PERSONAL INFORMATION

Jeremy D Harris

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WORK EXPERIENCE

June 2020 – present

Postdoctoral Fellow Researcher in Weitz Group

Department of Biological Sciences, Georgia Tech

- Advisor: Joshua Weitz, PhD, Associate Professor
- Aim: We aim to develop and analyze mathematical models of virus-microbe dynamics —guided, in part, by collaboration with experimentalists—to better understand the long-term interactions of viruses and their hosts.

August 2017 – May 2020

Postdoctoral Fellow Researcher in Koelle Research Group

Department of Biology, Emory University

- Advisor: Katia Koelle, PhD, Associate Professor
- Developed mathematical models influenza virus. In collaboration with experimental virologists, we studied the effects of multiplicity of infection (MOI) on influenza viral infection outcomes in cell culture. We also modeled a serial passage study in which varying MOIs of wild-type and defective interfering particles gave rise to cycling dynamics. Lastly, we developed a within-host stochastic exponential growth with mutations model to estimate between-host bottleneck sizes based on the number of de novo variants in recipient hosts.

EDUCATION

2017

Ph.D. in Mathematics

University of Pittsburgh, Pittsburgh, PA
Advisor: Bard Ermentrout, PhD, Distinguished University Professor

- Thesis: “Analysis of a spatially-distributed Wilson-Cowan model of cortex”

2011

B.S. in Mathematics, minor in Bioengineering

University of Pittsburgh, Pittsburgh, PA

- Honors College, Graduated Summa Cum Laude

PUBLICATIONS

In preparation.

- Harris, J.D., Park, S.W., Dushoff, J., Weitz J.S. (2020). “Modeling asymptomatic transmission in COVID-19.” (in preparation, anticipated date of submission: July 2021)
- Harris, J.D.*, Martin, B.E*., Koelle, K.V., and Brooke, C.B. (2020). “Influenza virus population cycles emerge from collections of variably responding cells.” *authors contributed equally. (in preparation, anticipated date of submission: Sept. 2021)

Published.

- Martin, B.E.*, Harris, J.D.* et al. (2020). ”Cellular co-infection can modulate the efficiency of influenza A virus production and shape the interferon response.” PLoS pathogens 16.10: e1008974. *authors contributed equally https://doi.org/10.1371/journal.ppat.1008974
- Harris, J.D. and Ermentrout, G.B. (2018). “Traveling waves in a spatially-distributed Wilson-Cowan model of cortex: From fronts to pulses.” Physica D: Nonlinear Phenomena, 369, 30-46. https://doi.org/10.1016/j.physd.2017.12.011

- Ali, R., Harris, J.D.*, and Ermentrout, G.B. (2016). "Pattern formation in oscillatory media without lateral inhibition." Physical Review E, 94(1), 012412. *corresponding author https://doi.org/10.1103/PhysRevE.94.012412
- Harris, J.D. and Ermentrout, G.B. (2015). "Bifurcations in the Wilson–Cowan equations with nonsmooth firing rate." SIAM Journal on Applied Dynamical Systems, 14(1), 43-72. https://doi.org/10.1137/140977953

PRESENTATIONS

2014 – present Talks & Posters (external)

While in Weitz lab:

- 2-minute Rapid Talk (poster) – "Modeling asymptomatic transmission in COVID-19." MIDAS 2021 (May 10-13)
- Invited speaker – "Modeling asymptomatic transmission in COVID-19." Virtual talk for University of Florida Math Bio seminar (Feb. 4, 2021)
- Poster presentation – "Modeling asymptomatic transmission in COVID-19." Student Conference on COVID-19 modeling (May 28-29, 2021)
- Invited speaker – "Modeling asymptomatic transmission in COVID-19." Virtual talk for Pitt Math Bio seminar (Nov. 19, 2020)

While in Koelle lab:

- Conference talk – "Estimating transmission bottleneck sizes from viral variants unique to recipient hosts." Epidemics Conference 2019 (Dec. 3-6, 2019)
- Invited speaker – "Cellular co-infection increases viral production but the constituents of the output depend on frequencies of the input." Kennesaw State University, Applied Math seminar (Nov. 15, 2019)
- Invited speaker – "How do defective interfering particles impact influenza virus dynamics?" University of Pittsburgh, Center for Vaccine Research (April 16, 2019)
- Discussion moderator – summarized conference talks/posters and facilitated "Big picture" discussion on the future of quantitative biology. A TMLS-sponsored conference at Emory (Jan. 16-18, 2019)
- Poster presentation – "Complex viral dynamics emerge in vitro from collections of heterogeneously-responding infected cells." Evolution of Complex Life at Georgia Tech (May 15-17, 2019)

During graduate school:

- Conference talk – "Traveling waves in a (nonsmooth) neural firing rate model." SIAM 2017 Annual Meeting (Pittsburgh, PA, July 10-14, 2017)
- Conference talk – "Patterns and waves in a spatially-extended neural field model." SIAM 2017 Conference on Applications of Dynamical Systems (Snowbird, Utah, May 21-25, 2017)
- Conference talk – "Travelling fronts and pulses in a nonsmooth neural mass model." SIAM 2015 Conference on Applications of Dynamical Systems (Snowbird, Utah, May 17-21, 2015)
- Conference talk – "The Wilson-Cowan equations with nonsmooth firing rate." (George Mason University, March 20-21, 2015)
- Conference talk – "Bifurcation analysis of the Wilson-Cowan equations with nonsmooth firing rate function." IEEE International Meeting on Analysis and Applications of Nonsmooth Systems (Como, Italy, August 10-12, 2014)

2011 – present Seminar Presentations (internal)

- Presented, ”Modeling asymptomatic transmission in COVID-19.” Complex microbial dynamics and infections seminar (Oct. 9, 2020)
- Presented, “Data literacy in the sciences.” Academic Learning Community on data literacy, Emory (March 31, 2020)
- Presented Rubin et al., ”Revealing neural correlates of behavior without behavioral measurements.” BioRxiv (2019). Theoretical Biophysics seminar, Emory (Oct. 21, 2019)
- Presented Shoval et al., “Evolutionary Trade-Offs, Pareto Optimality, and the Geometry of Phenotype Space.” Science (2012). Theoretical Biophysics seminar, Emory (Feb. 18, 2019)
- Presented on current methods of estimating transmission bottlenecks. Koelle lab meeting, Emory (Feb. 11, 2019)
- Presented Allesina and Levine, “A competitive network theory of species diversity.” PNAS (2011). Theoretical Biophysics seminar, Emory (Oct. 2017)
- Presented “The community ecology of influenza A defective interfering particles.” Ecology and Evolution seminar, Emory (Oct. 2017)
- Presented “Pattern formation in the Wilson-Cowan equations.” Applied Math seminar, Pitt (September 25, 2015)
- Presented on “Bifurcations of piecewise smooth flows.” Colombo et al., Physica D: Nonlinear Phenomena (2012). Math Bio seminar, Pitt (Sept. 12 & 17, 2015)
- Presented an introduction to rigidity in the tensegrity model – In preparation for the guest speaker, R. Connelly, as part of a themed semester on networks. Math Bio seminar, Pitt (Sept. 17, 2014)
- Presented on “Iterated Prisoner’s Dilemma contains strategies that dominate any evolutionary opponent.” Press and Dyson, PNAS (2012). Math Bio seminar, Pitt (March 6, 2014)
- Presented “Processes taking place on networks.” Math Bio seminar, Pitt (Feb. 5, 2013)
- Presented an existence proof of travelling waves in a shape-space model of antigenic variation in Trypanosomes. Applied Math seminar, Pitt (April 5, 2013)
- Presented on modelling antigenic variation in Trypanosome infections. Math Bio seminar, Pitt (Dec. 9, 2011 & Oct. 29, 2012.)

TEACHING EXPERIENCE

2015 – 2017 Teaching – Pitt

- Graduate Linear Algebra – Teaching Assistant
- Intro to Finite and Discrete Mathematics – Instructor
- Intro to Real Analysis – Teaching Assistant
- Intro to College Algebra – Instructor
- Calculus I (2 sections) – Instructor
- Intro to College Algebra (2 sections) – Instructor
- Intro to College Algebra – Instructor
- Calculus III – Teaching Assistant

2015 – 2016 Teaching Assistant Workshops – Pitt

- Topics include: developing a teaching philosophy, syllabus construction, encouraging participation, teaching with Powerpoint, navigating difficult situations

SERVICE

2015 – present Journal manuscript reviews

- Kähne, M., Rüdiger, S., Kihara, A. H., and Lindner, B. (2019). Gap junctions set the speed and nucleation rate of stage I retinal waves. PLoS computational biology, 15(4), e1006355.
- Nielsen, B. F. (2017). "Regularization of Ill-posed point neuron models." The Journal of Mathematical Neuroscience, 7(1), 6.
- Ji, Y., Zhang, X., Liang, M., Hua, T., and Wang, Y. (2015). "Dynamical analysis of periodic bursting in piece-wise linear planar neuron model." Cognitive Neurodynamics, 9(6), 573-579.

Spring 2021 - present GA Tech

- KITP Quantitative biology summer research course – Held hands-on labs (using Matlab, R, and Python) to go though the exercises on eco-evolutionary models of viral dynamics (August 9-13, 2021)
- Quantitative Biosciences Workshop 2021: Epidemics – Ran a hands-on breakout session using Matlab to go though the exercises; see material (May 17-18, 2021)
- Undergraduate Research Symposium – volunteered to serve as a judge of 5-minute talks (April 22, 2021)

2018 – Spring 2020 Emory

- Data Literacy Academic Learning Community – six 1.5 hour discussions on data literacy, with a focus on interdisciplinary educational approaches, skill-building in data literacy; deliverables include a package on data literacy for lessons and curriculum to support undergraduate education
- Data Science for Scientists ATL – monthly meetings and special sessions on all things data (e.g. Jupyter notebook demos, version control with git, visualization with R)
- Software carpentry workshop – hosted by Data Science for Scientists ATL (Nov. 23-24, 2019) – to learn and help others learn basic shell commands, version control with git, and to use jupyter notebooks and some basic python code
- Datafest at Emory – undergraduates analyze a large dataset as part of the quantitative theory and methods initiative (April 2019)
- Graduate Research Symposium – helped with judging of research talks/posters (2018-2020)
- Volunteer for Atlanta Bike Emory: participating in Emory Cares International Service Day (Saturday Nov. 9, 2019)
- Committee on Environment – We discuss, review, and make recommendations on campus projects and initiatives that have an environmental impact on campus (committee website) (2019-2020)

2018 – Spring 2020 Pitt

- Representative from the math department in general body meetings; planned and organized graduate student events, including socials and the new student teaching orientation (2013 – 2017)
- Organized for graduate students as an opportunity to practice presenting their work (2014 – 2015)
- Volunteer at Pitt's Integration Bees – Helped with the undergraduate bee (2014 & 2015); high school bee (2015 & 2016)

April 2020 – present Hearts to Nourish Hope Food Bank

- Volunteer through Hands on Atlanta – monthly, from April-August 2020

2018 – 2019 Human Rights Campaign (HRC)

- Volunteer for HRC Atlanta Pride Brunch (Oct. 13, 2019)

2013 – 2014

Volunteer for Neighborhood Learning Alliance (NLA)

- Helped high school students complete online coursework to obtain equivalent credit for a failed or incomplete course-requirement, Pittsburgh, PA (July and August of 2013 & 2014).

GROUPS & ORGANIZATIONS

2019 – Fall 2020

Emory, UGA, GA Tech

- Emory-UGA-GATech SARS-CoV-2 journal club (co-organizer) – to collect, organize, and share information on high output of COVID-19 papers. We read papers anywhere from epidemiological data analysis to vaccine efficacy studies. We meet weekly, and the google doc is kept up-to-date – first meeting April 20; updated August 14.

- Postdoctoral Science Magazine (editor) – to highlight research being done at Emory University and other research institutions in Atlanta; develop skills in communicating science; blog post (Emory PDA) on working remotely – March 25, 2020; last updated December 2020

2017 – Spring 2020

Emory University

- Biology Postdoctoral Cohort – created to build social and professional connections amongst postdocs in biology and related areas

- Theory and Modeling of Living Systems (TMLS) Initiative

- EmoRy R & coding club – to learn R studio, R markdown, version control with git

- Data Science for Scientists ATL – to engage with the data science community at Emory, both learning and helping with events (meetings, workshops, etc.)

- Data Literacy Academic Learning Community – seeks to provide a space for discussion and exploration of data literacy, with a focus on interdisciplinary educational approaches, skill-building in data literacy (6 meetings during spring semester 2020); one of our main goals is to develop a data literacy package that includes lessons and curriculum to support undergraduate education

CURRENT PROFESSIONAL MEMBERSHIPS

National/international Organizations

- Society for Industrial and Applied Mathematics (SIAM)
- Society for Mathematical Biology (SMB)
- American Mathematical Society (AMS)
- Models of infectious disease agent study (MIDAS)

AWARDS & FELLOWSHIPS

2011 – 2013

NSF-RTG, Complex Biological Systems Group

- Complex biological systems across multiple space and time scales
  Award number 0739261
- Funding for the first two years of graduate school

April 2011

Culver Award for undergraduate research, Department of Mathematics

- For work on modeling antigenic variation in Trypanosome infections

2010 – 2011 **NSF-RTG, Complex Biological Systems Group**

- Complex biological systems across multiple space and time scales
  Award number 0739261
- Undergraduate research experience: summer (2010) & spring/summer (2011)

2007 – 2011 **University of Pittsburgh scholarships**

- University of Pittsburgh, 2007-2011
- Swanson School of Engineering, 2007-2009

FUNDING ACKNOWLEDGMENTS

August 2017 – present **DARPA INTERCEPT W911NF-17-2-0034**

Principal Investigator: Chris B. Brooke, PhD, Assistant Professor

- Funding source of my postdoctoral fellowship
- As part of the INTERCEPT program, our research team has aimed to investigate the potential for defective interfering particles to be used as a novel therapeutic against viral infections by understanding their basic evolutionary consequences within- and between-hosts.

2013 – 2014 **NSF DMS 1219753**

Principal Investigator: G. Bard Ermentrout, PhD, Distinguished University Professor

- Interactions between Stimuli and Spatiotemporal Activity
- Working with an undergraduate REU student (summer 2014), we published our results in PRE (2016). (see publications section)

REFERENCES

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