Kameron Decker Harris Curriculum Vitae Updated: January 30, 2023

CONTACT Email: kameron.harris@wwu.edu   Web: glomerul.us   Code: kamdh, glomerulus-lab

POSITIONS **Assistant Professor**, 2020–present
Department of Computer Science, Western Washington University, Bellingham, Washington.

Washington Research Foundation Postdoctoral Fellow, 2018–2020
Paul G. Allen School of Computer Science & Engineering and Department of Biology
University of Washington, Seattle, Washington.

RESEARCH INTERESTS I am a computational scientist and applied mathematician with an interest in **neural systems** and **networks/graph theory**. These systems are often adaptive, meaning they can learn from their environment and exhibit complex behavior. I enjoy collaborative, interdisciplinary research at the intersection of theory, modeling, and data science, including work in machine learning and analytics.

PUBLICATIONS A list of publications including citations and metrics is on Google Scholar.

25. M Xie, S Muscinelli, KD Harris, A Litwin-Kumar. *Task-dependent optimal representations for cerebellar learning*. In review, eLife.

24. S Daetwiler, A Read, J Stillwell, KD Harris. *BrainViewer: interacting with spatial connectome data at the mesoscale*. Preprint.

23. B Pandey, M Pachitariu, BW Brunton, KD Harris. *Structured random receptive fields enable informative sensory encodings*. PLoS Comput Biol 18(10): e1010484. 2022.

22. KD Harris, Y Zhu. *Deterministic tensor completion with hypergraph expanders*. SIAM Mathematics of Data Science 3(4), 1117–1140. 2021.

21. KD Harris, A Aravkin, R Rao, BW Brunton. *Time-varying Autoregression with Low Rank Tensors*. SIAM Applied Dynamical Systems 20(4), 2335–2358. 2021.

20. G Brito, I Dumitriu, KD Harris. *Spectral gap in random bipartite biregular graphs and applications*. Combinatorics, Probability, & Computing, 1–39. 2021.

19. WS DeWitt, KD Harris, AP Ragsdale, K Harris. *Nonparametric coalescent inference of mutation spectrum history and demography*. Proceedings of the National Academy of Sciences 118 (21) e2013798118. 2021.

18. SM Hirsh, KD Harris, JN Kutz, BW Brunton. *Centering Data Improves the Dynamic Mode Decomposition*. SIAM Applied Dynamical Systems 19(3), 1920–1955. 2020.

17. KD Harris. *Additive function approximation in the brain*. Workshop paper: Real Neurons and Hidden Units. Neural Information Processing Systems. 2019.

16. P Kürschner, S Dolgov, KD Harris, P Benner. *Greedy low-rank algorithm for smooth connectome regression*. Journal of Mathematical Neuroscience 9: 9. 2019.

15. J Knox, KD Harris, N Graddis, JD Whitesell, H Zeng, JA Harris, E Shea-Brown, S Mihalas. *High resolution data-driven model of the mouse connectome*. Network Neuroscience 3(1), 217-236. 2019.

14. KD Harris, T Dashevskiy, J Mendoza, AJ Garcia III, J-M Ramirez, E Shea-Brown. *Different roles for inhibition in the rhythm-generating respiratory network*. Journal of Neurophysiology 118(4), 2070–2088. 2017.

13. A Litwin-Kumar, KD Harris, R Axel, H Sompolinsky, LF Abbott. *Optimal degrees of synaptic connectivity*. Neuron 93, 1153–1164. 2017.

12. KD Harris, S Mihalas, E Shea-Brown. *High resolution neural connectivity from incomplete tracing data using nonnegative spline regression*. Neural Information Processing Systems, 2016.

11. PS Dodds, EM Clark, S Desu, MR Frank, AJ Reagan, JR Williams, L Mitchell, KD Harris, IM Kloumann, JP Bagrow, K Megerdoomian, MT McMahon, BF Tivnan, CM Danforth. *Human language reveals a universal positivity bias*. Proceedings of the National Academy of Sciences 112(8), 2389–2394. 2015.

10. KD Harris, PS Dodds, CM Danforth. *Dynamical influence processes on networks: General theory and applications to social contagion*. Physical Review E 88, 022816. 2013.

9. L Mitchell, MR Frank, KD Harris, PS Dodds, CM Danforth. *The Geography of Happiness: Connecting Twitter sentiment and expression, demographics, and objective characteristics of place*. PLoS ONE 8(5): e64417. 2013.

8. PS Dodds, KD Harris, CM Danforth. *Limited Imitation Contagion on Random Networks: Chaos, Universality, and Unpredictability*. Physical Review Letters 110, 158701. 2013.

7. CA Bliss, IM Kloumann, KD Harris, CM Danforth, PS Dodds. *Twitter reciprocal reply networks exhibit assortativity with respect to happiness*. Journal of Computational Science 3(5), 388–397. 2012.

6. KD Harris, E-H Ridouane, DL Hitt, CM Danforth. *Predicting flow reversals in chaotic natural convection using data assimilation*. Tellus A 64, 17598. 2012.

5. N Allgaier, KD Harris, CM Danforth. *Empirical Correction of a Toy Climate Model*. Physical Review E 85, 026201. 2012.

4. IM Kloumann, CM Danforth, KD Harris, CA Bliss, PS Dodds. *Positivity of the English language*. PLoS ONE 7(1): e29484. 2012.

3. PS Dodds, KD Harris, IM Kloumann, CA Bliss, CM Danforth. *Temporal patterns of happiness and information in a global social network: Hedonometrics and Twitter*. PLoS ONE 6(12): e26752. 2011.

2. JL Payne, KD Harris, PS Dodds. *Exact solutions for social and biological contagion models on mixed directed and undirected, degree-correlated random networks*. Physical Review E 84, 016110. 2011.

1. PS Dodds, KD Harris, JL Payne. *Direct, physically motivated derivation of the contagion condition for spreading processes on generalized random networks*. Physical Review E 83, 056122. 2011.

GRANTS AND HONORS

Washington Research Foundation Postdoctoral Fellowship, 3 yr. grant, 2018–2020

Graduate
· Boeing Research Award in Applied Mathematics, University of Washington, 2016
· Big Data for Genomics and Neuroscience Training Grant, University of Washington, 2015–2017
· Joseph Hammack Research Award in Applied Mathematics, University of Washington, 2014
· Boeing Fellowship, University of Washington, 3 yrs. funding, 2012–2015
· John F. Kenney Award for Excellence in Mathematics, University of Vermont, 2012
· NASA Graduate Research Assistantship, University of Vermont, 2009, 2011

Fulbright Scholar, Chile, 2010
· Worked with transportation engineers to optimize the nighttime bus timetables of Santiago

Undergraduate
· Vermont Scholar, funded 100% financial need, 2005–2009
· URECA! NASA-funded undergraduate research grant, 2008–2009
· Honors College Scholar, *Magna cum laude*, Phi Beta Kappa
· Senior Mathematics Award for Research, 2009

EDUCATION

University of Washington, Seattle, Washington.
· Ph.D., Applied Mathematics, December 2017.
  Thesis: *This Brain Is a Mess: Inference, Random Graphs, and Biophysics to Disentangle Neuronal Networks*. Advisor: Eric Shea-Brown
  Committee: Ioana Dumitriu, Adrienne Fairhall, Stefan Mihalas, Jan-Marino Ramirez

University of Vermont, Burlington, Vermont.
· M.S., Mathematics, October 2012.
  Thesis: *On-off Threshold Models of Social Contagion*.
  Advisor: Peter Sheridan Dodds.
· B.A., Mathematics and B.A., Physics, May 2009.
  Honors College thesis: *Predicting Climate Regime Change in Chaotic Convection*.
  Advisor: Christopher M. Danforth.

Other education
· Methods in Computational Neuroscience. Marine Biological Lab, Woods Hole, MA. 2015.
· Mining and modeling of neuroscience data. Redwood Center for Theoretical Neuroscience. University of California Berkeley, 2013.
· Complex Systems Summer School. Santa Fe Institute, 2011.
· ISEP Exchange Program. Pontifícia Universidad Católica de Valparaíso, Chile. 2007.

Teaching & Mentoring	Instructor

· CNeuro2022. Theoretical and Computational Neuroscience Summer School.
  IOB (Basel, Switzerland) and Tsinghua University (Beijing, China) — August 2022
· Machine Learning I (DATA 371) — Spring 2022
· Analysis of Algorithms II (CSCI 405) — Fall 2021
· Analysis of Algorithms I (CSCI 305) — Winter, Spring 2021; Spring, Fall 2022
· Machine Learning (CSCI 471/571) — Fall 2020
· Data Science for Biologists (UW BIO 419/519) — Winter 2019
· Introduction to Computational Models in Biology (UW AMATH 422/522) — Fall 2017

Research mentoring
· Vivian White, CS undergrad. 2022–now.
· Suyhun "Michael" Ban, CS undergrad. 2021–now.
· Angus Read, CS grad. 2021–now.
· Caitlin Bannister, Neuroscience undergrad. 2021–now.
· Jessica Stillwell (now: PNNL), CS undergrad. 2020–2022.
· Grant Chou (now: Tuthill lab research tech), CS undergraduate. 2020–2022.
· Biraj Pandey, Applied Math PhD student. 2019–2022.
· Sean McCulloch (now: Allen Institute for Brain Science), WWU CS MSc student. 2020–2021.
· Seth Hirsh (now: Facebook Reality labs), Physics PhD student. 2018–2020.
· Satpreet Singh, Electrical & Computer Engineering PhD student. 2018–2019.
· Yuchen Wang (now: Adobe), CS & Engineering undergrad. 2018–2019.
· Nathan Lee, Applied Math PhD student. 2018–2019.
· Joseph Knox (now: Facebook data scientist), Allen Institute for Brain Science. 2017–2018.
· Nile Graddis, Allen Institute for Brain Science. 2015–2018.
· Joshua Mendoza (now: PNNL data scientist). Applied Math Honors thesis: *The effects of network structure in creating a two-phase breathing pattern in the Bötzinger and pre-Bötzinger complexes*, 2014–2015. UWIN Postbac Fellowship, 2016.

Teaching assistant
· Summer Workshop on the Dynamic Brain (UW/Allen Institute for Brain Science) — Summer 2016
· Women in Science and Engineering undergraduate program, UW — Summer 2014
· STEM Bridge undergraduate program, UW — Summer 2013
· Introduction to Nonlinear Dynamics and Chaos (UW AMATH 402/502) — Winter 2013, 2014
· Fundamentals of Calculus I (UVM MATH 19) — Fall 2008
· Basic Combinatorial Theory (UVM MATH 173) — Spring 2007

Instructor, Champlain Valley Union High School ACCESS community classes
· Intermediate Spanish: Advanced — Spring 2012
· Spanish for Beginners — Fall 2011

Guest lecturer
· Computational Modeling of Biological Systems (UW AMATH 422/522) — Fall 2016
· Introduction to Nonlinear Dynamics and Chaos (UW AMATH 402/502) — Winter 2015
· Linear Algebra (UVM MATH 124) — Fall 2009
· Introduction to Numerical Analysis (UVM MATH 237) — Fall 2009
· Chaos and Fractals (UVM MATH 266) — Spring 2009

Tutor
· UVM Learning Coop "in-house" undergraduate tutor — December 2006–March 2009
· VSAC Tutor Academy training — 2008

Ski instructor, Mad River Glen Freeride, students age 11–18 — Winter 2009–2010

Service and Professional Societies	CS graduate program committee, 2021–now

Member: Society for Industrial and Applied Mathematics, Organization for Computational Neuroscience

Conference organizer: DeepMath 2022

Conference referee: COSYNE (2021, 2022), NeurIPS (2021, 2022), SIAM Workshop on Network Science (2018)

Referee: Network Neuroscience, NeuroImage, Physical Review Letters, PLOS ONE, PLOS Comp Bio, Physical Review E, New Media and Society

Volunteer, SIAM Math Fair at Lockwood Elementary School, 2014

Computational neuroscience journal club co-organizer, 2014–2016

Organized UW Applied Math ski day, 2015

SELECTED TALKS   KD Harris. *Network geometry for sensing and learning.*
· CAIDA AI seminar, University of British Columbia invited talk
· NeuroAI in Seattle 2022, invited talk

KD Harris. *A Random Perspective on Tuning Properties of Sensory Neurons.* Invited talk, Center for Integrative Brain Research, Seattle Children's Research Institute, Seattle, WA. 2021.

KD Harris. *Rigorous theories of neural nets and kernel methods.* Invited talk, Computational Neuroscience Seminar, University of Washington, Seattle, WA. 2021.

KD Harris. *Leveraging the lacuna: spectral gaps and tensor recovery.* Invited talk, Minisymposium: Latest advances in spectral linear algebra in network science. SIAM Linear Algebra. 2021.

KD Harris. *Kernel theories of networks and their use in neuroscience.* Computational Neuroscience Seminar, University of Washington, Seattle, WA. 2020.

KD Harris, Y Zhu. *Tensor complexity and completion using hypergraph expanders.* Theory seminar. Computer Science & Engineering, University of Washington, Seattle, WA. 2020.

KD Harris. *Brain network reconstruction as an inverse problem.* Invited talk, Workshop: Inverse Problems in Imaging. SIAM PNW 2019, Seattle, WA. 2019.

KD Harris, I Dumitriu, G Brito. *Spectral gap in random bipartite biregular graphs and applications.* Theory seminar. Computer Science & Engineering, University of Washington, Seattle, WA. 2019.

KD Harris, J Harris, S Mihalas, H Choi, J Whitesell. *The Mouse Mesoscale Connectome: Data-driven Models and Organization of Cortical Networks.* Showcase Symposium team talk. Allen Institute for Brain Science, Seattle, WA. 2018.

KD Harris, A Litwin-Kumar, R Axel, H Sompolinsky, LF Abbott. *Connections between dimensionality and network sparsity.* Invited talk, Workshop: How does learning reshape dimensionality of collective network activity? Computational Neuroscience (CNS) 2018, Seattle, WA. 2018.

KD Harris. *Advances and challenges in connectome inference and analysis.*
· Institute for Disease Modeling, Bellevue, WA. 2017.
· Pacific Northwest National Laboratory, Richland, WA. 2017.

KD Harris, N Graddis, J Harris, S Mihalas, ET Shea-Brown. *Construction of a voxel-based mesoscopic mouse connectome.* Synergy Lecture. Allen Institute for Brain Science, Seattle, WA. 2016.

KD Harris, T Dashevskiy, J Mendoza, AJ Garcia III, J-M Ramirez, and ET Shea-Brown. *Role and limits of inhibition in an excitatory burst generator.* Invited talk, Connecting Network Architecture and Network Computation. BIRS, Banff, AB. 2015.

KD Harris, T Dashevskiy, J-M Ramirez, and ET Shea-Brown. *Combined Effects of Connectivity and Inhibition in a Model of Breathing Rhythmogenesis.* SIAM Dynamical Systems Conference. Snowbird Resort, Little Cottonwood Canyon, UT. 2015.

KD Harris, PS Dodds, CM Danforth. *Limited Imitation Social Contagion as a Model of Fashions.*
· Dynamics Days 2013. Marriott City Center, Denver, CO. 2013.
· SIAM Dynamical Systems Conference. Snowbird Resort, Little Cottonwood Canyon, UT. 2013.

KD Harris, M Munizaga, A Gschwender. *Timetable optimization for Transantiago night service—Fulbright studies in Chile.* Transportation Research Center Brown Bag Series. University of Vermont, Burlington, VT. 2011.

KD Harris, PS Dodds, CM Danforth, IM Kloumann, CA Bliss. *Geographical variation of happiness as expressed by users of Twitter.* Student Research Conference. University of Vermont, Burlington,

VT. 2011.

KD Harris, M Munizaga, A Gschwender. *Programación de servicios nocturnos—Proponiendo un horario optimizado para Transantiago* (Programming nightly bus service—Proposing an optimized schedule for Transantiago). Seminar "Herramientas avanzadas para la ciudad del futuro." Universidad de Chile, Santiago, Chile. 2010.

KD Harris, E-H Ridouane, D Hitt, CM Danforth.
Forecasting Flow Reversals in a Chaotic Toy Climate.
· SIAM Dynamical Systems Conference. Snowbird Resort, Little Cottonwood Canyon, UT. 2011.
· Applied Mathematics Seminar. University of Vermont, Burlington, VT. 2009.
· Graduate Student Seminar. University of Vermont, Burlington, VT. 2009.
· Student Research Conference. University of Vermont, Burlington, VT. 2009.
· MAA Northeastern Sectional Meeting. St. Michael's College, Burlington, VT. 2008.
· URECA! Awards Ceremony. University of Vermont, Burlington, VT. 2008.

TECHNICAL SKILLS   Programming languages: Python (scipy, numpy, networkx, scikit-learn, pandas), MATLAB, C/C++

Data: Experience with PostgreSQL + PostGIS, Hadoop + Pig, R

Computer systems: cluster environments, Linux, LaTeX, git

Spoken language: Spanish (fluent), English (native), French (basic)

REFERENCES   **Bingni Wen Brunton**
Associate Professor, Department of Biology, University of Washington
bbrunton@uw.edu

Eric Shea-Brown
Professor, Department of Applied Mathematics, University of Washington
etsb@amath.washington.edu

Ioana Dumitriu
Professor, Department of Mathematics, University of California San Diego
dumitriu@ucsd.edu

Christopher M. Danforth
Professor, Department of Mathematics & Statistics, University of Vermont
cdanfort@uvm.edu

Peter Dodds
Professor, Department of Computer Science, University of Vermont
pdodds@uvm.edu