Hannah Choi

Homepage: https://hannahchoi.math.gatech.edu /
E-mail: hannahch@gatech.edu
Address: Georgia Institute of Technology
School of Mathematics
686 Cherry Street
Atlanta, GA 30332-0160 USA

EDUCATION

Northwestern University — Evanston, IL
Ph.D. in Applied Mathematics — September 2014

Thesis title: Modeling of Oscillations and Bursting in Retinal AII Amacrine Cells
Advisors: Hermann Riecke, Ph.D. and William Kath, Ph.D.

Northwestern University — Evanston, IL
M.S. in Applied Mathematics (en route) — June 2010

University of California, Berkeley — Berkeley, CA
B.A. in Applied Mathematics — December 2007

RESEARCH & ACADEMIC POSITIONS

Primary Appointments

Assistant Professor — January 2021– Present
School of Mathematics
Georgia Institute of Technology, Atlanta, GA

Postdoctoral Fellow — June 2017– December 2020
Department of Applied Mathematics
University of Washington, Seattle, WA
Advisors: Eric Shea-Brown, Ph.D. and Stefan Mihalas, Ph.D.

Washington Research Foundation Innovation Postdoctoral Fellow in Neuroengineering — December 2014 – June 2017
Department of Applied Mathematics, Department of Biological Structure, and Institute for Neuroengineering
University of Washington, Seattle, WA
Advisors: Eric Shea-Brown, Ph.D., Wyeth Bair, Ph.D., Anitha Pasupathy, Ph.D.

Secondary Appointments

Adjunct Assistant Professor — April 2022– Present
Wallace H. Coulter Department of Biomedical Engineering
Georgia Institute of Technology, Atlanta, GA

Courtesy Appointment — January 2022– Present
School of Biological Sciences
Georgia Institute of Technology, Atlanta, GA

Program/Affiliated/Training Faculty — January 2021– Present
Quantitative Biosciences, Machine Learning, and Computational Sciences & Engineering PhD Programs
GT Neuro, Neural Engineering Center, and Computational Neural Engineering Training Program

Georgia Institute of Technology, Atlanta, GA

Visiting Scientist June 2017 – December 2020
Allen Institute for Brain Science, Seattle, WA

Simons Berkeley Research Fellow January 2018 – May 2018
Simons Institute for the Theory of Computing
University of California, Berkeley, CA
(Awarded a semester-long fellowship for "The Brain and Computation" program)

AWARDS & GRANTS

Major Awards and Grants

- **Current**

DoD Multidisciplinary University Research Initiative (MURI) (9/30/2022 - 9/30/2027)
Air Force Office of Scientific Research, Department of Defense
- FA9550-22-1-0315
- Title: FLAP- Fast, Lexicographic Agile Perception Integrates Decision
- and Control in a Spike-Resolved, Sensorimotor Program
- Role: Co-PI, with Simon Sponberg (lead PI), Jeff Riffell, Vahid Tarokh, Silvia Ferrari, Jamie Theobald

Alfred P. Sloan Research Fellowship (9/15/2022 - 9/15/2024)
Alfred P. Sloan Foundation
- Role: PI & Awardee

NIH K99/R00 BRAIN Initiative Career Transition Award (9/1/2019 – 12/31/2024)
National Eye Institute (NEI)-- National Institutes of Health (NIH)
- K99/R00 EY030840
- Title: Bridging structure, dynamics, and information processing in brain networks
- Role: PI

- **Completed**

Seed Grant: Forming Teams (7/1/2022 - 12/31/2022)
Georgia Institute of Technology
- Title: Bayesian learning for interpretable neural connectivity
- Role: Co-PI, with Anqi Wu (lead PI)

Patrick J McGovern Research Fellowship + Simons-Berkeley Research Fellowship (Spring 2018)
Simons Institute for the Theory of Computing, University of California, Berkeley
- Research fellowship for the semester-long program “The Brain and Computation” at the Simons Institute for the Theory of Computing, University of California, Berkeley

Washington Research Foundation (WRF) Innovation Postdoctoral Fellowship (2014-2017)
Washington Research Foundation & University of Washington Institute for Neuroengineering

Walter P. Murphy Fellowship (2009-2010)
Northwestern University

Summer Integrative Cancer Biology Program (ICBP) Fellowship (2007)

National Cancer Institute (NCI)

Selected Smaller Awards

- **IDEaS 2022-23 Seminar Series/Workshop Grant** (Spring 2023)
  The Institute for Data Engineering and Science (IDEaS), Georgia Tech
  Proposal on "Computational and Mathematical Approaches to Theoretical Neuroscience", with Debankur Mukherjee & Siva Theja Maguluri
- **Cosyne Presenters Travel Grant** (2018)
- **Modeling Neural Activity (MONA2) Conference Travel Award** (2016)
- **Conference Travel Grant** (2013), *The Graduate School, Northwestern University*

Competitively Allocated Resources

Allen Institute for Brain Science, OpenScope (2018)
Testing Models of Predictive Coding in Mouse Visual Cortex
Role: Co-PI with Marina Garrett, Nicholas Cain, and Rylan Larsen

PUBLICATIONS

In pipeline

A. Balwani, S. Cho, **H. Choi**, "Exploring the architectural biases of the canonical cortical microcircuit", in preparation

Preprints & Submitted/Under Review for Publication

2023, J. Del Rosario, S. Coletta[+], S. H. Kim[+], Z. Mobille, K. Peelman, B. Williams, A. J. Otsuki, A. Del Castillo Valerio, K. Worden, L. T. Blanpain, L. Lovell, **H. Choi**, B. Haider*, "Lateral inhibition in V1 controls neural and perceptual contrast sensitivity", *under review*
Preprint version (2023): bioRxiv: doi.org/10.1101/2023.11.10.566605

2023, D. Tang*, J. Zylberberg[+], X. Jia[+], **H. Choi**[+], "Stimulus-dependent functional network topology in mouse visual cortex", *under review*
Preprint version (2023): bioRxiv: doi.org/10.1101/2023.07.03.547364

2023, D.G. Wyrick, N. Cain, R.S. Larsen, J. Lecoq, M. Valley, R. Ahmed, J. Bowlus, G. Boyer, S. Caldejon, L. Casal, M. Chvilicek, M. DePartee, P.A.Groblewski, C. Huang, K. Johnson, I. Kato, J. Larkin, E. Lee, E, Liang, J. Luviano, K. Mace, C. Nayan, T. Nguyen, M. Reding, S. Seid, J. Sevigny, M. Stoecklin, A. Williford, **H. Choi***[+], M. Garrett*[+], L. Mazzucato*[+], "Differential encoding of temporal context and expectation under representational drift across hierarchically connected areas", *under review*
Preprint version (2023): bioRxiv: doi.org/10.1101/2023.06.02.543483

2023, C. Li, S.H. Kim, C. Rodgers, **H. Choi**, A. Wu*, "One-hot generalized linear model for switching brain state discovery", *under review*
Preprint version (2023): arXiv:2310.15263 [q-bio.NC]

2023, A. Sharafeldin*, N. Imam[+], **H. Choi**[+], "Active sensing with predictive coding and uncertainty minimization", *under review*
Preprint version (2023): arXiv:2307.00668 [cs.LG]

Published Papers

2023, F. Shirani*, **H. Choi**, "On the physiological and structural contributors to the overall balance of excitation and inhibition in local cortical networks", *Journal of Computational Neuroscience* [online ahead of print]

DOI: 10.1007/s10827-023-00863-x
Preprint version (2023): bioRxiv: doi.org/10.1101/2023.01.10.523489

2023, U.B. Sikandar*, **H. Choi**, J. Putney, H. Yang, S. Ferrari, S. Sponberg, "Predicting visually modulated precisely-timed spikes across a coordinated and comprehensive motor program", *International Joint Conference on Neural Networks (IJCNN)* :1–8
DOI: 10.1109/IJCNN54540.2023.10191280

2021, J.H. Siegle*[+], X. Jia*[+], S. Durand, S. Gale, C. Bennett, N. Graddis, G. Heller, T. Ramirez, **H. Choi**, J.A. Luviano, …, S.R. Olsen*[++], C. Koch[++], "Survey of spiking in the mouse visual system reveals functional hierarchy", *Nature* 592:86–92
DOI: 10.1038/s41586-020-03171-x
Preprint version (2019): bioRxiv: doi.org/10.1101/805010

2019, J.A. Harris*[+], S. Mihalas[+], K.E. Hirokawa, J.D. Whitesell, **H. Choi**, …, C. Koch, H. Zeng, "Hierarchical organization of cortical and thalamic connectivity", *Nature* 575:195-202
DOI: 10.1038/s41586-019-1716-z

2019, **H. Choi***, S. Mihalas, "Synchronization dependent on spatial structures of a mesoscopic whole-brain network", *PLOS Computational Biology* 15(4): e1006978
DOI: 10.1371/journal.pcbi.1006978
Preprint version (2018): bioRxiv: dx.doi.org/10.1101/319830

2018, **H. Choi***, A.Pasupathy, E. Shea-Brown, "Predictive coding in area V4: dynamical shape discrimination under partial occlusion", *Neural Computation* 30(5):1209–1257 [**Featured cover article**]
DOI: 10.1162/neco_a_01072
Preprint version (2016): arXiv:1612.05321 [q-Bio.NC] & PubMed version (2018)

2017, A.M. Fyall[+], Y. El-Shamayleh[+], **H. Choi**, E. Shea-Brown, A. Pasupathy*, "Dynamic representation of partially occluded objects in primate prefrontal and visual cortex", *eLife* 6:e25784
DOI: 10.7554/eLife.25784

2014, **H. Choi**, L. Zhang, M.S. Cembrowski, C.F. Sabottke, A.L. Markowitz, D.A. Butts, W.L. Kath, J.H. Singer*, and H. Riecke*, "Intrinsic bursting of AII amacrine cells underlies oscillations in rd1 mouse retina", *Journal of Neurophysiology* 112: 1491-1504
DOI: 10.1152/jn.00437.2014

2010, W-S. Jung, K.S. Lee, J.S. Park, **H. Choi**, M.Y. Choi*, "Sleepless in Seoul: The Ant and the Metrohopper", *Journal of the Korean Physical Society* 57(4):823
DOI: 10.3938/jkps.57.823
Preprint version (2010): arXiv:1010.1165

2010, M.Y. Choi*, **H. Choi**, J.-Y. Fortin, J. Choi, "Reply to the comment by A. Gadomski", *Europhysics Letter* 89: 40003
DOI: 10.1209/0295-5075/89/40003

2009, M.Y. Choi*, **H. Choi**, J.-Y. Fortin, J. Choi, "How skew distributions emerge in evolving systems", *Europhysics Letter* 85: 30006
DOI: 10.1209/0295-5075/85/30006

Peer-reviewed Conference Abstracts

2023, A. Balwani, **H. Choi**, "Exploring the architectural biases of the canonical cortical microcircuit" *Cosyne Abstracts 2023*, Montreal, Canada (Selected for a talk, 3.2% acceptance rate)

2023, J. Del Rosario, S. H. Kim, Z. Mobille, K. Peelman, S. Coletta, B. Williams, A. Del Castillo Valerio, **H. Choi**, B. Haider, "Distinct transformations of perceptual sensitivity by inhibitory neuron subtypes in V1" *Cosyne Abstracts 2023*, Montreal, Canada

2023, U. Sikandar, **H. Choi**, J. Putney, H. Yang, S. Ferrari, S. Sponberg, "Predicting sensory modulation of precise spike timing for motor control" *Cosyne Abstracts 2023*, Montreal, Canada

2022, D. Wyrick, **H. Choi**, M. Garrett, L. Mazzucato, N. Cain, R. Larsen, M. Valley, J. Lecoq, "Differential encoding of temporal context and expectation across the visual hierarchy" *Cosyne Abstracts 2022*, Lisbon, Portugal

2020, **H. Choi**, M. Garrett, R. Larsen, N. Cain, "Unraveling the neural circuitry of predictive coding in mouse visual cortex" *Cosyne Abstracts 2020*, Denver USA

2018, **H. Choi**, S. Mihalas, "Spatially constrained model of a mesoscopic whole-brain connectivity: insights from network dynamics", *Cosyne Abstracts 2018*, Denver USA

2017, **H. Choi**, A. Pasupathy, E. Shea-Brown, "Predictive coding in area V4 as a mechanism for recognition of partially occluded shapes", *Cosyne Abstracts 2017*, Salt Lake City USA

2016, **H. Choi**, A. Pasupathy, E. Shea-Brown, "Predictive coding in area V4 and prefrontal cortex explains dynamic discrimination of partially occluded shapes", *BMC Neuroscience*, 17 (Supple 1): P64
DOI: 10.1186/s12868-016-0283-6

2015, **H. Choi**, A. Khachatryan, C. LePre, E. Kaplan, Q. Zaidi, Y. Xiao, "Neural circuitry of brightness induction: modeling and physiology", *Journal of Vision* 15(12):638
DOI: 10.1167/15.12.638

2013, H. Riecke, **H. Choi**, M.S. Cembrowski, W.L. Kath, J.H. Singer, "Spikelets and bursts in axonless retinal AII amacrine cells coupled by gap junctions", *BMC Neuroscience*, 14 (Supple 1): 364
DOI: 10.1186/1471-2202-14-S1-P364

2013, H. Riecke, **H. Choi,** W.L. Kath, M.S. Cembrowski, J.H. Singer, **"**Spiking and bursting in gap-junction coupled axonless retinal amacrine cells", *The 8th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena*: *Computation and Theory*

Datasets & Software

2023, J. A. Lecoq, M. Garrett, **H. Choi**, L. Mazzucato, D. Wyrick, "Allen institute OpenScope -Differential encoding of temporal context and expectation (version 0.230602.2022) [data set]", *DANDI archive*.
DOI: 10.48324/dandi.000488/0.230602.2022

Theses

2014, **H. Choi**, "Modeling of Oscillations and Bursting in Retinal AII Amacrine Cells", PhD Thesis, Department of Engineering Sciences and Applied Mathematics, Northwestern University

* indicates corresponding author.
+,++ indicate equal contribution.
Underline indicates advisees in my group.

RESEARCH PRESENTATIONS

Invited Talks

"Predictive coding in cortical networks", *Data-Enabled Science Seminar*, Department of Mathematics, University of Houston, Houston, TX. Feb 9, 2024 [Scheduled]

"Visual coding shaped by anatomical and functional connectivity structures", *Workshop on "Neural Coding and Combinatorics", Math + Neuroscience: Strengthening the Interplay Between Theory and Mathematics Program*, The Institute for Computational and Experimental Research in Mathematics (ICERM), Brown University, Providence, RI. Oct 30-Nov 3, 2023 [Scheduled]

"Encoding of noisy sensory information in biological neural networks", *Session on "Application of Monte Carlo Methods to Real-World Problems", 2023 Association for Women in Mathematics (AWM) Research Symposium*, Clark Atlanta University, Atlanta, GA. Oct 1, 2023

"Neural computations in data-driven networks", *NanoFANS Forum- Bridging Biology & Nanotechnology*, Institute for Electronics and Nanotechnology, Georgia Institute of Technology, Atlanta, GA. June 22, 2023

"Differential encoding of sensory information across cortical micro-circuitry", *IDEaS on the Future of AI and Data-Enabled Discovery in Science and Engineering*, Georgia Institute of Technology, Atlanta, GA. February 23, 2023

"Differential encoding of sensory information across cortical micro-circuitry", *CDSNS colloquium*, School of Mathematics, Georgia Institute of Technology, Atlanta, GA. January 27, 2023

"Multi-scale complexity in anatomical and functional cortical networks", *NSF Collaborative Research in Computation Neuroscience (CRCNS) PI Meeting*, Georgia Institute of Technology, Atlanta, GA. October 27-28, 2022

"Linking structure and computation of data-driven brain networks", *Mathematical Biology Seminar Series*, The Center for Mathematical Biology, University of Pennsylvania, Philadelphia, PA. October 25, 2022

"Robust information representation in hierarchical networks of the visual cortex", *Optical Fall Vision Meeting, Session on "Neural network models of the visual system"* University of Rochester, Rochester, NY. October 20-23, 2022

"Linking structure and computation of data-driven brain networks", *CTN Seminar Series*, The Center for Theoretical Neuroscience (CTN), Columbia University, New York City, NY. September 9, 2022

"Linking structure and computation of data-driven brain networks", *2022 Georgia Scientific Computing Symposium*, Georgia Institute of Technology, Atlanta, GA. February 19, 2022

"Hierarchical structure and computation of multi-regional mouse cortical networks", *Dynamical Principles of Biological and Artificial Neural Networks (Online)*, Banff International Research Station for Mathematical Innovation and Discovery, Banff, AB., Canada. January 10, 2022 (Virtual)

"Linking Structure and Computation of Data-driven Brain Networks", *Biological Sciences Seminar*, School of Biological Sciences, Georgia Institute of Technology, Atlanta, GA. November 18, 2021

"Structure and computation of data-driven brain networks", *Research Horizons*, School of Mathematics, Georgia Institute of Technology, Atlanta, GA. October 13, 2021

"Linking structure and computation of data-driven brain networks", *Georgia Tech QBioS Summer Share*, Georgia Institute of Technology, Atlanta, GA. June 4, 2021 (Virtual)

"Hierarchical structure and computation of data-driven neuronal networks", *Georgia Tech Neuro Seminar Series*, Georgia Institute of Technology, Atlanta, GA. April 5, 2021 (Virtual)

"Hierarchical structure and computation of data-driven neuronal networks", *Mathematical Biology Seminars*, School of Mathematics, Georgia Institute of Technology, Atlanta, GA. March 19, 2021 (Virtual)

"Hierarchical structure and computation of brain networks", *Mathematics Colloquia and Seminars*, Department of Mathematics, University of California, Davis, CA. April 27, 2020 (Virtual)

"Hierarchical structure and computation of brain networks", Department of Neuroscience, Washington University School of Medicine, St. Louis, MO. Feb 10, 2020

"Hierarchical structure and computation of brain networks", Division of Biological Sciences and Halıcıoğlu Data Science Institute, University of California, San Diego, CA. Jan 21, 2020

"Hierarchical structure and computation of brain networks", Department of Mathematics, Boston University, Boston, MA. Jan 14, 2020

"Hierarchical structure and computation of brain networks", Departments of Mathematics & Biology, University of Oregon, Eugene, OR. Dec 12, 2019

"Inferring computation from structure in neuronal networks", School of Mathematics, Georgia Institute of Technology, Atlanta, GA. Dec 5, 2019

"Data-driven models of the mouse mesoscale connectome: network structure and functionality", Course: Modeling the brain and its pathologies, *International School of Brain Cells & Circuits "Camillo Golgi"*, Ettore Majorana Foundation and Centre for Scientific Culture, Erice, Italy. August 27- September 1, 2019

"Inferring functionality form network structure of the mouse mesoscale connectome", *The Brain and Computation Reunion Workshop*, Simons Institute for the Theory of Computing, University of California, Berkeley, CA. June 17, 2019

"Bridging structure and computation of brain networks at multiple scales", Gatsby Computational Neuroscience Unit, University College London, London, United Kingdom. May 23, 2019

"Bridging structure and computation of brain networks at multiple scales", Department of Biomedical Engineering, University of Southern California, Los Angeles, CA. May 6, 2019

"Bridging structure, dynamics, and computation in brain networks", Department of Computer Science, University of California, Santa Barbara, CA. January 17, 2019

"Bridging structure, dynamics, and computation in brain networks", Department of Mathematics, University of Pittsburgh, Pittsburgh, PA. December 6, 2018

"Bridging structure, dynamics, and computation in brain networks", Department of Cell Biology & Anatomy and Hotchkiss Brain Institute, University of Calgary, Calgary, Alberta, Canada. November 8, 2018

"Predictive coding in visual cortical area V4 as a mechanism for shape discrimination under partial occlusion", *Swartz Meeting*, Janelia Research Campus, Ashburn, VA. July 23-26, 2017

"Predictive coding explains discrimination of occluded shapes in an intermediate visual cortical area", *Applied Mathematics Thursday Seminars*, University of Washington, Seattle, WA. May 19, 2016

"Dynamical shape discrimination in visual and frontal cortex", *Neural Computation and Engineering Connection*, University of Washington, Seattle, WA. January 29, 2016

"Modeling of oscillations and bursting in retinal AII amacrine cells", *SUNY Eye Institute 6th Annual Meeting*, Syracuse, NY. September 27-28, 2014

"Bursting and oscillations in retinal AII amacrine cells", *Chicago Area SIAM Student Conference*, Evanston, IL, April 5, 2014

Other Presentations (not listed under "Peer-reviewed Conference Abstracts")

Other Talks

"Data-Driven Models of the Mouse Mesoscale Connectome: Network Structure and Functionality" as part of session "Physical-Based Modeling and Machine Learning for Biological and Environmental Sciences" with M. Zahr, F. Xia, K. Champion, J. Z. Bai, and Z. Xu, *SIAM Conference on Parallel Processing for Scientific Computing 2020*, Seattle, WA. February 12-15, 2020 🔗 [Invited to a session]

"OpenScope: a community-driven brain observatory", Team Talk with Jerome Lecoq, Yazan Billeh, Josh Larkin and Joel Zylberberg. *Allen Institute Showcase*, Allen Institute for Brain Science, Seattle, WA. November 12, 2019

"Network structure and dynamics of a mesoscopic mouse whole-brain connectome" as part of Minisymposium "Artificial Intelligence and Neuroscience: From Neural Dynamics to Artificial Agents" with M. Sahani, O. Costilla Reyes, L. Duncker, J. Glaser, A.Nayebi, and A. Banino, *Society for Neuroscience (SfN)*, Chicago, IL. October 19-23, 2019 🔗 [Invited to a minisymposium]

"The Mouse Mesoscale Connectome: Data-driven Models and Organization of Cortical Networks", Team Talk with Julie Harris, Jennifer Whitesell, Stefan Mihalas, and Kameron Harris. *Allen Institute Showcase*, Allen Institute for Brain Science, Seattle, WA. December 4, 2018

"Predictive coding in visual cortical area V4", *Brain & Computation Seminar*, Simons Institute for the Theory of Computing, University of California, Berkeley, CA. April 4, 2018.

"Predictive coding in visual cortical area V4: a mechanism for shape recognition under partial occlusion", *Brain Dynamics on Multiple Scales - Paradigms, their Relations, and Integrated Approaches (International Workshop)*, Max-Planck Institute for Physics of Complex Systems, Dresden, Germany. June 19-23, 2017

"Intrinsically bursting AII amacrine cells drive oscillations in the degenerated rd1 retina", Mini-symposium presentation, *SIAM Annual Meeting*, Chicago, IL. July 7-11, 2014

Other Poster Presentations

A. Balwani, S. Cho, **H. Choi**, "Connectivity-dependent information representation in the canonical cortical microcircuit", *The 9th Annual BRAIN Initiative Investigators Meeting*, Bethesda, MD. June 12-13, 2023

A. Balwani, **H. Choi**, "Context encoding in a neural network model based on the canonical cortical microcircuit", *The 8th Annual BRAIN Initiative Investigators Meeting*, June 21-22, 2022 (Virtual)

N. Cain, **H. Choi**, M. Garrett, R. Larsen, J. Lecoq, L. Mazzucato, M. Valley, D. Wyrick, "Neural circuitry of predictive coding in mouse visual cortex", *The 7th Annual BRAIN Initiative Investigators Meeting*, June 15-17, 2021 (Virtual)

H. Choi, S. Mihalas, E. Shea-Brown, "Linking structure and computation in mouse cortical network", *The 6th Annual BRAIN Initiative Investigators Meeting*, June 1-2, 2020 (Virtual)

H. Choi, K.E. Hirokawa, J.D. Whitesell, N. Graddis, C. Koch, H. Zeng, J.A. Harris, S. Mihalas, "Unsupervised construction of a data-driven cortical hierarchy in mouse", *Society for Neuroscience (SfN) Annual Meeting*, Chicago, IL. October 19-23, 2019

H. Choi, I. Magrans de Abril, B. Hu, S. Mihalas, "Uncovering network generation rules from large scale connectivity measurements", *Society for Neuroscience (SfN) Annual Meeting*, Chicago, IL. October 19-23, 2019

H. Choi, K.E. Hirokawa, J.D. Whitesell, N. Graddis, C. Koch, H. Zeng, J.A. Harris, S. Mihalas, "Unsupervised construction of a data-driven cortical hierarchy in mouse", *Swartz Meeting,* Janelia Research Campus, Ashburn, VA. July 21-24, 2019

H. Choi, A. Pasupathy, E. Shea-Brown, "Predictive coding in area V4: dynamic discrimination of partially occluded shapes", *Modeling Neural Activity (MONA2) Meeting*, Waikoloa, HI. June 22-24, 2016

H. Choi, A. Fyall, E. Shea-Brown, A. Pasupathy, "Neural mechanisms of shape discrimination under partial occlusion: a circuit model of V4 and prefrontal cortex", *Society for Neuroscience (SfN) Annual Meeting*, Chicago, IL. October 20, 2015

H. Choi, A. Fyall, E. Shea-Brown, A. Pasupathy, "Shape discrimination under partial occlusion: a dynamical model of V4-prefrontal cortex network", *Computational Vision Summer School (CVSS),* Freudenstadt, Germany. July 28-August 4, 2015

H. Choi, M.S. Cembrowski, J.H. Singer, W.L. Kath, H. Riecke, "Intrinsically bursting AII amacrine cells drive oscillations both in wildtype and rd1 retina", *Society for Neuroscience (SfN) Meeting,* San Diego, CA. Nov 13-15, 2013

H. Choi, L.M. Heiser, P. T. Spellman,"Firefly analysis of 51 breast cancer cell lines", *NCI Integrative Cancer Biology Program Steering Committee Meeting,* Washington DC. November 13-14, 2007

Co-authored, Presented by Others

D. Tang, X. Jia, J. Zylberberg, **H. Choi**, "Stimulus-driven network complexity of neuronal activities", *Society for Neuroscience (SfN) Meeting,* San Diego, CA. November 12-16, 2022 (Virtual, Poster)

S. Cho, A. Balwani, **H. Choi**, "Leveraging Predictive Coding to Improve Artificial Neural Network Performance", *Collaborative Research in Computation Neuroscience (CRCNS) PI Meeting 2022,* Atlanta, GA. October 27-28, 2022 (Poster)

Z. Mobille, **H. Choi**, "Informational dynamics and decodability in spiking neural networks with biologically-motivated structure", *Collaborative Research in Computation Neuroscience (CRCNS) PI Meeting 2022,* Atlanta, GA. October 27-28, 2022 (Poster)

U.B.Sikandar, **H. Choi**, S. Ferrari, S. Sponberg, "Predicting coordinated and precise motor spikes from a sensory stimulus", *Collaborative Research in Computation Neuroscience (CRCNS) PI Meeting 2022,* Atlanta, GA. October 27-28, 2022 (Poster)

J.H. Siegle, X. Jia, … **H. Choi**, … S.R. Olsen, C. Koch, "A large-scale, standardized survey of spiking activity across the mouse visual system", *Society for Neuroscience (SfN) Meeting,* Chicago, IL. October 19-23, 2019 (Poster)

A. Fyall, **H. Choi**, E. Shea-Brown, A. Pasupathy, "Primate prefrontal cortex and the representation of partially occluded shapes", *Society for Neuroscience (SfN) Meeting,* San Diego, CA. November 12-16, 2016 (Poster)

A. Pasupathy, A. Fyall, **H. Choi**, "Discriminating partially occluded shapes: insights from visual and frontal cortex", *Computational and Systems Neuroscience (Cosyne) Meeting,* Salt Lake City, UT. March 5-8, 2015 (Poster)

H. Riecke, **H. Choi**, L. Zhang, M.S. Cembrowski, W.L. Kath, J.H. Singer, "Intrinsic bursting of AII amacrine cells underlies oscillations in the rd1 mouse retina", *Nonlinear dynamics and stochastic methods: from neuroscience to other biological applications,* Pittsburgh, PA. March 10-12, 2014 (Poster)

H. Choi, M.S. Cembrowski, L. Zhang, W.L. Kath, H Riecke, J. Demb, J.H. Singer, "Intrinsic bursting and oscillations in the rod pathway of the retina", *Collaborative Research in Computation Neuroscience (CRCNS) PI Meeting 2013,* Cambridge, MA. June 9- June 11, 2013 (Poster)

PRESS COVERAGE

- "School of Physics Uses Moths and Origami Structures for Innovative Defense Research", April 18, 2022.
- "Hannah Choi and Henry S. La Pierre Named Sloan Fellows", February 16, 2022.
- "Allen Institute maps out a high-resolution 'org chart' for connections in the brain", GeekWire. October 30, 2019.
- "A model for how the brain stays in sync", May 28, 2019.
- "OpenScope: The First Shared Observatory for Neuroscience", July 26, 2018.
- "OpenScope gives neuroscientists time on Allen Institute's telescope for the brain", GeekWire. July 26, 2018.
- "Brain at work: spotting half-hidden objects", September 19, 2017.

RESEARCH ADVISING

Postdocs

Farshad Shirani, Postdoc in the School of Mathematics (July 2021 – May 2023)
Georgia Institute of Technology, Atlanta, GA
- Subsequent position: Visiting Assistant Professor (postdoc) in the School of Mathematics, Georgia Tech

Soon Ho Kim, Postdoc in the School of Mathematics (January 2022 - Present)
Georgia Institute of Technology, Atlanta, GA

Graduate Students

Disheng Tang, PhD student in Quantitative Biosciences (May 2021 – May 2022)
Georgia Institute of Technology, Atlanta, GA
- Subsequent position: PhD student in Xiaoxuan Jia's group at Tsinghua University

Aishwarya Balwani, PhD student in Electrical & Computer Engineering (May 2021 - Present)
Co-advised with Chris Rozell
Georgia Institute of Technology, Atlanta, GA

Abdelrahman Sharafeldin, PhD student in Machine Learning- BME (August 2021 - Present)
Georgia Institute of Technology, Atlanta, GA

Zachary Mobille, PhD student in Quantitative Biosciences- School of Mathematics (January 2022 - Present)
InQuBATE Training Fellow & CNTP Scholar
Georgia Institute of Technology, Atlanta, GA

Graduate Rotation Students

Nikolas McNeal, PhD student in Machine Learning- School of Mathematics (Fall 2023 - Present)
Georgia Institute of Technology, Atlanta, GA

Qiuyang (Alex Yang) Wang, PhD student in Computational Science and Engineering- School of Biological Sciences (Fall 2023 - Present)
Georgia Institute of Technology, Atlanta, GA

Undergraduate Students

Richard Snell, undergraduate major in Applied and Computational Mathematical Sciences
AMATH 499 Undergraduate Reading and Research Course Advisor (March 2017 - June 2017)
University of Washington, Seattle, WA

Suhee Cho, undergraduate visiting student from KAIST, major in Bio & Brain Engineering
MATH 4699 Undergraduate Research Course Advisor (January 2022 – December 2022)
Georgia Institute of Technology, Atlanta, GA
- Subsequent position: Undergraduate student at KAIST

Brittany Ahn, undergraduate student, major in Neuroscience with a minor in Mathematics
MATH 4699 Undergraduate Research Course Advisor (January 2023 – May 2023)
Georgia Institute of Technology, Atlanta, GA
- Subsequent position: Undergraduate student at Georgia Tech

Eric Li, undergraduate student, major in Mathematics
MATH 2699/4699 Undergraduate Research Course Advisor (January 2023 – Present)
Georgia Institute of Technology, Atlanta, GA

Connor White, undergraduate student, major in Biomedical Engineering
BMED 4699 Undergraduate Research Course Advisor (August 2023 – Present)
Georgia Institute of Technology, Atlanta, GA

PhD Thesis Committee Member

Joy Putney (QBioS PhD, 2021; Thesis defense 9/22/2021; Advisor: Simon Sponberg; Georgia Institute of Technology)
Usama Sikandar (Electrical Engineering 2022-Present; Thesis proposal 4/21/2022; Advisor: Simon Sponberg; Georgia Institute of Technology)
Brianna Karpowicz (Biomedical Engineering 2022-Present; Thesis proposal 10/6/2022; Advisor: Chethan Pandarinath; Emory University & Georgia Institute of Technology)
Andrew Sedler (Machine Learning-Biomedical Engineering PhD, 2023; 2022-2023; Thesis proposal 9/14/2022 & Thesis defense 4/12/2023; Advisor: Chethan Pandarinath; Georgia Institute of Technology)
Leo Wood (QBioS 2022-Present; Thesis proposal 9/21/2022; Advisor: Simon Sponberg; Georgia Institute of Technology)
Chengrui Li (CSE 2022-Present; Oral Qualifier 12/7/2022; Advisor: Anqi Wu; Georgia Institute of Technology)
Aran Komatsuzaki (Machine Learning-Mathematics 2022-Present; Thesis proposal 12/5/2022; Advisor: Heinrich Matzinger; Georgia Institute of Technology)
Zehui Zhao (Physics 2023-Present; Oral Qualifier 4/4/2023; Advisor: Ilya Nemenman; Emory University)
Hymavathy Balasubramanian (Neuroscience 2023-Present; First Committee Meeting 8/17/2023; Advisor: Malavika Murugan; Emory University)
Lisa Meyer-Baese (Biomedical Engineering 2023-Present; Advisors: Shella Keilholz and Dieter Jaeger; Emory University & Georgia Institute of Technology)
Jorge Quesada Pacora (Machine Learning-ECE 2023-Present; Advisor: Ghassan AlRegib; Georgia Institute of Technology)

TEACHING EXPERIENCE

Graduate & Undergraduate Courses

Instructor

Georgia Institute of Technology Atlanta, GA
School of Mathematics
- Courses:
- MATH 1552 Integral Calculus (undergraduate level) Spring 2021
- MATH 4320 Complex Analysis (undergraduate level) Spring 2022
- MATH 8803 Neuronal Dynamics and Networks (graduate special topics) Fall 2022, Spring 2024
- MATH 4541 Dynamics and Bifurcations I (undergraduate level) Fall 2023

University of Washington Seattle, WA
Department of Applied Mathematics January 2017 - June 2017
- Courses:
- AMATH 402/502 Introduction to Dynamical Systems and Chaos (undergraduate & graduate levels) Winter 2017
- AMATH 575 Dynamical Systems (graduate level) Spring 2017

Teaching Assistant

Northwestern University Evanston, IL
Department of Mathematics September 2010 - June 2012, September 2013 - June 2014
- Courses:
- MATH 224 Integral Calculus of One Variable Functions
- MATH 230 Differential Calculus of Multivariable Functions
- MATH 234 Multiple Integration and Vector Calculus
- MATH 381 Fourier Analysis and Boundary Value Problems (undergraduate level)

Department of Engineering Sciences and Applied Mathematics September 2012 - June 2013
- Courses:
- Engineering Analysis 4 - Differential Equations and Boundary Value Problems: computing and modeling
- MATH 234 Multiple Integration and Vector Calculus (undergraduate level)

Drop-in Physics Tutor

University of California, Berkeley Berkeley, CA
Student Learning Center August 2005 - May 2008
- Tutored at academic help sessions for undergraduates in introductory physics courses

Workshops & Invited lectures

Guest Speaker/Lecturer

Quantitative Biosciences Seminar (Instructor: William Ratcliff) September 28, 2023
Georgia Institute of Technology, Atlanta GA October 5, 2022
October 6, 2021

M@th Hub workshop seminar series: Overcoming the Computational Complexity of Large Dynamical Systems with Parallel Computations (Instructor: Jorge Gonzalez) November 18, 2022
Georgia Institute of Technology, Atlanta GA

MATH 4801 Undergraduate Seminar (Instructor: Hunter Lehmann & Enid Steinbart) September 26, 2022
Georgia Institute of Technology, Atlanta GA

Quantitative Biosciences Career Seminar November 2, 2021
Georgia Institute of Technology, Atlanta GA

Computation and the Brain (Instructor: Santosh Vempala) April 12, 2021
College of Computing,
Georgia Institute of Technology, Atlanta GA

Mathematical Modeling Course (Instructor: Braden Brinkman) May 12, 2016
Department of Applied Mathematics,
University of Washington, Seattle WA

Teaching Assistant November 11, 2016
Data Science and Data Skills for Neuroscientists
Organized by Konrad Kording (Northwestern) & Alyson Fletcher (UCLA)
Society for Neuroscience, San Diego, CA

SEMESTER-LONG OR SUMMER PROGRAMS

The Brain and Computation January- May 2018
Simons Institute for the Theory of Computing, UC Berkeley Berkeley, CA

Computational Vision Summer School July 28- August 4, 2015
Bernstein Center for Computational Neuroscience Tübingen Freudenstadt, Germany

Berkeley summer course in mining and modeling of neuroscience data July 6-17, 2015
Redwood Center for Theoretical Neuroscience, UC Berkeley Berkeley, CA

UNDERGRADUTE RESEARCH EXPERIENCE

Research Assistant, Visiting Student July 2008 - June 2009
Harvard University Cambridge, MA
School of Engineering and Applied Sciences
Advisor: Donhee Ham, Ph.D.

ICBP Summer Undergraduate Research Fellow, Student Research Assistant June 2007 - May 2008
Lawrence Berkeley National Laboratory Berkeley, CA
Life Sciences Division
Advisors: Paul Spellman, Ph.D., Joe Gray, Ph.D.
Postdoc mentors: Laura Heiser, Ph.D., Jatinder Arora, Ph.D.
**Awarded a Summer Integrative Cancer Biology Program (ICBP) Fellowship from the National Cancer Institute (NCI/NIH)*

PROFESSIONAL MEMBERSHIPS

Society for Industrial and Applied Mathematics (SIAM), Society for Neuroscience (SfN), Vision Sciences Society (VSS), Organization for Computational Neuroscience (OCNS)

PROFESSIONAL SERVICES

Editorial Board
- Associate Editor, Science Advances (2023-Present)

Referee
- Journals: Nature, Journal of Neuroscience, Cell Reports, Science Advances, PLOS Computational Biology, Neural Computation, Network Neuroscience, IEEE Design & Test, SIAM Undergraduate Research Online, PLOS One, Frontiers in Computational Neuroscience (Review Editor)
- Conferences: Computational and Systems Neuroscience (Cosyne; 2018, 2019, 2020, 2023), Cognitive Computational Neuroscience (CCN; 2017, 2018, 2019), NeurIPS Workshop "Information-Theoretic Principles in Cognitive Systems" (2022)
- Grants & programs review panels: NSF Collaborative Research in Computational Neuroscience (CRCNS) 2023 review panelist

Conference & Seminar Organizing
- Program Committee Member, 2024 Computational and Systems Neuroscience Meeting (Cosyne)

- Co-organizer of the GT Neuro Seminar, Georgia Institute of Technology (2022-Present)
- Organizer of the GT Joint Computational Neuroscience Journal Club, Georgia Institute of Technology (2021-Present)
- Co-organizer of the IDEaS Themed Seminar Series: "Computational and Mathematical Approaches to Theoretical Neuroscience", Georgia Institute of Technology (Spring 2023)
- Co-organizer of the Boeing Distinguished Speaker Series in Applied Mathematics at the University of Washington (2015- 2019)
- Co-organizer of the Computational Neuroscience Seminar Series at the University of Washington (2016 - 2018)

Institute & Department Committee Work

- Graduate Committee Member, Quantitative Biosciences Program, Georgia Institute of Technology (2022-Present)
- DEI Committee Member, School of Mathematics, Georgia Institute of Technology (2023-Present)
- Graduate Committee Member, School of Mathematics, Georgia Institute of Technology (2021-2023)

OUTREACH & BROADER IMPACT

Collaborative undergraduate research mentoring activity

- In collaboration with the Department of Mathematics at Spelman College, undergraduate students selected through Spelman's undergraduate research mentoring program (Math RaMP) participate in the journal club organized by Hannah Choi at Georgia Tech.

Faculty member, School of Mathematics DEI Committee, Georgia Institute of Technology (2023-Present)
Faculty speaker, Computational Science Activity/Mentoring Group Welcome Event (May 7, 2023, link)
Scientific committee member, M@th Hub workshop seminar series: Overcoming the Computational Complexity of Large Dynamical Systems with Parallel Computations, School of Mathematics, Georgia Institute of Technology (Fall 2022, link)
Guest discussion panelist, a summer immersion group of high school students organized by Girls Who Code (July 19, 2017)
Amnesty International Urgent Action Network (2001- 2019)
Volunteer tutor, Martin Luther King Junior High School, Berkeley, CA (August 2005 - May 2006)