Gregory A. Handy
5812 South Ellis Ave | Chicago IL, 60637 | ghandy@uchicago.edu

Research interests

Theoretical neuroscience, applied mathematics, stochastic processes, mathematical biology, dynamical systems, and calcium dynamics

Education

University of Utah 2013-2019
Ph.D. in Mathematics
Advisor: Alla Borisyuk

University of Michigan 2011-2012
M.S. in Electrical Engineering-Systems

University of Maryland Baltimore County 2007-2011
B.S. in Mathematics
Minor in computer science
Summa Cum Laude, Meyerhoff Scholar, President's List, Nominated for Valedictorian

Positions

Postdoctoral Associate (Doiron Research Group) 2020-Present
University of Chicago, Departments of Neurobiology and Statistics
Grossman Center for Quantitative Biology and Human Behavior

Postdoctoral Associate (Doiron Research Group) 2019-2020
University of Pittsburgh, Department of Mathematics
Center for the Neural Basis of Cognition

Publications and preprints

(*co-first authors)

2022
14. **G Handy**, A Borisyuk. Investigating the ability of astrocytes to drive neural network synchrony. *bioRxiv*, 2022.
13. IA Oldenburg*, WD Hendricks*, **G Handy***, K Shamardani, HR Bounds, B Doiron, H Adesnik. The logic of recurrent circuits in primary visual cortex. *bioRxiv*, 2022.
12. M Kumar, **G Handy**, S Kouvaros, LL Brinson, B Bizup, B Doiron, and T Tzounopoulos. Cell-type-specific roles of inhibitory interneurons in the rehabilitation of auditory cortex after peripheral damage. *bioRxiv*, 2022.

2021
11. J Veit, **G Handy**, DP Mossing, B Doiron, H Adesnik. Cortical VIP neurons locally control the gain but globally control the coherence of gamma band rhythms. *bioRxiv*, 2021. In revisions at *Neuron*.
10. **G Handy**, SD Lawley. Revising Berg-Purcell for finite receptor kinetics. *Biophys. J.*, 120 (11), 2021.
9. DA Aponte, **G Handy**, AM Kline, H Tsukano, B Doiron, HK Kato. Recurrent network dynamics shape direction selectivity in primary auditory cortex. *Nat. Commun.*, 12 (314), 2021.

2019
8. **G Handy**, SD Lawley, A Borisyuk. Role of trap recharge time on the statistics of captured particles. Phys. Rev. E, 99, 2019.

2018
7. **G Handy**, SD Lawley, A Borisyuk. Receptor recharge time drastically reduces the number of captured particles. *PLOS Comput. Biol.*, 14(3), 2018.

2017
6. M Taheri*, **G Handy***, A Borisyuk, JA White. Diversity of evoked astrocyte Ca^{2+} dynamics quantified through experimental measurements and mathematical modeling. *Front. Syst. Neurosci.*, 11, 2017.
5. **G Handy***, M Taheri*, JA White, A Borisyuk. Mathematical investigation of IP_3-dependent calcium dynamics in astrocytes. *J. Comput. Neurosci.*, 42(3), 2017.

2016
4. G Blanchard, M Flaska, **G Handy**, S Pozzi, C Scott. Classification with asymmetric label noise: Consistency and maximal denoising. *Electron. J. Stat.*, 10(2), 2016.

2013 3. C Scott, G Blanchard, **G Handy**. Classification with asymmetric label noise: Consistency and maximal denoising. *Proceedings of the 26th Annual Conference on Learning Theory*, *PMLR*, 30, 2013.

2012 2. **G Handy**, BE Peercy. Extending the IP_3 receptor model to include competition with partial agonists. *J. Theor. Biol.*, 310, 2012

2009 1. WD Potter, E Drucker, P Bettinger, F Maier, M Martin, D Luper, M Watkinson, **G Handy**, and C Hayes. Diagnosis configuration, planning and path finding: Experiments in nature-inspired optimization. In *Natural Intelligence for Scheduling, Planning and Packing Problems*, edited by R. Chiong. Studies in Computational Intelligence, vol 250. Springer, Berlin, Heidelberg, 2009.

Grants and fellowships

Burroughs Wellcome Fund's Career Award at the Scientific Interface ($500,000)	2022-
Swartz Foundation Fellow for Theory in Neuroscience ($200,000)	2020-2022
BioFire Scholar	2018-2019
RTG Fellowship Recipient (University of Utah)	2013-2014, 2015-2016, 2017
Rackham Merit Fellowship Recipient (University of Michigan)	2011-2012
Meyerhoff scholar (UMBC)	2007-2011

Honors and support

SMB Landahl Grant	2018
Outstanding Graduate Student Award (University of Utah)	2017
STEM Ambassador Program's 2017 cohort	2017
SIAM-LS16 Poster Prize Winner (Graduate Student Category)	2016
Pi Mu Epsilon	2011
Outstanding Graduating Senior in the Mathematics Department (UMBC)	2011
Phi Beta Kappa Honor Society (Fall Inductee)	2010
Outstanding Teaching Assistant in the Statistics Department (UMBC)	2010
The Honor Society of Phi Kappa Phi	2010
Golden Key International Honor Society	2009

Selected talks and conference presentations (by topic)

Functional interactions of feature space and physical space in neocortical circuits

Swartz Foundation Meeting Cold Spring Harbor Laboratory, New York	Aug. 2022
Sculpted Light in the Brain (poster) Boston University, Massachusetts	June 2022
Cosyne (poster) Lisbon, Portugal	March 2022

Interneuron subtypes shape computations in the visual and auditory cortices

Chicago Symposium on Computational Neuroscience University of Chicago, Illinois	June 2022
Swartz Foundation Meeting (Virtual)	Oct. 2021
University of Utah Mathbio Seminar (Virtual)	Sept. 2021
Cosyne (Virtual; poster)	Feb. 2021
Allen Institute Modeling Workshop (Virtual)	Aug. 2020
SIAM Life Sciences minisymposium (Virtual)	June 2020

Influence of astrocytes in neural network synchrony

Cosyne (poster) Denver, Colorado	March 2020

Digging through DiRT: Investigating how trap recharge time influences the

New Jersey Institute of Technology Applied Mathematics Seminar (Virtual)	Sept. 2020
SIAM Conference on the Life Sciences (poster) Minneapolis, Minnesota	Aug. 2018

Society for Mathematical Biology Annual Meeting (poster) July 2018
Sydney, Australia

Society for Mathematical Biology Annual Meeting (poster) July 2017
Salt Lake City, UT

Measurement and mathematical modeling of calcium signaling in astrocytes

NeuroNex Workshop Oct. 2018
University of Houston, Texas

MAA MathFest Aug. 2018
Denver, Colorado

SIAM Conference on Applications of Dynamical System May 2017
Snowbird, Utah

Society for Neuroscience Annual Meeting Nov. 2016
San Diego, California

SIAM Conference on the Life Sciences (poster) July 2016
Boston, Massachusetts

Gordon Research Seminar and Conference on Calcium Signaling (poster) June 2015
Newry, Maine

Teaching

Courses

Differential Equations, University of Pittsburgh Spring 2020

Mathematics in Medicine, University of Utah Spring 2018

Differential Equations and Linear Algebra, University of Utah Fall 2017

Mathematical Biology Journal Club, University of Utah Spring 2017

Differential Equations and Linear Algebra, University of Utah Fall 2016

Mathematics in Medicine (Lab Instructor), University of Utah Spring 2016

The Role of Mathematics in Medicine (Teaching Assistant), University of Utah Fall 2015

College Algebra, University of Utah Spring 2015

Intermediate Algebra (Teaching Assistant), University of Utah Fall 2014

Introduction to Probability and Statistics (Teaching Assistant), UMBC Fall 2009

Summer schools and tutorials

Neuromatch academy project mentor Summer 2022
- Advised students that studied the differences in electrophysiology properties of neurons from healthy, epileptic, and cancer patients (dataset from Allen Institute)

Cosyne 2022 tutorial teaching assistant Feb. 2022
- Helped create and lead students through exercises that accompanied Dan Goodman's tutorial on spiking neural networks for neuroscience
- Topics included classical spiking networks, reservoir computing, and surrogate gradient decent, with an application to sound localization

Neuromatch academy project mentor Summer 2021
- Mentored a project that investigated the role of interneuron subclasses in driving behavior of mice when presented with novel visual stimuli using a dataset from the Allen Institute

Cosyne 2021 tutorial teaching assistant Feb. 2021
- Helped create and lead students through online exercises that accompanied Kanaka Rajan's tutorial on recurrent neural networks (RNN) for neuroscience
- Topics included linearization of a non-linear system of differential equations stability analysis, principal component analysis, and random matrix theory.

Neuromatch academy teaching assistant July 2020
- Led students through daily tutorial covering topics including dimensional reduction, Wilson-Cowan equations, and deep learning
- Mentored two projects investigating datasets collected in Stringer et al., 2019.

Mentorship (High Schoolers and Undergraduates)

Alex Negron (Illinois Institute of Technology, class of 2022) 2021-2022
- Co-mentor a project researching the role of functional inhibitory subtypes as part of the Simons Collaboration on the Global Brain Undergraduate Research Fellowship program

Ethan Yu (University of Chicago, class of 2025) Summer 2022
- Investigated how locomotion modulates neuronal activity in the visual cortex as part of the Neuroscience Early Stage Scientist Training Program at the University of Chicago

Robert Csete (University of Chicago, class of 2024) Summer 2021
- Helped to developed intuition behind rate-based models of neurons and extended an excitatory-inhibitory model to include multiple inhibitory subclasses as part of the Neuroscience Early Stage Scientist Training Program at the University of Chicago

Emma Fine (University of Utah, class of 2019) Fall 2017
- Explored how the expected number and variability of binding events varies with non-instantaneous recharge rates

Daniel Griffin (Utah State University, class of 2017) Summer 2016
- Mentored a summer REU project that extended a single compartment calcium model to include effects from the extracellular space and additional ionic fluxes

Olivia Dennis (Skyline High School, class of 2015) Spring 2015
- Led a reading group on the textbook "Mathematical Physiology" by Dr. James Keener and Dr. James Sneyd

Other teaching experience

Led summer qualifying exam preparatory courses for first- and second-year graduate students for Differential Equations (Summer 2016) and Functional Analysis (Summer 2017)

Service and extracurricular activities

Reviewer for Journal of Computational Neuroscience, Journal of Neuroscience, and Cosyne

Co-organized the inaugural Chicago Symposia on Computational Neuroscience June 2022

Volunteer judge for the SIMIODE Challenge Using Differential Equation Models Dec. 2021

Expanding Your Horizons Chicago Volunteer March 2021
- Assisted in the development and implementation of Zoom workshops that engaged middle school girls in exciting and diverse experiences across STEM fields

Organized the Applied Mathematics Seminar at the University of Pittsburgh Spring 2020

Poster presenter at the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) Conference in Salt Lake City Oct. 2017

STEM Ambassador Program's 2017 cohort 2017
- STEMAP is a research and public engagement training program funded by the National Science Foundation.
- Attended training workshops and held engagement events and gained experience talking about mathematics with non-scientist.
- Worked with Splore, a non-profit that specializes in leading accessible outdoor adventures
- Participated in cross-country skiing and rock-climbing trips during which I discussed the mathematical concepts that can be found in each activity, as well as my current research in mathematical neuroscience

Graduate Student Advisory Committee, active member
- Chair of Recruitment Committee 2016-2017
  Coordinated prospective graduate recruitment scheduling and activities.
- Retention, Promotion, and Tenure Committee 2016-2017
  Reviewed teaching evaluations for faculty promotions.

Poster presenter at Science Day (University of Utah) Nov. 2015
- Science day consists of interactive workshops providing high school students with a great look at laboratory research and career opportunities in science, math, and engineering.

Professional memberships

Society for Industrial and Applied Mathematics · Society for Mathematical Biology
Mathematical Association of America · Association for Women in Mathematics

Technologies

C · MATLAB · Python · Julia · Mathematica · Maple · XPPAUT · Java · RStudio · Excel

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