Nate Sutton, Ph.D.

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Education

George Mason University, Fairfax VA 22030
Ph.D. Bioengineering with Neurotechnology & Computational Neuroscience concentration, 2024, GPA 4.0/4.0
Arizona State University, Phoenix AZ 85004
M.Sc. Biomedical Informatics, 2012, GPA 4.0/4.0
Quinnipiac University, Hamden CT 06518
B.Sc. Biology, 2006

Employment

Research Assistant, George Mason University, Fairfax, Va	2019 - current
Remote Services Technician, Support.com, Cambridge, Ma	2014 - 2019
Volunteer Software Developer, Biopython, Phoenix, Az	(4 months) 2013
Research Assistant/Software Developer, Arizona State University, Phoenix, Az	(15 months) 2010 - 2011
Stem Cell Lab Technician, Cord Blood Registry, Tucson, Az	2006-2009

Honors & Awards

Dissertation Completion Grant, George Mason University	2024
Presidential Scholarship, George Mason University	2019 - 2023

Publications

Sutton, N. M., Gutiérrez-Guzmán, B. E., Dannenberg, H., & Ascoli, G. A. (2024). A Continuous Attractor Model with Realistic Neural and Synaptic Properties Quantitatively Reproduces Grid Cell Physiology. *International Journal of Molecular Sciences*, 25(11), 6059.

Rebecca, R. G., Ascoli, G. A., **Sutton, N. M.**, & Dannenberg, H. (2024). Spatial periodicity in grid cell firing is explained by a neural sequence code of 2-D trajectories. *eLife*, 13.

Wheeler, D. W., Kopsick, J. D., **Sutton, N.**, Tecuatl, C., Komendantov, A. O., Nadella, K., & Ascoli, G. A. (2024). Hippocampome.org 2.0 is a knowledge base enabling data-driven spiking neural network simulations of rodent hippocampal circuits. *Elife*, 12, RP90597.

Niedermeier, L., Chen, K., Xing, J., Das, A., Kopsick, J., Scott, E., **Sutton, N.**, Webber, K.,Dutt, N., & Krichmar, J. L. (2022). CARLsim 6: An Open Source Library for Large-Scale, Biologically Detailed Spiking Neural Network Simulation. *In 2022 International Joint Conference on Neural Networks (IJCNN)* (pp. 1-10). IEEE.

Sutton, N. M., & Ascoli, G. A. (2021). Spiking neural networks and hippocampal function: A web-accessible survey of simulations, modeling methods, and underlying theories. *Cognitive systems research*, 70, 80-92.

Tecuatl, C., Wheeler, D. W., **Sutton, N.**, & Ascoli, G. A. (2021). Comprehensive estimates of potential synaptic connections in local circuits of the rodent hippocampal formation by axonal-dendritic overlap. *Journal of Neuroscience*, 41(8), 1665-1683. https://www.jneurosci.org/content/41/8/1665.abstract

Sanchez-Aguilera, A., Wheeler, D. W., Jurado-Parras, T., Valero, M., Nokia, M. S., Cid, E., Fernandez-Lamo, I.,

Sutton, N., ... Ascoli, G. A. (2021). An update to Hippocampome.org by integrating single-cell phenotypes with circuit function in vivo. *PLoS biology*, 19(5), e3001213. https://doi.org/10.1371/journal.pbio.3001213

Sutton, N. (2020). Neuroscience Research in Spatial Navigation Using Robotic Animals. *Mason Archival Repository Service*. http://ebot.gmu.edu/bitstream/handle/1920/11761/sutton_robonav.pdf

Sutton, N., Wojtulewicz, L., Mehta, N., & Gonzalez, G. (June, 2012). Automatic approaches for gene-drug interaction extraction from biomedical text: corpus and comparative evaluation. *In Proceedings of the 2012 Workshop on Biomedical Natural Language Processing* (pp. 214-222). Association for Computational Linguistics. http://aclweb.org/anthology/W12-2427

Conference Abstracts and Poster Presentations

Sutton, N., M., Gutiérrez-Guzmán, B., E., Dannenberg, H., Ascoli, G., A., (2024). A Continuous Attractor Model Implementation with Realistic Neural and Synaptic Properties Quantitatively Reproduces Recorded Grid Cell Physiology. *10th Annual BRAIN Initiative Meeting*. https://brainmeeting.swoogo.com/2024/home

Sutton, N., M., Gutiérrez-Guzmán, B., E., Dannenberg, H., Ascoli, G., A., (2024). A Continuous Attractor Model Implementation with Realistic Neural and Synaptic Properties Quantitatively Reproduces Recorded Grid Cell Physiology. *5th Annual Interdisciplinary Navigation Symposium*. https://inavsymposium.com/

Sutton, N., Dannenberg, H., Ascoli, G. (2023). A Continuous Attractor Model Implementation with Realistic Neural and Synaptic Properties Quantitatively Reproduces Recorded Grid Cell Physiology. *9th Annual BRAIN Initiative Meeting*. https://brainmeeting.swoogo.com/2023/home

Sutton, N., Dannenberg, H., Ascoli, G. (2023). A Continuous Attractor Model Implementation with Realistic Neural and Synaptic Properties Quantitatively Reproduces Recorded Grid Cell Physiology. *Society for Neuroscience 2023 Conference*

Sutton, N., Dannenberg, H., Ascoli, G. (2023). A Continuous Attractor Model Implementation with Realistic Neural and Synaptic Properties Quantitatively Reproduces Recorded Grid Cell Physiology. *Hippocampome 2.0 Conference at George Mason University*

Sutton, N., Ascoli, G. A. (2021). Hippocampal Spiking Neural Network Models: An Online Survey of Simulations and Underlying Theories. *Biomedical Engineering Society 2021 Conference.*

Sutton, N., Ascoli, G. A. (2021). Hippocampal Spiking Neural Network Models: An Online Survey of Simulations and Underlying Theories. *Biologically Inspired Cognitive Architectures 2021 Conference*.

Kadlec, K., Hung, Y., **Sutton, N.**, Goncalves, M., Ghosh, S., Uchida, M., Biederman, J., WoodWorth, H, Whitefield-Gabrieli, S., & Gabrieli, J. D. E. (2016). Neural biomarkers of risk factors for pediatric mood disorders. Poster, *MIT Summer Research Program in Biology, Brain and Cognitive Sciences* and *Center for Brains, Minds & Machines Summer Programs Conference*. Cambridge, Ma

Sutton, N., Wojtulewicz, L., Mehta, N., & Gonzalez, G. (2012). Automatic approaches for gene-drug interaction extraction from biomedical text: corpus and comparative evaluation. Poster & Paper, In *Proceedings of the 2012 Workshop on Biomedical Natural Language Processing*, Montreal, Ca

Sutton, N., Wojtulewicz, L., Mehta, N., & Gonzalez, G. (2012). Automatic approaches for gene-drug interaction extraction from biomedical text: corpus and comparative evaluation. In *Proceedings of the 2012 workshop on biomedical natural language processing* (pp. 214-222). Association for Computational Linguistics.

Sutton N., Gonzalez G. (2012). Using Natural Language Processing to Automatically Extract Alzheimer's disease related genotype-phenotype and pharmacogenomic findings. Poster & Abstract, *Arizona Alzheimer's*

Consortium Conference, Pheonix, Az

Sutton N., Gonzalez G. (2011). Extracting genotype-phenotype relationships from literature using natural language processing, Poster, *Biomedical Informatics Symposium*, Pheonix, Az

Sutton N., Dinu D. (2010). Automatic estimation of individual population similarity using genetic markers. Poster, *Biomedical Informatics Symposium*, Pheonix, Az

Open Source Software Work

MazeRunner: Rodent Spatial Memory Simulation July 2017–June 2019

- A model of grid and place cells, and theta rhythms is implemented based on published models such as attractor networks for spatial awareness from Dr. Matthew Nolan's lab and others.
- Advanced game engine, Unreal Engine 4, simulated the maze. This work is designed to accommodate integrating rodent recordings and neural properties into training and testing the model. Github.com/NMSutton/MazeRunner

3d Graphical Simulation of Biophysics, Open Worm Project Apr. 2016–Dec. 2016

- In collaboration with the Open Worm Project including Dr. Stephen Larson and Dr. Sergey Khayrulin. The software I worked on reformats signal recordings for processing control over muscle actuation of physics simulated models.
- Using C++, OpenCL, and Python OpenGL code was created to import 3d models from blender and generate a physics simulation of their activity. Github.com/NMSutton/Sibernetic

Memory Module: Hippocampus Neural Network Simulation Sep. 2015–July 2016

- Experimental recordings from rat hippocampus areas were modeled in a spiking neural network. Open access data from Dr. György Buzsáki's lab at NYU was the data source.
- Izhikevich neurons with pyramidal parameters were used. Functions derived from experimental data optimized synapse weights. Github.com/NMSutton/MemoryModule

Visual Receptor Fields 3d Simulation Jun. 2015–Dec. 2015

- Center-surround and other fields generating firing responses to image patterns were simulated. Visual system equations included the Gabor filter and differences of Gaussians.
- Custom C++ graphics created 3d images or videos of space-time fields and stimuli change over time in fields. Github.com/NMSutton/DisplacementMapper

Reinforcement learning with Spiking Neural Networks Jul. 2014–Jul. 2015

- In collaboration with Ignacio Tartavull, M.Sc. Image based classification of characters using spiking neural networks with reinforcement learning. Reimplemented simulation based on published work.
- This work includes active dendrites and direct to soma signaling signal processing neuron dynamics, lateral Inhibition, use of a learning rate in computations, and the Brian 2 toolkit. Github.com/Tartavull/Snn-rl

Neuroscience Skills

Signal Processing:	Rate, Temporal, Oscillation Coding, Diff. Eqs., Spatial Nav. Associated Cells
Neural Networks:	Excitatory and Inhibitory Signal Balancing, High Performance Computing
Biophysics:	Neuron and synapse models with values based on published animal studies
Simulators:	CARLsim, NEST, NEURON, MOOSE, Brian, XPPAUT
Machine Learning:	Neural Nets, HMM, PCA, SVM, Gradient Decent, and others
Online Courses:	Computational Neuroscience, Machine Learning, Calculus One

Programming and Math Skills

Languages:	C++, C, Java, Python, MATLAB, Octave, PHP, HTML, CSS, JavaScript, Ruby, XML, VB
Calculus:	Systems of differential equ., Higher Order Deriv. and Integ., Multivars., Linear Algebra

Statistics:	Bayesian techniques, Graduate Biostatistics course, R language, SageMath software, SAS
OS:	Windows, Linux with several distributions, Android
Books Read:	Object-Oriented Programming in Java, Data Structures and Algorithms in Java
Wiki/Ebooks:	C++ Programming, Python Programming, Ruby on Rails, Why's Ruby Guide

Computational Biology Work

Additional details on computational biology project I worked on during and after my master's degree are at Nsutton.com/Research.

Volunteer Work

In 2023 and 2024 I did volunteer work in food banks, thrift shops, environmental clean up, and a holiday festival.

References Available Upon Request