page(s):1766 – 1769.

### Conference Abstracts

- 2022 Ni, K. & Cai, X. Decoding working memory of economic values from the prefrontal cortex. San Diego, CA: Society for Neuroscience, 2022. Online.
- 2022 Xu, C., Ni, K., & Cai, X. Specialized neuronal modules for economic and single-attribute choice in the orbitofrontal cortex. San Diego, CA: Society for Neuroscience, 2022. Online.
- 2019 Ni, K., Liu, Y., & Cai, X. Prefrontal mechanisms of economic decisions with sequential offers. Program No. 514.23. 2019 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2019. Online.
- 2019 Xu, C., & Cai, X. 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
- 2019 Sun, Y., Cai, X., & Ku, Y. 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.
- 2019 Shin, E., Jang, Y., Kim, S., Kim, H., Cai, X., Lee, D., & Jung, W.M. 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.
- 2018 Wu, Z., Cai, X., & Chen, A. 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.
- 2017 Wu, Z., Cai, X., & Chen, A. 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.
- 2016 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.
- 2011 Cai, X. & Padoa-Schioppa, C. The role of orbitofrontal and lateral prefrontal cortex in economic choice and choice-guided behavior. *Society for Neuroscience Abstract* 515.08.
- 2011 Padoa-Schioppa, C., Cai, X. & McCall, J. Neuronal activity in dorsal and ventral anterior cingulate cortex during economic choice. *Society for Neuroscience Abstract* 515.09.
- 2011 Padoa-Schioppa, C., & Cai, X. 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.*
- 2010 Cai, X., & Padoa-Schioppa, C. Dissociating economic choice from action selection. *Society for Neuroscience Abstract* 813.1
- 2009 Seo, H., Cai, X., & Lee, D. Computation of value functions based on gains and losses in the cortico-striatal network. Computational and Systems Neuroscience Meeting. Salt Lake City, UT
- 2008 Cai, X., Kim, S., & Lee, D. Coding of temporally discounted values in the primate striatum during inter-temporal choice. *Society for Neuroscience Abstract* 691.16
- 2008 Seo, H., Cai, X., & Lee, D. Signals related to gains and losses of conditioned reinforcements in the primate striatum *Society for Neuroscience Abstract* 691.15
- 2008 Cai, X., Kim, S., & Lee, D. Role of prefrontal cortex and striatum in inter-temporal choice. 2nd Annual Social & Affective Neuroscience Conference, Boston, MA.
- 2006 Cai, X., Shimansky, Y.P., Loeb, G.E., & He, J. Recruitment and tuning of motor cortical neurons during adaptation to perturbations of arm reaching movement in monkeys. *Society for Neuroscience Abstract* 560.12
- 2006 Cai, X., Shimansky, Y.P., He, J. Neural Correlates of Difference in Strategy of Adaptation to Force Perturbations. Computational and Systems Neuroscience Meeting. Salt Lake City, UT
- 2005 Cai, X., Shimansky, Y.P., & He, J. (2005) Neural Correlates of Difference in Adaptation Strategy to Force Perturbations. *Society for Neuroscience Abstract* 707.14
- 2005 Shimansky, Y.P., Cai, X., & He, J. 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.
- 2004 Cai, X., Shimansky, Y.P., Weber, D.J., & He, J. Dissociation between modifications of arm kinematics and motor cortical activity during adaptation to reach perturbations, *Society for Neuroscience Abstract* 263.11

- 2003 Cai, X., Shimansky, Y.P., Weber, D.J., & He, J. 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

### Peer Reviewed Book Chapter

- 2016 Seo, H., Kim, S., Cai, X., Donahue, C.H., & 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.

### External Grants

- 2021 – 2026 Cai, X. (PI). Neural mechanisms of value-based decisions. National Science and Technology Innovation 2030 Major Program. ¥ 3,350,000. Total project budget (with PKU) is ¥ 6,000,000.
- 2018 – 2023 Cai, X. (Subproject PI, Principal Scientist: Mu-ming Poo). Functional verification of non-human primate disease models. Shanghai Municipality. Direct cost to Cai is ¥ 3,250,000.
- 2017 – 2019 Cai, X. (PI). Encoding of working memory for reward and aversion by orbitofrontal cortex amygdala circuit. National Natural Science Foundation of China. ¥ 600,000.
- 2016 – 2019 Cai, X (co-PI, PI: Longnian Lin) Large-scale neuronal activity recording and brain neural network decoding. Science and Technology Commission of Shanghai Municipality. Direct cost to Cai ¥ 800,000.
- 2016 – 2017 Cai, X. (PI). Encoding and integration of effort cost by prefrontal cortex – nucleus accumbens circuit. National Natural Science Foundation of China. ¥ 250,000.
- 2015 – 2018 Cai, X (co-PI, PI: Xiao-Jing Wang) Neural network mechanism and computational principles of cognitive function. Science and Technology Commission of Shanghai Municipality. Direct cost to Cai is ¥ 600,000.
- 2014 – 2017 Cai, X (co-PI, PI: Xiao-Jing Wang) Contribution of the lateral prefrontal cortex to economic choice. Science and Technology Commission of Shanghai Municipality. Direct cost to Cai is ¥ 500,000.

### Internal Grants

- 2022 – 2023 Cai, X. (PI). Distributed value working memory in the lateral and orbitofrontal cortices in economic choice. NYU Shanghai Major-Grants Seed Fund. ¥ 400,000.
- 2017 – 2019 Ku, Y and Cai, X (co-PIs). Neural processes underlying the interplay between affective information and working memory. NYU-ECNU Joint Research Institute Seed Grants for Research Collaboration. ¥ 230,000.
- 2016 – 2019 Cai, X and Glimcher, PW (co-PIs) Distribution of attribute coding neural ensembles in the orbitofrontal cortex during multi-attribute decision-making. New

York University Global Seed Grants for Collaborative Research. Direct cost to Cai is \$ 105,000.

## Invited Talks

2022	The Inaugural 2022 Frontal Cortex Gordon Research Conference, Ventura, CA
2022	Tsinghua Laboratory of Brain and Intelligence Seminar Series, Tsinghua University
2022	Neuroeconomics Colloquium, Institute for the Study of Decision Making, NYU
2021	The 14th Biennial Conference of Chinese Neuroscience Society, Chongqing, China
2019	The 13th Biennial Conference of Chinese Neuroscience Society, Suzhou, China
2019	The 1 <sup>st</sup> Chinese Computational and Cognitive Neuroscience Conference, Chengdu, China
2017	The 15 <sup>th</sup> China Biophysics Congress, Shanghai, China
2017	The 12 <sup>th</sup> Biennial Conference of Chinese Neuroscience Society, Tianjin, China
2017	The Brain Cognition and Brain Disease Institute of Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, Shenzhen, China
2017	Cold Spring Harbor Asia Meeting, Primate Neuroscience: From Perception to Cognition & Disease Models, Suzhou, China
2016	International Symposium on the Science of Brain Functions, Hong Kong, China
2014	DongFang Forum, Shanghai, China
2014	The 4th International Conference on Neuroeconomics and Neuromanagement, Zhejiang, China
2014	The 14th Kavli Futures Symposium on Neuroeconomics, Shanghai, China
2013	Center for Neuroeconomics, New York University
2013	Institute of Cognitive Neuroscience, East China Normal University.
2013	IDG-McGovern Institute for Brain Research, Beijing Normal University.
2013	Zhejiang University Interdisciplinary Institute of Neuroscience and Technology, Zhejiang University.
2013	Institute of Neuroscience, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences.
2013	Center for Neural Science, New York University.
2009	Institute of Neuroscience, Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences.
2009	Qiushi Academy for Advanced Studies, Zhejiang University.
2009	Department of Anatomy & Neurobiology, Washington University in St. Louis.

## Teaching

### Courses

2015, 2016, 2017, 2018,	Undergraduate	<i>Introduction to Neural Science</i>	NYU Shanghai
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2019, 2020,  
2021

2016, 2017, 2018, 2019,  
2022 Upper-level undergraduate and junior-level graduate *Neurobiology of Decision Making* NYU Shanghai

#### Guest Lecturer

2015	Duke Neuroeconomics Program in China	Duke Kunshan
2016, 2017, 2018, 2019	Cognitive Neuroscience II	Institute of Cognitive Neuroscience, ECNU
2015, 2019	Shanghai Neuroeconomics Summer School	NYU Shanghai

#### Individual Instructing

Independent and Capstone studies for NYU Shanghai Undergraduate Students  
2021 Yuma Kanazawa

Summer Undergraduate Research Program (SURP) at NYUSH  
2018 Sitan Liu (Sichuan University)  
2019 Yiqing Lin (Peking University)

#### **Mentoring**

##### Post-doctoral Fellows

2017 Kuntan Ni, postdoctoral fellow  
2015 – 2017 Manyi Yim, postdoctoral fellow, Co-mentor with Xiao-Jing Wang (current position: postdoctoral fellow at MIT)

##### Graduate Students

2015 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 – Ziqi Wu, PhD student (ECNU School of Life Sciences), Co-mentor with Aihua Chen  
2017 – 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 PhD Committee

- 2017 – Josh Moller-Mara, PhD student (Neural Science, NYU Shanghai track)  
2018 – 2022 Xiaoyue Zhu, PhD student (Neural Science, NYU Shanghai track)

### Member of PhD Dissertation Committee

- 2020 Siwei Xie, PhD (University of the Chinese Academy of Sciences)  
2019 Han Hou, PhD (University of the Chinese Academy of Sciences)  
2019 Yang Xie, PhD (University of the Chinese Academy of Sciences)  
2018 Chaofei Bao, PhD (East China Normal University)  
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)

### **University and Department Service**

- 2014 – 2018 NYU Shanghai coordinator of “the Shanghai Neuroeconomics Collective”  
2014, 2020 Neuroscience Faculty Search Committee  
2014 – Vice-chair of NYU Shanghai’s Institutional Animal Care and Use Committee  
2017 Working Group: Teaching and Learning Center  
2018 Sample Course, Candidate Weekend  
2020 – 2021 Deputy Graduate Coordinator of Neuroscience  
2021 – Graduate Coordinator of Neuroscience

### **External Service**

#### Grant Reviewing

*National Natural Science Foundation of China (NSFC, China)*

#### Journal Reviewing

*Behavioral and brain functions*

*Behavioural Brain Research*

*Cerebral Cortex*

*eLife*

*Frontiers in Neuroscience*

*Frontiers in Decision Neuroscience*  
*Journal of Experimental Psychology: Animal Learning and Cognition*  
*Journal of Neuroscience*  
*Journal of Neurophysiology*  
*Nature Communications*  
*Nature Neuroscience*  
*Neuron*  
*PLOS Biology*  
*PNAS*  
*Scientific Reports*