Gregory A. Handy

Contact information

University of Chicago
Department of Neurobiology
Grossman Center for Quantitive
Biology and Human Behavior

ghandy@uchicago.edu

Research interests

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

Education

University of Utah

Ph.D. in Mathematics, May 2019

Advisor: Alla Borisyuk

University of Michigan

M.S. in Electrical Engineering–Systems, December 2012

University of Maryland Baltimore County

B.S. in Mathematics, May 2011
Minor in computer science
Meyerhoff Scholar, President's List, Summa Cum Laude, Nominated for Valedictorian

Positions

Postdoctoral Associate (2020-Present)

University of Chicago
Departments of Neurobiology and Statistics
Grossman Center for Quantitive Biology and Human Behavior

Postdoctoral Associate (2019-2020)

University of Pittsburgh
Department of Mathematics
Center for the Neural Basis of Cognition

Publications and preprints

(*co-first authors)

2021 10. **G Handy**, SD Lawley. Revising Berg-Purcell for finite receptor kinetics. *Biophysical Journal*, 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. *Frontiers in Systems Neuroscience*, 11, 2017.

5. **G Handy***, M Taheri*, JA White, A Borisyuk. Mathematical investigation of IP_3-dependent calcium dynamics in astrocytes. *Journal of Computational Neuroscience*, 42(3), 2017.

2016 4. G Blanchard, M Flaska, **G Handy**, S Pozzi, C Scott. Classification with asymmetric label noise: Consistency and maximal denoising. *Electronic Journal of Statistics*, 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. *Journal of Theoretical Biology*, 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.

Invited Talks and Conference Presentations

Division of labor among interneurons enables rich cortical computations (poster)
Cosyne — February 2021
Virtual

Digging through DiRT: Investigating how trap recharge time influences the statistics of particle diffusion
New Jersey Institute of Technology Applied Mathematics Seminar — September 2020
Virtual

Division of labor among interneurons enables rich cortical computations
Allen Institute Modeling Workshop — August 2020
Virtual

Interneuron Subpopulations Enable Direction Selectivity in A1
SIAM Life Sciences minisymposium — June 2020
Virtual

Influence of astrocytes in neural network synchrony (poster)
Cosyne — March 2020
Denver, Colorado

Measurement and Mathematical Modeling of Calcium Signaling in Astrocytes
NeuroNex Workshop — October 2018
Houston, Texas

Influence of Trap Recharge on the Statistics of Captured Particles (poster)
SIAM Conference on the Life Sciences — August 2018
Minneapolis, Minnesota

Investigation of Calcium Dynamics in Astrocytes via Bifurcation Analysis
MAA MathFest — August 2018
Denver, Colorado

Influence of Trap Recharge on the Statistics of Captured Particles (poster)
Society for Mathematical Biology Annual Meeting — July 2018
Sydney, Australia

Particle Diffusion and Competitive Receptor Binding (poster)
Society for Mathematical Biology Annual Meeting — July 2017
Salt Lake City, UT

Mathematical Investigation of Ion Dynamics in Astrocytes and the Extracellular Space
SIAM Conference on Applications of Dynamical System — May 2017
Snowbird, UT

The Role of SOC Channels and Other Calcium Fluxes in Astrocyte Calcium Signaling Investigated through Mathematical Modeling (poster)
Society for Neuroscience Annual Meeting — November 2016
San Diego, CA

Investigating Experimental Variations in Astrocytes with a Mathematical Model of Calcium Dynamics (poster)
SIAM Conference on the Life Sciences — July 2016
Boston, MA

Measurement and Mathematical Modeling of Calcium Signaling in Astrocytes (poster)
Gordon Research Seminar and Conference on Calcium Signaling — June 2015
Newry, ME

Identifying the Role of Store-Operated Calcium Channels in Astroctyes via an Open-Cell Model (poster)
SIAM Conference on Applications of Dynamical Systems — May 2015
Snowbird, UT

Algorithms for Reconstructing Images from Helical CT Scans (poster)
CIC Summer Research Opportunity Program Conference — July 2010
Columbus, OH

Honors and support

Swartz Foundation Fellow for Theory in Neuroscience	2020-2022
BioFire Scholar	2018
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
RTG Fellowship Recipient (University of Utah)	2013-2014, 2015-2016, 2017
Rackham Merit Fellowship Recipient (University of Michigan)	2011-2012
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
Meyerhoff scholar (UMBC)	2007-2011

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
Introductory Physics (Learning Assistant), UMBC	Spring 2009
Precalculus Mathematics (Teaching Assistant), UMBC	Fall 2008

Summer schools and tutorials

Cosyne tutorial teaching assistant — February 2021
Helped created and led 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 July 2020
Led students through daily tutorial covering topics including dimensional reduction, Wilson-Cowan equations, and deep learning, while also mentoring two projects investigating datasets collected in Stringer et al., 2019.

Mentorship

Emma Fine (University of Utah, class of 2019) Fall 2017
Mentored a project exploring the expected number and variability of binding events with non-instantaneous recharge rates.

Daniel Griffin (Utah State University, class of 2017) Summer 2016
Mentored a summer REU project extending 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
Mentored 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

Poster presenter at the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) Conference in Salt Lake City October, 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 organization 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) November, 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