Aran Nayebi

website: https://anayebi.github.io/
Google Scholar Profile

EDUCATION

Doctor of Philosophy, Neuroscience 2016-2022
Stanford University
Cumulative GPA: 4.04/4.0

Master of Science, Computer Science 2015-2017
Stanford University
Concentration: Artificial Intelligence
Cumulative GPA: 4.05/4.0

Bachelor of Science, Mathematics 2011-2015
Stanford University
Cumulative Major GPA: 3.94/4.0
Secondary Major: Symbolic Systems Concentration: Applied Logic

RESEARCH INTERESTS

Computational Neuroscience; Artificial Intelligence; Deep Learning; Computational Cognitive Science

AWARDS

2024 Burroughs Wellcome Fund Career Awards at the Scientific Interface (BWF CASI)
2023 NIH Early Independence Award Finalist (top 2 candidates from all of MIT)
2020 Top 10% Reviewer for Neural Information Processing Systems (NeurIPS)
2017-2020 Stanford Mind, Brain, Computation, and Technology (MBCT) Graduate Trainee
2017 Hertz Foundation Finalist
2015 NSF Graduate Research Fellowship (NSF GRFP)
2014 Barry M. Goldwater Scholarship
2014 Phi Beta Kappa Honors Society
2012 Stanford Undergraduate Advising & Research (UAR) Small Grant Recipient
2011-2015 Launcelot J. Gamble Undergraduate Scholarship

RESEARCH POSITIONS

Assistant Professor, Machine Learning Department,
Carnegie Mellon University (CMU) 2024-Present

- The goal of my lab, the NeuroAgents lab, is to work at the intersection of neuroscience & AI to reverse-engineer animal intelligence and build the next generation of autonomous agents. Learn more here.
- *Additional affiliations:* Neuroscience Institute (core faculty), Robotics Institute (courtesy).

K. Lisa Yang Integrative Computational Neuroscience (ICoN) Postdoctoral Fellow,
McGovern Institute for Brain Research,
Massachusetts Institute of Technology (MIT) 2022-2024
PIs: Dr. Guangyu Robert Yang and Dr. Mehrdad Jazayeri

- Understanding the neural mechanisms of mental simulation and long-range planning by building and evaluating goal-driven networks against macaque electrophysiological responses and human behavioral responses.

- Showed that dynamically-equipped self-supervised video foundation models that predict the future state of their environment in latent spaces that can support a wide range of downstream Embodied AI tasks, align most closely with human error patterns and macaque frontal cortex neural dynamics.

Neurosciences Ph.D. Candidate, Stanford University 2016-2022
PIs: Dr. Daniel L. K. Yamins and Dr. Surya Ganguli

- Developed models and techniques from deep learning and large-scale data analysis to build the (currently) most accurate, mechanistic models of neural circuits across species (rodents and macaques) and modalities (sensory and non-sensory).
- Used goal-driven models to study the role of recurrent processing in the primate ventral visual pathway; mouse visual processing; biological learning; and heterogeneity in rodent medial entorhinal cortex (MEC).

Computer Science Masters Student, Stanford University 2015-2016
PI: Dr. Stephen A. Baccus

- Helped develop the first high-fidelity model of the retinal response to natural scenes.
- Showed that deep learning approaches outperformed prior classic models of the retina that were geared towards more structured stimuli.

Mathematics Undergraduate Student, CURIS Program, Stanford University 2014-2015
PI: Dr. Virginia V. Williams

- Developed the current fastest quantum algorithms for shortest path problems.

Mathematics Undergraduate Student, CURIS Program, Stanford University 2013-2014
PI: Dr. Luca Trevisan

- Developed new lower bound techniques to prove lower bounds for advised quantum computations.
- Proved a fundamental limit on all quantum computers in speeding up the solution of certain cryptographic problems.

Mathematics Undergraduate Student, Stanford University 2012-2013
PIs: Dr. Solomon Feferman and Dr. Grigori Mints

- Developed a novel method to concisely derive Diophantine equations that are logically equivalent to number-theoretic ones.
- Published an article in the philosophy of computing on physical limitations of previously proposed hypercomputers.

PUBLICATIONS (*: joint first author)

1. Q. Simeon, L. Venâncio, M.A. Skuhersky, **A. Nayebi**, E.S. Boyden, G.R. Yang. "Scaling Properties for Artificial Neural Network Models of a Small Nervous System". *IEEE Southeastcon 2024*. 1-9.

2. **A. Nayebi**, R. Rajalingham, M. Jazayeri, G.R. Yang. "Neural foundations of mental simulation: future prediction of latent representations on dynamic scenes". *Advances in Neural Information Processing Systems (NeurIPS)*, Volume 36 (2023): 70548–70561. **(Selected for spotlight presentation, top 3% of all submissions)**
3. **A. Nayebi***, N.C.L. Kong*, C. Zhuang, J.L. Gardner, A.M. Norcia, D.L.K. Yamins. "Mouse visual cortex as a limited resource system that self-learns an ecologically-general representation". *PLOS Computational Biology*, Volume 19 (2023): 1-36.
4. N. Maheswaranathan*, L.T. McIntosh*, H. Tanaka*, S. Grant*, D.B. Kastner, J.B. Melander, **A. Nayebi**, L. Brezovec, J. Wang, S. Ganguli, S.A. Baccus. "Interpreting the retinal neural code for natural scenes: from computations to neurons". *Neuron*, Volume 111 (2023): 2742-2755.
5. K. Hermann, **A. Nayebi**, S. van Steenkiste, M. Jones. "For human-like models, train on human-like tasks". Commentary in *Behavioral and Brain Sciences* 2023; 46:e394.
6. **A. Nayebi**, J. Sagastuy-Brena, D.M. Bear, K. Kar, J. Kubilius, S. Ganguli, D. Sussillo, J.J. DiCarlo, D.L.K. Yamins. "Recurrent connections in the primate ventral visual stream mediate a tradeoff between task performance and network size during core object recognition". *Neural Computation*, Volume 34 (2022): 1652-1675.
7. **A. Nayebi**, A. Attinger, M.G. Campbell, K. Hardcastle, I.I.C. Low, C.S. Mallory, G.C. Mel, B. Sorscher, A.H. Williams, S. Ganguli, L.M. Giocomo, D.L.K. Yamins. "Explaining heterogeneity in medial entorhinal cortex with task-driven neural networks". *Advances in Neural Information Processing Systems (NeurIPS)*, Volume 34 (2021): 12167-12179. **(Selected for spotlight presentation, top 3% of all submissions)**
8. J.B. Melander*, **A. Nayebi***, B.C. Jongbloets, D.A. Fortin, M. Qin, S. Ganguli, T. Mao, H. Zhong. "Distinct *in vivo* dynamics of excitatory synapses onto cortical pyramidal neurons and inhibitory interneurons". *Cell Reports*, Volume 37 (2021): 1-10.
9. C. Zhuang, S. Yan, **A. Nayebi**, M. Schrimpf, M.C. Frank, J.J. DiCarlo, D.L.K. Yamins. "Unsupervised neural network models of the ventral visual stream". *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, Volume 118 (2021): 1-11.
10. **A. Nayebi***, S. Srivastava*, S. Ganguli, D.L.K. Yamins. "Identifying learning rules from neural network observables". *Advances in Neural Information Processing Systems (NeurIPS)*, Volume 33 (2020): 2639-2650. **(Selected for spotlight presentation, top 3% of all submissions)**
11. D.M. Bear, C. Fan, D. Mrowca, Y. Li, S. Alter, **A. Nayebi**, J. Schwartz, L. Fei-Fei, J. Wu, J.B. Tenenbaum, D.L.K. Yamins. "Learning physical graph representations from visual scenes". *Advances in Neural Information Processing Systems (NeurIPS)*, Volume 33 (2020): 6027-6039. **(Selected for oral presentation, top 1% of all submissions)**
12. D. Kunin*, **A. Nayebi***, J. Sagastuy-Brena*, S. Ganguli, J. Bloom, D.L.K. Yamins. "Two routes to scalable credit assignment without weight symmetry". *Proceedings of the 37th International Conference on Machine Learning (ICML)*, PMLR 119 (2020): 5511-5521.
13. J. Kubilius*, M. Schrimpf*, K. Kar, R. Rajalingham, H. Hong, N.J. Majaj, E.B. Issa, P. Bashivan, J. Prescott-Roy, K. Schmidt, **A. Nayebi**, D.M.

Bear, D.L.K. Yamins, J.J. DiCarlo. "Brain-like object recognition with high-performing shallow recurrent ANNs". *Advances in Neural Information Processing Systems (NeurIPS)*, Volume 32 (2019): 12805-12816. **(Selected for oral presentation, top 1% of all submissions)**

14. H. Tanaka, **A. Nayebi**, N. Maheswaranathan, L.T. McIntosh, S.A. Baccus, S. Ganguli. "From deep learning to mechanistic understanding in neuroscience: the structure of retinal prediction". *Advances in Neural Information Processing Systems (NeurIPS)*, Volume 32 (2019): 8537-8547.
15. **A. Nayebi***, D.M. Bear*, J. Kubilius*, K. Kar, S. Ganguli, D. Sussillo, J.J. DiCarlo, D.L.K. Yamins. "Task-driven convolutional recurrent models of the visual system". *Advances in Neural Information Processing Systems (NeurIPS)*, Volume 31 (2018): 5290-5301.
16. P.S. Javangula, K. Modarresi, P. Shenoy, Y. Liu, **A. Nayebi**. "Efficient hybrid algorithms for computing clusters overlap". *Procedia Computer Science*, Volume 108 (2017): 1050-1059.
17. L.T. McIntosh*, N. Maheswaranathan*, **A. Nayebi**, S. Ganguli, S.A. Baccus. "Deep learning models of the retinal response to natural scenes". *Advances in Neural Information Processing Systems (NIPS)*, Volume 29 (2016): 1369-1377.
18. **A. Nayebi** and V.V. Williams. "Quantum algorithms for shortest paths problems in structured instances". 17th Annual Southwest Quantum Information and Technology (SQuInT) Workshop (2015): 1-15.
19. **A. Nayebi**, S. Aaronson, A. Belovs, L. Trevisan. "Quantum lower bound for inverting a permutation with advice". *Quantum Information & Computation*, Volume 15 (2015): 901-913.
20. **A. Nayebi**. "Exponential prefixed polynomial equations". *Bulletin of Symbolic Logic*, Volume 20 (2014): 252.
21. **A. Nayebi**. "Practical intractability: a critique of the hypercomputation movement". *Minds and Machines*, Volume 24 (2014): 275-305.
22. **A. Nayebi**. "Fast matrix multiplication techniques based on the Adleman-Lipton model". *International Journal of Computer Engineering Research*, Volume 3 (2012): 10-19. **(Published while in high school)**
23. **A. Nayebi**. "Upper bounds on the solutions to $n = p + m^2$". *Bulletin of the IMS*, Volume 37 (2011): 95-108. **(Published while in high school)**

INVITED TALKS

1. *Using embodied AI for "why" questions in systems neuroscience*. Carnegie Mellon University (CMU) Neuroscience Institute (NI) Retreat, National Aviary. 4 December 2024. Pittsburgh, PA.
2. *Model improvements from reverse-engineering natural intelligence*. Theory & Practice of Foundation Models Workshop. Google Research. 15 November 2024. Mountain View, CA.
3. *Neural foundations of mental simulation*. Society for Neuroscience (SfN) 2024. Nanosymposium on Computational Models. 9 October 2024. Chicago, IL.
4. *A relationship between predictive neural models and high-dimensional embodied control*. Collective Motions of Animals and Robots 2024. 30 May 2024. Cargèse, FR.

5. *Neural foundations of mental simulation: future prediction of latent representations on dynamic scenes*. IEEE International Conference on Development and Learning (ICDL) 2024. (invited as a lightning talk). 22 May 2024. Austin, TX.
6. *A task-optimized approach to systems neuroscience*. Flagship Pioneering Intelligence. 25 April 2024. Cambridge, MA.
7. *Task-optimized models of the brain*. Carnegie Mellon University, Machine Learning Department, School of Computer Science. 16 April 2024. Pittsburgh, PA. (Later video re-recording here: `https://www.youtube.com/watch?v=fE5wRn9Rwgo`)
8. *A task-optimized approach to systems neuroscience*. University of Pennsylvania Departments of Bioengineering & Computer and Information Science (CIS) Seminar. 4 April 2024. Philadelphia, PA.
9. *Task-optimized dynamical models of the brain*. Harvard Department of Applied Mathematics & Kempner Institute for the Study of Natural and Artificial Intelligence. 20 February 2024. Cambridge, MA.
10. *Goal-driven models of physical understanding*. CS 375/Psych 249 Guest Lecture, Stanford University. 13 February 2024. Stanford, CA.
11. *Bridging neural dynamics to goal-directed behavior across species and timescales*. Harvard Center for Brain Science (CBS) & Kempner Institute for the Study of Natural and Artificial Intelligence. 16 January 2024. Cambridge, MA.
12. *Bridging neural dynamics to goal-directed behavior across timescales*. Cognition, Brain, & Behavior Seminar. Harvard Department of Psychology & Kempner Institute for the Study of Natural and Artificial Intelligence. 30 November 2023. Cambridge, MA.
13. *Using embodied AI to help answer "why" questions in systems neuroscience*. Robert J. and Nancy D. Carney Institute for Brain Science, Brown University. 4 October 2023. Providence, RI.
14. *Using embodied AI to help answer "why" questions in systems neuroscience*. Center for Brains, Minds and Machines (CBMM) Research Meeting, Massachusetts Institute of Technology (MIT). 19 September 2023. Cambridge, MA.
15. *We probably need a new idea...or two?*. Conference on Cognitive Computational Neuroscience (CCN) GAC 2023, Oxford University. 25 August 2023. Oxford, UK.
16. *Neural foundations of mental simulation: future prediction of latent representations on dynamic scenes*. Massachusetts Institute of Technology (MIT) Brain and Cognitive Sciences (BCS)/McGovern Institute for Brain Research (MIBR)/Picower Institute for Learning and Memory (PILM) Retreat. 4 June 2023. North Falmouth, MA.
17. *Principled, goal-driven models to investigate structure and function in neural circuits*. Yale Wu Tsai Institute (WTI) Symposium: Computation and Cognition. 6 March 2023. New Haven, CT.
18. *Principled, goal-driven models to investigate structure and function in neural circuits*. Harvard Medical School (HMS) & Kempner Institute for the Study of Natural and Artificial Intelligence. 23 February 2023. Cambridge, MA.
19. *Principled, goal-driven models to investigate structure and function in neural circuits*. Cold Spring Harbor Laboratory (CSHL). 14 December 2022. Virtual.

20. *Mouse visual cortex as a limited resource system that self-learns an ecologically-general representation*. World Wide NeuRise (WWNeuRise). 2 November 2022. Virtual.
21. *A goal-driven approach to systems neuroscience*. PhD Dissertation Defense, Stanford University. 15 March 2022. Stanford, CA.
22. *Explaining heterogeneity in medial entorhinal cortex with task-driven neural networks*. Neural Information Processing Systems (NeurIPS) 2021 Spotlight Presentation. 9 December 2021. Virtual.
23. *Explaining heterogeneity in medial entorhinal cortex with task-driven neural networks*. Neuromatch 4.0 Flash Talk. 1 December 2021. Virtual.
24. *Explaining heterogeneity in medial entorhinal cortex with task-driven neural networks*. Stanford Computational Neuroscience Journal Club (CNJC). 17 November 2021. Stanford, CA.
25. *A model-based approach towards identifying the brain's learning algorithms*. Stanford Mind, Brain, Computation, and Technology Seminar. 25 January 2021. Virtual.
26. *Identifying learning rules from neural network observables*. Neural Information Processing Systems (NeurIPS) 2020 Spotlight Presentation. 10 December 2020. Virtual.
27. *Identifying learning rules from neural network observables*. Neuromatch 3.0. 29 October 2020. Virtual.
28. *Assessing the role of feedback connections in artificial and biological neural networks*. Stanford Mind, Brain, Computation, and Technology Seminar. 18 May 2020. Virtual.
29. Presented with J. Sagastuy-Brena. *Two routes to scalable credit assignment without weight symmetry*. International Conference on Machine Learning (ICML) 2020. 12-18 July 2020. Virtual.
30. *Task-driven convolutional recurrent neural network models of dynamics in higher visual cortex*. Society for Neuroscience (SfN) 2019. Minisymposium on Artificial Intelligence and Neuroscience. 21 October 2019. Chicago, IL.
31. *Task-driven recurrent models & dissecting neural computations in silico*. Bernstein Conference 2019. Brain against the Machine Workshop. 18 September 2019. Berlin, Germany.
32. Presented with J.B. Melander. *Deep networks and the brain: simile or metaphor?* Stanford Computational Neuroscience Journal Club (CNJC). 17 April 2019. Stanford, CA.
33. *Measuring and modeling the weight dynamics of many synapses onto diverse cell-types in vivo*. Computational and Systems Neuroscience (COSYNE) 2019. Talk T-36. 3 March 2019. Lisbon, Portugal.
34. *Convolutional recurrent neural network models of dynamics in higher visual cortex*. Vision Sciences Society (VSS) Meeting 2018. 21 May 2018. St. Pete Beach, FL.
35. *Convolutional recurrent neural network models of neural dynamics in the ventral visual stream*. Stanford Psychology FriSem. 7 March 2018. Stanford, CA.
36. *Lower bounds for advised quantum computations*. Stanford Mathematical Logic Seminar. 20 May 2014. Stanford, CA.
37. *On the elimination of the bounded universal quantifier for Diophantine predicates*. Stanford Mathematical Logic Seminar. 22 January 2013. Stanford, CA.

38. *Interactive paradigms of computation*. Stanford Mathematical Logic Seminar. 24 April 2012. Stanford, CA.

INVITED PANELIST

1. RagaAI Webinar. "The Future of GenAI - Agentic Frameworks and More". 11 September 2024. Online.
2. International Conference on Learning Representations (ICLR) 2024 Workshop on Representational Alignment. 11 May 2024. Vienna, AT.
3. Cognitive Computational Neuroscience (CCN) 2023 Generative Adversarial Collaboration (GAC) 2. "Comparing Artificial and Biological Networks: Are We Limited by Tools, Hypotheses or Data?" 25 August 2023. Oxford, UK.
4. Machine Learning AI Clubhouse. "Brain Simulation: What it means". 15 April 2021. Online.
5. Society for Neuroscience (SfN) 2019. Minisymposium on Artificial Intelligence and Neuroscience. 21 October 2019. Chicago, IL.

POSTERS

1. L. Kozachkov, Q. Simeon, E.S. Boyden, G.R. Yang, **A. Nayebi**. *Deciphering neural-glial mechanisms of intrinsic motivation in larval zebrafish with artificial embodied agents*. IEEE International Conference on Development and Learning (ICDL) 2024. Poster #116. 22 May 2024. Austin, TX.
2. I. Thobani, J. Sagastuy-Brena, **A. Nayebi**, R. Cao, D. Yamins. *Inter-animal transforms as a guide to model-brain comparison*. International Conference on Learning Representations (ICLR) 2024 Workshop on Representational Alignment. Poster, invited for contributed talk. 11 May 2024. Vienna, AT.
3. **A. Nayebi**, R. Rajalingham, M. Jazayeri, G.R. Yang. *Neural foundations of mental simulation: future prediction of latent representations on dynamic scenes*. Neural Information Processing Systems (NeurIPS) 2023. Poster #417. 14 December 2023. New Orleans, LA.
4. **A. Nayebi**, R. Rajalingham, M. Jazayeri, G.R. Yang. *Neural mechanisms of mental simulation in primate frontal cortex*. Conference on Cognitive Computational Neuroscience (CCN) 2023, Oxford University. Poster #P-1B.114. 24 August 2023. Oxford, UK.
5. **A. Nayebi***, N.C.L. Kong*, C. Zhuang, J.L. Gardner, A.M. Norcia, D.L.K. Yamins. *Mouse visual cortex as a limited-resource system that self-learns a task-general representation*. Computational and Systems Neuroscience (COSYNE) 2023. Poster III-002. 11 March 2023. Montreal, Canada.
6. J. Sagastuy-Brena*, I. Thobani*, **A. Nayebi**, R. Cao, D.L.K. Yamins. *Inter-animal transforms as a guide to model-brain comparison*. Computational and Systems Neuroscience (COSYNE) 2023. Poster III-022. 11 March 2023. Montreal, Canada.
7. J. Sagastuy-Brena*, I. Thobani*, **A. Nayebi**, R. Cao, D.L.K. Yamins. *Modelling inter-animal variability*. Conference on Cognitive Computational Neuroscience (CCN) 2022. Poster #P-1.35. 25 August 2022. San Francisco, CA.
8. **A. Nayebi**, A. Attinger, M.G. Campbell, K. Hardcastle, I.I.C. Low, C.S. Mallory, G.C. Mel, B. Sorscher, A.H. Williams, S. Ganguli, L.M. Giocomo, D.L.K. Yamins. *Explaining heterogeneity in medial entorhinal cortex with task-driven neural networks*. Neural Information Processing Systems (NeurIPS) 2021. Poster #F0. 9 December 2021. Virtual.

9. **A. Nayebi***, S. Srivastava*, S. Ganguli, D.L.K. Yamins. *Identifying learning rules from neural network observables*. Computational and Systems Neuroscience (COSYNE) 2021. Poster I-116. 24 February 2021. Virtual.
10. **A. Nayebi***, S. Srivastava*, S. Ganguli, D.L.K. Yamins. *Identifying learning rules from neural network observables*. Neural Information Processing Systems (NeurIPS) 2020. Poster #1568. 10 December 2020. Virtual.
11. D.M. Bear, C. Fan, D. Mrowca, Y. Li, S. Alter, **A. Nayebi**, J. Schwartz, L. Fei-Fei, J. Wu, J.B. Tenenbaum, D.L.K. Yamins. *Learning physical graph representations from visual scenes*. Neural Information Processing Systems (NeurIPS) 2020. Poster #131. 7 December 2020. Virtual.
12. D. Kunin*, **A. Nayebi***, J. Sagastuy-Brena*, S. Ganguli, J. Bloom, D.L.K. Yamins. *Two routes to scalable credit assignment without weight symmetry*. International Conference on Machine Learning (ICML) 2020. 14 July 2020. Virtual.
13. H. Tanaka, **A. Nayebi**, N. Maheswaranathan, L.T. McIntosh, S.A. Baccus, S. Ganguli. *From deep learning to mechanistic understanding in neuroscience: revealing computational mechanisms of retinal prediction via model reduction*. Computational and Systems Neuroscience (COSYNE) 2020. Poster III-62. 29 February 2020. Denver, CO.
14. J. Kubilius*, M. Schrimpf*, K. Kar, R. Rajalingham, H. Hong, N.J. Majaj, E.B. Issa, P. Bashivan, J. Prescott-Roy, K. Schmidt, **A. Nayebi**, D.M. Bear, D.L.K. Yamins, J.J. DiCarlo. *Brain-like object recognition with high-performing shallow recurrent ANNs*. Neural Information Processing Systems (NeurIPS) 2019. Poster #190. 12 December 2019. Vancouver, Canada.
15. H. Tanaka, **A. Nayebi**, N. Maheswaranathan, L.T. McIntosh, S.A. Baccus, S. Ganguli. *From deep learning to mechanistic understanding in neuroscience: the structure of retinal prediction*. Neural Information Processing Systems (NeurIPS) 2019. Poster #152. 11 December 2019. Vancouver, Canada.
16. C. Zhuang, S. Yan, **A. Nayebi**, D.L.K. Yamins. "Self-supervised neural network models of higher visual cortex development". *Conference on Cognitive Computational Neuroscience (CCN)* 2019: 566-569.
17. M. Schrimpf, K. Kar, P. Bashivan, **A. Nayebi**, J.J. DiCarlo, J. Kubilius, H. Hong, N.J. Majaj, R. Rajalingham, E.B. Issa, D.M. Bear, J. Prescott-Roy, JK. Schmidt, D.L.K. Yamins. *Using brain-score to evaluate and build neural networks for brain-like object recognition*. Computational and Systems Neuroscience (COSYNE) 2019. Poster III-61. 2 March 2019. Lisbon, Portugal.
18. **A. Nayebi***, D.M. Bear*, J. Kubilius*, K. Kar, S. Ganguli, D. Sussillo, J.J. DiCarlo, D.L.K. Yamins. *Task-driven convolutional recurrent models of the visual system*. Neural Information Processing Systems (NeurIPS) 2018. Poster #20. 4 December 2018. Montreal, Canada.
19. **A. Nayebi***, J. Kubilius*, D.M. Bear, S. Ganguli, J.J. DiCarlo, D.L.K. Yamins. *Convolutional recurrent neural network models of dynamics in higher visual cortex*. Computational and Systems Neuroscience (COSYNE) 2018. Poster III-83. 3 March 2018. Denver, CO.
20. N. Maheswaranathan*, L.T. McIntosh*, D.B. Kastner, L. Brezovec, **A. Nayebi**, S. Ganguli, S.A. Baccus. *Deep models of retinal responses to natural scenes generalize to diverse structured stimuli*. Computational and Systems Neuroscience (COSYNE) 2018. Poster III-8. 3 March 2018. Denver, CO.

21. L.T. McIntosh*, N. Maheswaranathan*, **A. Nayebi**, S. Ganguli, S.A. Baccus. *Deep learning models of the retinal response to natural scenes*. Neural Information Processing Systems (NIPS) 2016. Poster #150. 5 December 2016. Barcelona, Spain.
22. L.T. McIntosh*, N. Maheswaranathan*, **A. Nayebi**, S. Ganguli, S.A. Baccus. *Deep convolutional neural network models of the retinal response to natural scenes*. Computational and Systems Neuroscience (COSYNE) 2016. Poster III-26. 27 February 2016. Salt Lake City, UT.
23. **A. Nayebi** and V.V. Williams. *Quantum algorithms for shortest paths problems in structured instances*. 17th Annual Southwest Quantum Information and Technology (SQuInT) Workshop. 19-21 February 2015. Berkeley, CA.
24. **A. Nayebi**. *Exponential prefixed polynomial equations*. Association for Symbolic Logic (ASL) European Summer Meeting - Logic Colloquium 2013. 22-27 July 2013. Évora, Portugal.

PATENTS

1. K. Modarresi, I. Radu, C. Menguy, J.V. Muthiyil, Y. Liu, S. Qiang, **A. Nayebi**. *Segment extension based on lookalike selection*. Patent #15,700,343. 14 March 2019.
2. K. Modarresi, Y. Liu, P.P. Shenoy, **A. Nayebi**, P.S. Javangula. *User data overlap determination in a digital medium environment*. Patent #15,610,033. 6 December 2018.
3. K. Modarresi, J.M. Diner, E.T. Chin, **A. Nayebi**. *Segment valuation in a digital medium environment*. Patent #15,354,944. 17 May 2018.

REVIEWER

- **Books:** Princeton University Press
- **Journals:**
  - Biological Cybernetics
  - Journal of Neuroscience
  - Nature
  - Nature Communications
  - Neural Computation
  - Transactions on Machine Learning Research (TMLR)
  - Science Advances
- **Conferences:**
  - Computational and Systems Neuroscience (COSYNE) 2025
  - Brain-Score Computational and Systems Neuroscience (COSYNE) 2022 Workshop
  - Conference on Cognitive Computational Neuroscience (CCN) 2019, 2023
  - International Conference on Learning Representations (ICLR) 2021
  - Neural Information Processing Systems (NeurIPS) 2018, 2019, 2020, 2023

TEACHING

- Completed the 2024 Kaufman Teaching Certificate Program (KTCP) at MIT.
- Spring Quarter 2018. Teaching Assistant, Neuroscience Computational Core (NEPR 208). Instructor: Professor Stephen A. Baccus. Stanford University. Prepared and graded homework assignments, and met with students.
- Autumn Quarter 2017. Teaching Assistant, Large-Scale Neural Network Models for Neuroscience (CS 375). Instructor: Professor Daniel L. K. Yamins. Stanford University. Prepared teaching lessons and homework assignments, and met with students.

MENTORING

I have mentored 10 students at multiple levels (2 undergraduates, 6 graduate students, and 2 postdoctoral scholars starting in the field while I was a graduate student), helping them formulate questions and meeting with them regularly. These have resulted in their co-authorship on multiple publications (9 total) and conference presentations (11 total). While at Stanford, I have also been an advisor to undergraduates and graduate students in other roles as an Advising Fellow for the Symbolic Systems Program and as a Graduate Residence Community Associate. These have involved mentoring many undergraduates and masters students in the PhD application process, and advising beginning graduate students in planning their career trajectories.

I have also supported international colleagues by serving as a professional reference for academic visa applications.

UNIVERSITY SERVICE

- 2024-2025. Machine Learning Department PhD Admissions Committee. Carnegie Mellon University (CMU).
- 2024 - Present. PhD Thesis Committee Member for:
  - Lane Lewis; CMU PNC.
  - Noushin Quazi; CMU PNC.
  - Alessandro Marin Vargas; EPFL Neuroscience.

  Master's Thesis Committee Member for:
  - Dunhan Jiang; CMU Computational Biology.
- 2020. Munger Graduate Residence Community Associate (CA). Stanford University.
- 2018-2019. Mind, Brain, Computation, and Technology (MBCT) Seminar Organizer. Stanford University.
- 2014-2016. Advising Fellow for the Symbolic Systems Program. Stanford University.
- 2014-2015. Murray House Resident Computing Consultant (RCC). Stanford University.

BYLINE ARTICLES

1. A. Johnstone. *AI scientists are producing a host of new theories of how our brains learn*. The Economist. 14 August 2024.
2. A. Snyder. *What real bodies can show artificial minds*. Axios. 15 March 2024.
3. A. Trafton. *The brain may learn about the world the same way some computational models do*. MIT News. 30 October 2023.
4. **A. Nayebi**. *A model-based approach towards identifying the brain's learning algorithms*. The Stanford AI Lab Blog. 9 December 2020.

5. **A. Nayebi**. *Complementary learning systems within the hippocampus: reconciling episodic memory with statistical learning*. Stanford NeuWrite West Blog. 4 February 2018.

TECHNICAL REPORTS & PROJECTS

1. B. Sorscher, G.C. Mel, **A. Nayebi**, L. Giocomo, D.L.K. Yamins, S. Ganguli. "When and why grid cells appear or not in trained path integrators". *bioRxiv*. November 2022: 1-13.
2. **A. Nayebi**, H. Blundell. "Recurrent versus Recursive Approaches Towards Compositionality in Semantic Vector Spaces". *CS 224U: Natural Language Understanding, Stanford University*. June 2016: 1-9.
3. M. Vitelli, **A. Nayebi**. "CARMA: A Deep Reinforcement Learning Approach to Autonomous Driving". *CS 239: Advanced Topics in Sequential Decision Making, Stanford University*. March 2016: 1-8.
4. **A. Nayebi**, D. Cable, R. Wedeen. "Inferring Network Dynamics from Simulated Extracellular Electrophysiological Data". *CS 379C: Computational Models of Neocortex, Stanford University*. June 2015: 1-13.
5. **A. Nayebi**, M. Vitelli. "GRUV: Algorithmic Music Generation using Recurrent Neural Networks". *CS 224D: Deep Learning for NLP, Stanford University*. June 2015: 1-6.
6. J. Miller, **A. Nayebi**, A. Mohamed. "Semi-Supervised Learning for Sentiment Analysis". *CS 229: Machine Learning, Stanford University*. December 2014: 1-5.
7. **A. Nayebi**. "On the Riemann Hypothesis and Hilbert's Tenth Problem". *MATH 391: Logic Research Seminar, Stanford University*. February 2012: 1-14.

SKILLS

Programming Languages: Python, MATLAB, R, Mathematica, C, C++, C#, Bash. *Software Frameworks:* NumPy, TensorFlow, PyTorch, SciPy, Scikit-learn, Pandas, Theano, Git/Github, LaTeX.

SOFTWARE

1. A creator of `ptutils`, a set of utilities for training and validating PyTorch models on GPU and TPU. Initial release: 2022.
2. A primary contributor to `tnn`, a set of utilities for building temporal neural networks with TensorFlow. 84 Github stars & 13 forks as of September 2021. Initial release: 2016.
3. A primary contributor to `tfutils`, a set of utilities for training and validating TensorFlow models on GPU and TPU. 25 Github stars & 9 forks as of September 2021. Initial release: 2016.
4. Co-author of `GRUV`, a package for algorithmic music generation using recurrent neural networks. 793 Github stars & 170 forks as of September 2021. Initial release: 26 July 2015.
5. Author of Poisson loss, `Permute`, `UpSample1D`, and `UpSample2D` layers in the Keras deep learning API. 2015.
6. Author of `keras-extra` package to connect CNN layers with RNN layers in the Keras deep learning API. 155 Github stars & 37 forks as of September 2021. Initial release: 2015.
7. Author of `DMG Automounter for Linux` shell script to mount Mac OS X DMG files in Linux. 19,138 downloads as of September 2021. Initial release: 2008.

INDUSTRY EXPERIENCE

Machine Learning Scientist Intern at Adobe Systems, Inc June 2016-September 2016

Produced 3 patents and 1 publication.

- Analyzed live and historic data to provide insights to the data set
- Researched, prototyped, and implemented new models and algorithms
- Cooperated and collaborated with other teams across Adobe on common project
- Validated and tested models and algorithms

Author of Ranking Model, Total Waterpolo March 2011-September 2011

Hired to create the first automated water polo ranking model in the United States, which ranks teams based on strength of schedule and home team advantage.