Guangyu Robert Yang

Computational Neuroscientist

"What I cannot create, I do not understand."
– Richard Feynman

Professional Position

2021-	**Assistant Professor**, *Department of Brain and Cognitive Sciences and Schwarzman College of Computing*, Massachusetts Institute of Technology.
2018-2021	**Postdoctoral Research Scientist**, *Center for Theoretical Neuroscience*, Columbia University.
2019-	**Co-organizer**, *Computational and Cognitive Neuroscience Summer School*.
2017	**Software Engineering Intern**, Google Brain, Mountain View, CA. Host: David Sussillo
2013–2017	**Research Assistant**, *Center for Neural Science*, New York University.
2011	**Visiting Student Researcher**, *Department of Neurobiology*, Yale University.

Education

2013–2018	**Doctor of Philosophy**, *Center for Neural Science*, New York University. Thesis: Neural circuit mechanisms of cognitive flexibility Advisor: *Xiao-Jing Wang*
2012–2013	**Doctoral Study**, *Interdepartmental Neuroscience Program*, Yale University. Rotation Advisors: *Daeyeol Lee and Mark Laubach*
2008–2012	**Bachelor of Science**, *School of Physics*, Peking University. Thesis: Controlling Chaos in Random Recurrent Neural Networks Advisor: *Junren Shi*.
2010	**Computational and Cognitive Neurobiology Summer School**, *Cold Spring Harbor Asia*.

Selected Awards

2018-2021	Junior Fellow, Simons Society of Fellows
2019	CCN 2019 Trainee Travel Award
2018	Dean's Outstanding Dissertation Award in the Sciences, New York University
2016	Samuel J. and Joan B. Williamson Fellowship, New York University
2013-2016	MacCracken Fellowship, New York University

2011 Benz Scholarship, Peking University

2010 National Scholarship of China, China

2009 University Scholarship, Peking University

2007 Silver Medal, Chinese Physics Olympiad, China

Ongoing work presented at conferences

*=equal contributions

2020 GR Yang*, PY Wang*, Y Sun, A Litwin-Kumar, R Axel, LF Abbott. Evolving the Olfactory System. *CCN 2019* **Oral**, *Cosyne 2020*. *NAIsys 2020*.

2020 S Minni*, L Ji-An*, T Moskovitz, G Lindsay, K Miller, M Dipoppa, GR Yang. Understanding the functional and structural differences across excitatory and inhibitory neurons. *Cosyne 2020*

2020 D Tyulmankov, GR Yang, LF Abbott. Meta-learning Hebbian plasticity for continual familiarity detection. *Cosyne 2020*.

2019 G Lindsay, T Moskovitz, GR Yang, K Miller. Do Biologically-Realistic Recurrent Architectures Produce Biologically-Realistic Models? *CCN 2019*

2019 M Molano-Mazon, GR Yang, A Hermoso-Mendizabal, J de la Rocha. RNNs develop history biases in an expectation-guided two-alternative forced choice task. *CCN 2019*.

2019 M Molano-Mazon, J Pastor-Ciurana, M Fradera, J de la Rocha, A Compte, GR Yang. NeuroGym: A framework for training any model on more than 50 neuroscience paradigms. *CNS 2019*

2019 T Ito, GR Yang, CV Cocuzza, DH Schultz, MW Cole. Predicting motor behavior using neural encoding models during complex cognitive tasks *OHBM 2019*

2019 L Driscoll, GR Yang, K Shenoy, D Sussillo. Recurrent neural networks as a model organism to study multi task decision making. *Cosyne 2019*

Publications

Google scholar page

*=equal contributions

2020 GR Yang, XJ Wang. Artificial Neural Networks for Neuroscientists: A Primer. *Neuron*. (2020) doi.org/10.1016/j.neuron.2020.09.005

2019 GR Yang, MW Cole, K Rajan. How to study the neural mechanisms of multiple tasks. *Current Opinion in Behavioral Sciences*. (2019) doi: 10.1016/j.cobeha.2019.07.001

2019 N Masse, GR Yang, HF Song, XJ Wang, DJ Freedman. A silent and hybrid mnemonic encoding in recurrent neural network models endowed with short-term synaptic plasticity. *Nature Neuroscience*. (2019) 22, 1159-1167

2019 GR Yang, M Joglekar, HF Song, WT Newsome, XJ Wang. Task representations in neural networks trained to perform many cognitive tasks. *Nature Neuroscience*. (2019) 22, 297-306

2018   GR Yang*, I Ganichev*, XJ Wang, J Shlens, D Sussillo. COG: A dataset and architecture for visual reasoning with a working memory. *European Conference on Computer Vision* 2018.

2018   XJ Wang, GR Yang. A disinhibitory circuit motif and flexible information routing in the brain. *Current Opinion in Neurobiology* 2018. doi: 10.1016/j.conb.2018.01.002.

2018   M Joglekar, J Mejias, GR Yang, XJ Wang. Inter-areal balanced amplification enhances signal propagation in a large-scale circuit model of the primate cortex. *Neuron* 2018. doi: 10.1016/j.neuron.2018.02.031

2017   LC Garcia del Molino, GR Yang, J Mejias, XJ Wang. Paradoxical response reversal during top-down modulation in cortical circuits with multiple interneuron types. *eLife* 2017; doi: 10.7554/eLife.29742

2017   Y Kim*, GR Yang*, K Pradhan, KU Venkataraju, M Bota, LC GarcÃŋa del Molino, G Fitzgerald, K Ram, M He, J Levine, P Mitra, ZJ Huang, XJ Wang, P Osten. Brain-wide maps reveal stereotyped cell type-based cortical architecture and subcortical sexual dimorphism. *Cell* 2017. doi:10.1016/j.cell.2018.09.020.

2017   HF Song, GR Yang, XJ Wang. Reward-based training of recurrent neural networks for cognitive and value-based tasks. *eLife* 2017; doi: 10.7554/eLife.21492

2016   GR Yang, JD Murray, and XJ Wang. A dendritic disinhibitory circuit mechanism for pathway-specific gating. *Nature Communications*. 7 (2016). doi: 10.1038/ncomms12815

2016   HF Song*, GR Yang*, and XJ Wang. Training excitatory-inhibitory recurrent neural networks for cognitive tasks: a simple and flexible framework. *PLoS Comput Biol* 12(2) (2016): e1004792. doi:10.1371/journal.pcbi.1004792

Selected Talks

2021   Evolving Neural Networks workshop

2021   Center for Brains, Minds, Machines

2021   Computational Neuroethology seminar, Indiana University

2021   Cognitive Neuroscience Society (CNS) Annual Meeting

2021   Neuroscience meets AI, Junior Scientist Club, Society for Neuroscience

2021   Cross-level seminar, Center for Neural Science, New York University

2020   BSTP Seminar, Yale University

2020   Center for Brain Science, RIKEN

2020   PDP meeting, Princeton University

2020   Neural computations: Learning and dynamics in recurrent networks, Bernstein Conference workshop

2020   CCCN, Chinese Computational and Cognitive Neuroscience Conference

2020   Neurochat, Chinese Association for Psychological & Brain Science

2020   ZIPS seminar, Zuckerman Institute, Columbia University

2020   Sainsbury Wellcome Centre and Gatsby Unit, University College London

2020   Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology

2020	Emerging Neuroscience Symposium, California Institute of Technology
2019	SCGB NY-area Postdoc Meeting, Flatiron Institute
2018	Gatsby Tri-Center Meeting
2018	State-Dependent Neuromodulation of Information Processing, Cosyne workshop
2018	RNNs: What are we doing and why?, Cosyne workshop
2017	PDP meeting, Princeton University
2017	Swartz meeting, Janelia
2017	Center for Theoretical Neuroscience, Columbia University
2017	Cosyne
2015	Center for Neural Science, New York University
2013	Center for Neural Science, New York University
2013	Department of Neurobiology, Yale University

Teaching

2018	Methods in Computational Neuroscience, Marine Biological Laboratory, Woods Hole, MA, USA Teaching assistant.
2016	Mathematical Tools for Cognitive and Neural Science, NYU Teaching assistant.
2014, 2016	Computational and Cognitive Neuroscience Summer School, China Teaching assistant. Developed various tutorials, and advised student projects.

Research Mentorship

2019-	Danil Tyulmankov, graduate student in the group of Larry Abbott.
2018	Sun Minni, undergraduate student at Peking University, through an internship at Columbia University,
2017	Li Ji-An, graduate student at University of Science and Technology of China, through an internship in the group of Xiao-Jing Wang.
2015	Siyuan Li, undergraduate student at East China Normal University, through an internship in the group of Xiao-Jing Wang.

Reviewer

Nature Neuroscience, Nature Computational Science, Nature Communications, eLife, Journal of Neuroscience, PLOS Computational Biology, Current Opinion in Neurobiology, Neural Networks, Chaos, Frontiers in Neuroscience, JMLR (Journal of Machine Learning Research), NeurIPS (Conference on Neural Information Processing Systems), ICLR (International Conference on Learning Representations), ICML (International Conference on Machine Learning), Cosyne (Computational and Systems Neuroscience), CCN (Conference on Cognitive Computational Neuroscience), CNS (Organization for Computational Neurosciences)

Science outreach

2021	Leadership alliance program at Columbia University
2021	A practical guide to using Recurrent Neural Networks for cognitive neuroscience. Organized by MIT Brain and Cognitive Sciences department
2020	Open Talk on Artificial Neural Networks for Neuroscientists. Organized by Open-Science
2019	Late Night Science presentation to non-scientist audience. Organized by Columbia University Neuroscience Outreach
2018	BRAINYAC (Brain Research Apprenticeships in New York at Columbia) mentor. Co-mentored Jerel Vazquez, high school student

University/Departmental Service

2018-2020	Co-organizer of *Recent Advances in Neural Networks* Journal Club, Zuckerman Institute, Columbia University
2018	Co-initiator of *Axon* GPU cluster, Zuckerman Institute, Columbia University
2015	Co-chair of Retreat Planning Committee, Center for Neural Science, New York University