

Nate Sutton, Ph.D.

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[Nsutton.com](https://nsutton.com) | [Linkedin](#) | [Google Scholar](#) | [Github](#)

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

Postdoctoral Researcher , Brandeis University, Waltham, Ma	2025 - current
Research Specialist , George Mason University, Fairfax, Va	2024 - 2025
Research Assistant , George Mason University, Fairfax, Va	2019 - 2024
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. (2025). Automated Measurement of Grid Cell Firing Characteristics. *Algorithms*, 18(3), 139.

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). Software for Automated Measurement of Grid Cell Firing Characteristics. *Society for Neuroscience DC Metro Area 2024 Annual Meeting*. [Nsutton.com/GridMet-Poster/](https://nsutton.com/GridMet-Poster/) <https://sites.google.com/site/sfndcma/events>

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
<https://Nsutton.com/EmoNeuroPsych/>

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

Maze Runner: 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](https://github.com/NMSutton/MazeRunner)

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

- In collaboration with the Open Worm Project including Dr. Stephen Larson and Dr. Sergey Khayrulin. The software I worked on reformat 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/Sibernetica](https://github.com/NMSutton/Sibernetica)

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](https://github.com/NMSutton/MemoryModule)

ViReFields: 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. This study is based on material in Drs. Peter Dayan's and Laurence Abbott's *Theoretical Neuroscience* book.
- Custom C++ graphics created 3d images or videos of space-time fields and stimuli change over time in fields. [Github.com/NMSutton/DisplacementMapper](https://github.com/NMSutton/DisplacementMapper)

SNNRL: 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](https://github.com/Tartavull/Snn-rl)

Emotion Neuropsychology Experiment Software Development

Oct. 2014–Feb. 2015

- In collaboration with Dr. Yuwen Hung who researches as a postdoc at MIT.
- Psychtoolbox toolkit integrated for functions like recording subjects' keypress reactions.
- Data and metadata was stored to accommodate analysis of synchronized neural image recordings.
- Existing code was expanded on to present images as emotion stimulus with precise timing, format, and multiple random and pseudorandom ordering methods. Conference poster:
<https://N Sutton.com/EmoNeuroPsych/>

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

SELECTED COURSES

George Mason University: Neuron and Network Modeling, Neural Engineering, Grant Proposal Writing
Arizona State University: Biostatistics in Medicine and Informatics, Information Systems Engineering, Topics in Bioinformatics and Translational Research
Quinnipiac U.: Cell Physiology, Linear Algebra, Organic Chemistry, General Physics I & II, Pathophysiology
Online: Machine Learning, Calculus One, Computational Neuroscience, Multivariate Calculus (in progress)
Pima Community College: C Programming Language, C++ and Object-Oriented Programming, Intro. Statistics

COMPUTATIONAL BIOLOGY WORK

Additional details on computational biology project I worked on during and after my master's degree are at N Sutton.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