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Joshua T. Vogelstein

Personal Information

Primary Appointment

08/14 – **Assistant Professor**, *Department of Biomedical Engineering*, JHU.

Joint Appointments

09/19 – **Joint Appointment**, *Department of Biostatistics*, Johns Hopkins University (JHU).
08/15 – **Joint Appointment**, *Department of Applied Mathematics and Statistics*, JHU.
08/14 – **Joint Appointment**, *Department of Neuroscience*, JHU.
08/14 – **Joint Appointment**, *Department of Computer Science*, JHU.

Institutional and Center Appointments

08/15 – **Steering Committee**, *Kavli Neuroscience Discovery Institute (KNDI)*.
08/14 – **Core Faculty**, *Institute for Computational Medicine*, JHU.
08/14 – **Core Faculty**, *Center for Imaging Science*, JHU.
08/14 – **Assistant Research Faculty**, *Human Language Technology Center of Excellence*, JHU.
10/12 – **Affiliated Faculty**, *Institute for Data Intensive Engineering and Sciences*, JHU.

Education & Training

2003 – 2009 **Ph.D in Neuroscience**, *Johns Hopkins School of Medicine*,
Advisor: Eric Young,
Thesis: OOPSI: a family of optical spike inference algorithms for inferring neural connectivity from population calcium imaging .

2009 – 2009 **M.S. in Applied Mathematics & Statistics**, *Johns Hopkins University*.

1998 – 2002 **B.A. in Biomedical Engineering**, *Washington University, St. Louis*.

Academic Experience

08/18 – **Director of Biomedical Data Science Focus Area**, *Department of Biomedical Engineering, Johns Hopkins University*.

05/16 – **Visiting Scientist**, *Howard Hughes Medical Institute*, Janelia Research Campus.

10/12 – 08/14 **Endeavor Scientist**, *Child Mind Institute*.

08/12 – 08/14 **Affiliated Faculty**, *Kenan Institute for Ethics*.
Duke University

08/12 – 08/14 **Adjunct Faculty**, *Department of Computer Science, Johns Hopkins University*.

12/09 – 01/11 **Post-Doctoral Fellow**, *Department of Applied Mathematics and Statistics*, Supervised by Carey E. Priebe, Johns Hopkins University.
Research Statistics of populations of networks.

06/01 – 09/01 **Research Assistant**, *Prof. Randy O'Reilly, Dept. of Psychology*.
University of Colorado

06/00 – 09/00 **Clinical Engineer**, *Johns Hopkins Hospital*.

06/99 – 08/99 **Research Assistant under Dr. Jeffrey Williams**, *Dept. of Neurosurgery, Johns Hopkins Hospital*.

06/98 – 08/98 **Research Assistant under Professor Kathy Cho**, *Dept. of Pathology, Johns Hopkins School of Medicine*.

Publications

Published (Peer-Reviewed Research Articles)

Note: CV author in bold; Trainees in italics,
(55 papers; top 10 cited 3,128 times; H-index 30; 11 first, 10 last, 55 middle authorships) as of 2020/01/25

[55] *Shangsi Wang*, *Jesús Arroyo*, **Joshua T Vogelstein**, and Carey E Priebe. "Joint Embedding of Graphs". In: Transactions on Pattern Analysis and Machine Intelligence in press (Oct. 2019). URL: http://arxiv.org/abs/1703.03862.

[54] *Youjin Lee*, *Cencheng Shen*, Carey E Priebe, and **Joshua T Vogelstein**. "Network dependence testing via diffusion maps and distance-based correlations". In: Biometrika (Sept. 2019). ISSN: 0006-3444. DOI: 10.1093/biomet/asz045. arXiv: 1703.10136. URL: https://doi.org/10.1093/biomet/asz045.

[53] *Jaewon Chung*, *Benjamin D. Pedigo*, *Eric W. Bridgeford*, *Bijan K. Varjavand*, and **Joshua T. Vogelstein**. "GraSPy: Graph Statistics in Python". In: Journal of Machine Learning Research 20.158 (Apr. 2019), pp. 1–7. eprint: https://arxiv.org/abs/1904.05329. URL: http://jmlr.org/papers/v20/19-490.html.

[52] **Joshua T. Vogelstein**, *Eric W. Bridgeford*, *Benjamin D. Pedigo*, *Jaewon Chung*, Keith Levin, Brett Mensh, and Carey E. Priebe. "Connectal Coding: Discovering the Structures Linking Cognitive Phenotypes to Individual Histories". In: Current Opinion in Neurobiology 55 (Apr. 2019), pp. 199–212. ISSN: 18736882. DOI: 10.1016/j.conb.2019.04.005. URL: https://doi.org/10.1016/j.conb.2019.04.005.

[51] Jake J. Son, Jon C. Clucas, Curt White, Anirudh Krishnakumar, **Joshua T. Vogelstein**, Michael P. Milham, and Arno Klein. "Thermal sensors improve wrist-worn position tracking". In: npj digital medicine 2.1 (Feb. 2019). ISSN: 2398-6352. DOI: 10.1038/s41746-019-0092-2. URL: https://doi.org/10.1038/s41746-019-0092-2.

[50] Carey E. Priebe, Youngser Park, **Joshua T. Vogelstein**, John M. Conroy, Vince Lyzinski, Minh Tang, Avanti Athreya, Joshua Cape, and *Eric Bridgeford*. "On a two-truths phenomenon in spectral graph clustering". In: Proceedings of the National Academy of Sciences of the United States of America 116.13 (Feb. 2019), pp. 5995–6000. ISSN: 10916490. DOI: 10.1073/pnas.1814462116. arXiv: 1808.07801. URL: https://www.pnas.org/content/early/2019/03/07/1814462116.short.

[49] **Joshua T. Vogelstein**, *Eric W. Bridgeford*, Qing Wang, Carey E. Priebe, Mauro Maggioni, and *Cencheng Shen*. "Discovering and deciphering relationships across disparate data modalities". In: eLife 8 (Jan. 2019). ISSN: 2050084X. DOI: 10.7554/eLife.41690. arXiv: 1609.05148. URL: https://elifesciences.org/articles/41690.

[48] Runze Tang, Michael Ketcha, Alexandra Badea, Evan D Calabrese, Daniel S Margulies, **Joshua T Vogelstein**, Carey E Priebe, and Daniel L Sussman. "Connectome Smoothing via Low-rank Approximations". In: Transactions in Medical Imaging (Dec. 2018). URL: https://ieeexplore.ieee.org/document/8570772.

[47] *Cencheng Shen*, Carey E Priebe, and **Joshua T Vogelstein**. "From Distance Correlation to Multiscale Graph Correlation". In: Journal of the American Statistical Association (Oct. 2018). URL: https://www.tandfonline.com/doi/full/10.1080/01621459.2018.1543125.

[46] **Joshua T. Vogelstein**, Eric Perlman, Benjamin Falk, *Alex Baden*, William Gray Roncal, *Vikram Chandrashekhar*, Forrest Collman, Sharmishtaa Seshamani, Jesse L. Patsolic, *Kunal Lillaney*, Michael Kazhdan, Robert Hider, Derek Pryor, Jordan Matelsky, Timothy Gion, *Priya Manavalan*, Brock Wester, Mark Chevillet, Eric T. Trautman, Khaled Khairy, *Eric Bridgeford*, Dean M. Kleissas, Daniel J. Tward, Ailey K. Crow, Brian Hsueh, Matthew A. Wright, Michael I. Miller, Stephen J. Smith, R. Jacob Vogelstein, Karl Deisseroth, and Randal Burns. "A Community-Developed Open-Source Computational Ecosystem for Big Neuro Data". In: Nature Methods 15.11 (Oct. 2018), pp. 846–847. ISSN: 15487105. DOI: 10.1038/s41592-018-0181-1. arXiv: 1804.02835. URL: https://www.nature.com/articles/s41592-018-0181-1.

[45] Avanti Athreya, Donniell E. Fishkind, Minh Tang, Carey E. Priebe, Youngser Park, **Joshua T. Vogelstein**, Keith Levin, Vince Lyzinski, Yichen Qin, and Daniel L Sussman. "Statistical Inference on Random Dot Product Graphs: a Survey". In: Journal of Machine Learning Research 18 (May 2018), pp. 1–92. ISSN: 15337928. arXiv: 1709.05454. URL: http://jmlr.org/papers/v18/17-448.html.

[44] Joshua D. Cohen, Lu Li, Yuxuan Wang, Christopher Thoburn, Bahman Afsari, Ludmila Danilova, Christopher Douville, Ammar A. Javed, Fay Wong, Austin Mattox, Ralph H. Hruban, Christopher L. Wolfgang, Michael G. Goggins, Marco Dal Molin, Tian Li Wang, Richard Roden, Alison P. Klein, Janine Ptak, Lisa Dobbyn, Joy Schaefer, Natalie Silliman, Maria Popoli, **Joshua T. Vogelstein**, *James D. Browne*, Robert E. Schoen, Randall E. Brand, Jeanne Tie, Peter Gibbs, Hui Li Wong, Aaron S. Mansfield, Jin Jen, Samir M. Hanash, Massimo Falconi, Peter J. Allen, Shibin Zhou, Chetan Bettegowda, Luis A. Diaz, Cristian Tomasetti, Kenneth W. Kinzler, Bert Vogelstein, Anne Marie Lennon, and Nickolas Papadopoulos. "Detection and localization of surgically resectable cancers with a multi-analyte blood test". In: Science 359.6378 (Feb. 2018), pp. 926–930. ISSN: 10959203. DOI: 10.1126/science.aar3247. URL: https://doi.org/10.1126/science.aar3247.

[43] Daniele Durante, David B. Dunson, and **Joshua T. Vogelstein**. "Rejoinder: Nonparametric Bayes Modeling of Populations of Networks". In: Journal of the American Statistical Association 112 (Oct. 2017). ISSN: 0162-1459. DOI: 10.1080/01621459.2017.1395643. URL: https://doi.org/10.1080/01621459.2017.1395643.

[42] *Gregory Kiar*, Krzysztof J. Gorgolewski, Dean Kleissas, William Gray Roncal, Brian Litt, Brian Wandell, Russel A. Poldrack, Martin Wiener, R. Jacob Vogelstein, Randal Burns, and **Joshua T. Vogelstein**. "Science in the cloud (SIC): A use case in MRI connectomics". In: GigaScience 6.5 (May 2017), pp. 1–10. ISSN: 2047-217X. DOI: 10.1093/gigascience/gix013. arXiv: 1610.08484. URL: https://academic.oup.com/gigascience/article-lookup/doi/10.1093/gigascience/gix013.

[41] *Shaojie Chen*, Kai Liu, Yuguang Yang, Yuting Xu, Seonjoo Lee, Martin Lindquist, Brian S. Caffo, and **Joshua T. Vogelstein**. "An M-estimator for reduced-rank system identification". In: Pattern Recognition Letters 86 (Jan. 2017), pp. 76–81. ISSN: 0167-8655. DOI: 10.1016/J.PATREC.2016.12.012. URL: https://www.sciencedirect.com/science/article/pii/S0167865516303671.

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[33] Danai Koutra, Neil Shah, **Joshua T. Vogelstein**, Brian Gallagher, and Christos Faloutsos. "DeltaCon: Principled Massive-Graph Similarity Function with Attribution". In: ACM Transactions on Knowledge Discovery from Data 10.3 (Feb. 2016). ISSN: 1556-4681. DOI: 10.1145/2824443. URL: http://doi.acm.org/10.1145/2824443.

[32] Vince Lyzinski, Donniell E. Fishkind, Marcelo Fiori, **Joshua T. Vogelstein**, Carey E. Priebe, and Guillermo Sapiro. "Graph Matching: Relax at Your Own Risk". In: IEEE Transactions on Pattern Analysis and Machine Intelligence 38.1 (Jan. 2016), pp. 60–73. ISSN: 01628828. DOI: 10.1109/TPAMI.2015.2424894. arXiv: 1405.3133. URL: http://doi.org/10.1109/TPAMI.2015.2424894.

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[29] Li Chen, Cencheng Shen, **Joshua T. Vogelstein**, and Carey E. Priebe. "Robust Vertex Classification". In: IEEE Transactions on Pattern Analysis and Machine Intelligence 38.3 (2016), pp. 578–590. ISSN: 01628828. DOI: 10.1109/TPAMI.2015.2456913. URL: http://dx.doi.org/10.1109/TPAMI.2015.2456913.

[28] Carey E. Priebe, Daniel L. Sussman, Minh Tang, and **Joshua T. Vogelstein**. "Statistical Inference on Errorfully Observed Graphs". In: Journal of Computational and Graphical Statistics 24.4 (Oct. 2015), pp. 930–953. ISSN: 15372715. DOI: 10.1080/10618600.2014.951049. arXiv: 1211.3601. URL: https://doi.org/10.1080/10618600.2014.951049.

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[26] Li Chen, **Joshua T Vogelstein**, Vince Lyzinski, and Carey E Priebe. "A Joint Graph Inference Case Study: the C.elegans Chemical and Electrical Connectomes". In: Worm 5 (2015). ISSN: 2162-4054. DOI: 10.1080/21624054.2016.1142041. eprint: 1507.08376. URL: http://arxiv.org/abs/1507.08376.

[25] *William R Gray Roncal*, Dean M Kleissas, **Joshua T Vogelstein**, *Priya Manavalan*, *Kunal Lillaney*, Michael Pekala, Randal Burns, R Jacob Vogelstein, Carey E Priebe, Mark A Chevillet, and Gregory D Hager. "An automated images-to-graphs framework for high resolution connectomics". In: Frontiers in Neuroinformatics 9 (2015). ISSN: 1662-5196. DOI: 10.3389/fninf.2015.00020. URL: http://journal.frontiersin.org/article/10.3389/fninf.2015.00020.

[24] **Joshua T. Vogelstein**, John M. Conroy, Vince Lyzinski, Louis J. Podrazik, Steven G. Kratzer, Eric T. Harley, Donniell E. Fishkind, R. Jacob Vogelstein, and Carey E. Priebe. "Fast Approximate Quadratic programming for graph matching". In: PLoS ONE 10.4 (2015). ISSN: 19326203. DOI: 10.1371/journal.pone.0121002. URL: http://dx.doi.org/10.1371/journal.pone.0121002.

[23] **Joshua T. Vogelstein** and Carey E. Priebe. "Shuffled Graph Classification: Theory and Connectome Applications". In: Journal of Classification 32.1 (2015), pp. 3–20. ISSN: 14321343. DOI: 10.1007/s00357-015-9170-6. arXiv: 1112.5506. URL: https://doi.org/10.1007/s00357-015-9170-6.

[22] Vince Lyzinski, Daniel L. Sussman, Donniell E. Fishkind, Henry Pao, Li Chen, **Joshua T. Vogelstein**, Youngser Park, and Carey E. Priebe. "Spectral clustering for divide-and-conquer graph matching". In: Parallel Computing 47 (2015), pp. 70–87. ISSN: 01678191. DOI: 10.1016/j.parco.2015.03.004. arXiv: 1310.1297. URL: https://doi.org/10.1016/j.parco.2015.03.004.

[21] Narayanan Kasthuri, Kenneth Jeffrey Hayworth, Daniel Raimund Berger, Richard Lee Schalek, José Angel Conchello, Seymour Knowles-Barley, Dongil Lee, Amelio Vázquez-Reina, Verena Kaynig, Thouis Raymond Jones, Mike Roberts, Josh Lyskowski Morgan, Juan Carlos Tapia, H. Sebastian Seung, William Gray Roncal, **Joshua Tzvi Vogelstein**, Randal Burns, Daniel Lewis Sussman, Carey Eldin Priebe, Hanspeter Pfister, and Jeff William Lichtman. "Saturated Reconstruction of a Volume of Neocortex". In: Cell 162.3 (2015), pp. 648–661. ISSN: 10974172. DOI: 10.1016/j.cell.2015.06.054. URL: https://doi.org/10.1016/j.cell.2015.06.054.

[20] David E. Carlson, **Joshua T. Vogelstein**, Qisong Wu, Wenzhao Lian, Mingyuan Zhou, Colin R. Stoetzner, Daryl Kipke, Douglas Weber, David B. Dunson, and Lawrence Carin. "Multichannel Electrophysiological Spike Sorting via Joint Dictionary Learning and Mixture Modeling". In: IEEE Transactions on Biomedical Engineering 61.1 (Jan. 2014), pp. 41–54. ISSN: 0018-9294. DOI: 10.1109/TBME.2013.2275751. arXiv: 1304.0542. URL: http://ieeexplore.ieee.org/document/6571240/.

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[14] **Joshua T. Vogelstein**, *William Gray Roncal*, R. Jacob Vogelstein, and Carey E. Priebe. "Graph classification using signal-subgraphs: Applications in statistical connectomics". In: IEEE Transactions on Pattern Analysis and Machine Intelligence 35.7 (2013), pp. 1539–1551. ISSN: 01628828. DOI: 10.1109/TPAMI.2012.235. arXiv: 1108.1427. URL: https://doi.org/10.1109/TPAMI.2012.235.

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[10] Donniell E. Fishkind, Daniel L. Sussman, Minh Tang, **Joshua T. Vogelstein**, and Carey E. Priebe. "Consistent adjacency-spectral partitioning for the stochastic block model when the model parameters are unknown". In: SIAM Journal on Matrix Analysis and Applications 34.1 (2012), pp. 23–39. ISSN: 0895-4798. DOI: 10.1137/120875600. arXiv: 1205.0309. URL: http://arxiv.org/abs/1205.0309.

[9] **Joshua T. Vogelstein**, R. Jacob Vogelstein, and Carey E. Priebe. "Are mental properties supervenient on brain properties?" In: Scientific Reports 1 (2011). ISSN: 20452322. DOI: 10.1038/srep00100. URL: https://doi.org/10.1038/srep00100.

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[4] **Joshua T Vogelstein**, Adam M Packer, Tim A Machado, Tanya Sippy, Baktash Babadi, Rafael Yuste, and Liam Paninski. "Fast non-negative deconvolution for spike train inference from population calcium imaging". In: Journal of Neurophysiology 104 (2009). ISSN: 0022-3077. DOI: 10.1152/jn.01073.2009. arXiv: 0912.1637. URL: https://doi.org/10.1152/jn.01073.2009.

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Submitted (Peer-Review Research Articles)

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Funding

The below table shows my direct (total) cost expenditures since being hired, indicating a steady increase >30% per year.

Financial Year	Direct	Total
2015:	$113,761	$168,924
2016:	$360,123	$524,225
2017:	$459,523	$709,019
2018:	$550,011	$887,186
2019:	$850,836	$1,366,308

Current

2020 – 2025 **CAREER: Foundational Statistical Theory and Methods for Analysis of Populations of Attributed**,
NSF 17-537
Role on project: Principal Investigator
Term: 01-Mar-2020 to 31-Dec-2025
Budget: $384,873 (direct) $245,357 (indirect) $630,230 (total)
The goal is to establish foundational theory and methods for analyzing populations of attributed connectomes.

2019 – 2022 **Accessible technologies for high-throughput, whole-brain reconstructions of molecularly characterized mammalian neurons**,
NIH RO1 Research Grant
Role on project: Co-Investigator (PI: Muller, Miller)
Term: 01-Sept-2019 to 31-Aug-2022
Total budget: $753,974 (direct) $426,471 (indirect) $1,180,445 (total cost)
The overall goal of the proposal is to develop technologies for the brain wide reconstruction of axonal arbors of molecularly defined neurons. The proposal aims at overcoming barriers in neuronal labeling, imaging and computation to achieve this goal, and to develop a technology platform that can be scaled to all neurons of the brain.

2019 – 2020 **Reproducible imaging-based brain growth charts for psychiatry**,
NIH R01 Research Grant
Role on project: Co-Investigator (PI: Saterthwaite)
Term: 01-Aug-2019 to 31-May-2020
Budget: $231,276 (direct) $131,585 (indirect) $362,861 (total cost)
Aggregate, harmonize, and analyze existing large-scale pediatric neuroimaging datasets to identify normative and clinical brain growth curves.

2019 – **Microsoft Research Award**,
Mircosoft Research Gift
Role on Project: Principal Investigator
Term: Unrestricted Gift
Budget: $50,000 (total cost)
Research and development of neuroscience and connectomes around neuronal circuit and system modeling, application of time-series-of-graphs and dynamics to neuronal signaling analysis and connectomes, and in the abstractions of matter, math, machines that point toward complex systems composed of low-level components.

2018 – 2020 **Lifelong Learning Forests**,
Defense Advanced Research Projects Agency Research Grant FA8650-18-2-7834 (128567)
Role on Project: Principal Investigator
Term: 01-Jul-2018 to 30-Jun-2020
Budget: $1,123,474 (direct) $715,834 (indirect) $1,839,308 (total cost)
Lifelong Learning Forests (L2Fs) will learn continuously, selectively adapting to new environments and circumstances utilizing top-down feedback to impact low-level processing, with provable statistical guarantees, while maintaining computational tractability at scale.

2018 – 2021 **SemiSynBio: Collaborative Research: YeastOns: Neural Networks Implemented in Communication Yeast Cells**,
National Science Foundation Research Grant (129439)
Role on project: Co-Investigator (PI: Schuman)
Term: 01-Jul-2018 to 30-Jun-2021
Budget: $172,971 (direct) $90,971 (indirect) $263,942 (total cost)
Provide neuroscience and machine learning expertise to guide the design of the computational learning capabilities of the system.

2018 – 2019 **Connectome Coding at the Synaptic Scale**,
Schmidt Science Foundation (128503)
Role on Project: Principal Investigator
Term: 01-Jan-2018 to 31-Dec-2019
Budget: $250,000 (total cost)
Study learning and plasticity at an unprecedented scale, revealing the dynamics of large populations of synapses comprising an entire local cortical circuit. No previously conducted experiment could answer the questions about the dynamics of large populations of synapses, which is crucial to understanding the learning process.

2017 – 2021 **Continual Learning Across Synapses, Circuits, and Brain Areas**,
Defense Advanced Research Projects Agency Research Grant FA8650-18-2-7834 (129061)
Role on project: Co-Investigator (PI: Tolias)
Term: 01-Nov-2017 to 30-Oct-2021
Budget: $486,666 (direct) $310,049 (indirect) $796,715 (total cost)
Develop the pre-processing analysis pipeline for the imaging data collected in this project.

2017 – 2020 **NeuroNex Innovation Award: Towards Automatic Analysis of Multi-Terabyte Cleared Brains**,
National Science Foundation 1707298
Role on Project: Principal Investigator
Term: 01-Sept-2017 to 31-Aug-2020 (No Cost Extension)
Budget: $588,758 (direct) $371,241 (indirect) $959,999 (total cost)
We propose to lower the barrier to connecting data to analyses and models by providing a coherent cloud computational ecosystem that minimizes current bottlenecks in the scientific process.

2017 – 2022 **Sensorimotor processing, decision making, and internal states: towards a realistic multi-scale circuit model of the larval zebrafish brain**,
NIH Research Grant 1U19NS104653-01 (127940)
Role on Project: Co-Investigator (PI: Engert)
Term: 01-Sept-2017 to 31-Aug-2022
Budget: $655,206 (direct) $394,794 (indirect) $1,050,000 (total cost) (JHU sub-award)
Generate a realistic multiscale circuit model of the larval zebrafish's brain – the multiscale virtual fish (MSVF). The model will span spatial ranges from the nanoscale at the synaptic level, to local microcircuits to inter-area connectivity - and its ultimate purpose is to explain and simulate the quantitative and qualitative nature of behavioral output across various timescales.

2017 – 2020 **CRCNS US-German Res Prop: functional computational anatomy of the auditory cortex**,
National Institutes of Health Research Grant 1R01DC016784-01 (126308)
Role on Project: Co-Investigator (PI: Ratnanather, J)
Term: 01-July-2017 to 30-June-2020
Budget: $458,519 (direct) $288,624 (indirect) $747,143 (total cost)
Create a robust computational framework for analyzing the cortical ribbon in a specific region: the auditory cortex.

2017 – 2020 **Multiscale Generalized Correlation: A Unified Distance-Based Correlation Measure for Dependence Discovery**,
National Science Foundation Research Grant (132031)
Role on project: Co-Investigator (PI: Cencheng, S)
Term: 01-May-2017 to 30-April-2020
Budget: $124,189 (direct) $75,811 (indirect) $200,000 (total cost)
Establish a unified methodology framework for statistical testing in high-dimensional, noisy, big data, through theoretical advancements, comprehensive simulations, and real data experiments.

2016 – 2020 **D3M: What Would Tukey Do?**,
Defense Advanced Research Projects Agency Research Grant FA8750-17-2-0112 (125863)
Role on project: Co-Investigator (PI: Priebe, C)
Term: 01-Oct-2016 to 30-Sep-2020
Budget: $2,746,050 (direct) $1,660,310 (indirect) $4,406,360 (total cost)
Develop theory and methods for generating a discoverable archive of data modeling primitives and for automatically selecting model primitives and for composing selected primitives into complex modeling pipelines based on user-specified data and outcome(s) of interest.

Pending

2020 – 2023 **Graspy: A python package for rigorous statistical analysis of populations of attributed connectomes**,
NIH MN-19-147
Role on project: Principal Investigator
Term: 01-Mar-2020 to 30-June-2023
Budget: $861,240 (direct) $549,039 (indirect) $1,410,279 (total)
The goal of this project is to establish a state-of-the-art toolbox for analysis of connectomes, spanning taxa, scale, and complexity. More specifically, we will develop and extend implementations to enable neurobiologists to 1) estimate latent structure from attributed connectomes, (2) identify meaningful clusters among populations of connectomes, and (3) detect relationships between connectomes and multivariate phenotypes, such as behavior, genetics, and physiology.

2020 – 2022 **High throughput mapping pipeline for incomplete and censored neuroimaging data**,
NIH / MH-19-148
Role on Project: Co-Investigator (PI: Miller)
Term: 01-Mar-2020 to 30-Nov-2022
Budget: $1,107,698 (direct) $637,159 (indirect) $1,744,857 (total)
Develop technologies to map brain coordinates on incomplete MRI brain imaging data.

2020 – 2025 **NeuroNex: Enabling Identification and Impact of Synaptic Weight in Functional Networks**,
NSF 19-563
Role on project: Co-Investigator (PI: Harris)
Term: 01-April 2020 to 31-March-2025
Budget: $609,294 (direct) $388,425 (indirect) $997,719 (total)
Develop the requisite technology to understand the impact of synaptic weight on functional networks.

2020 – 2025 **Identifying Neurobehavioral Pathways for Cannabis Use Disorder: Multimodal MRI Investigations of Control and Reward Neural Networks**,
NIH18-062 - National Institute on Drug Abuse
Role on project: Co-Investigator (PI: Hanson)
Term: 01-April-2020 to 31-March-2025
Budget: $234,338 (direct) $149,389 (indirect) $383,727 (total)
This project will connect strong behavioral markers of addiction risk, measures of drug use, and measures of brain network connectivity to aid in understanding what causes drug use, versus what is a consequence of it.

2020 – 2023 **A Novel Framework for Mapping Brain Dynamics and Substrates of Human Cognition Across Species**,
NIH MH-20-120
Role on project: Co-Investigator (PI: Milham)
Term: 01-July-2020 to 30-June-2023
Budget: $178,898 (direct) $114,047 (indirect) $292,945 (total)
Develop and apply modern alignment methods to compare and contrast human and non-human brain imaging.

2020 – 2023 **MBAc: Mouse Brain Atlasing in the Cloud**,
NIH MN-19-147
Role on project: Co-Investigator (PI: Osten)
Term: 01-July-2020 to 30-June-2023
Budget: $1,520,570 (direct) $969,363 (indirect) $2,489,933 (total)
Develop and disseminate CloudReg, a cloud brain atlasing tool for microscale whole mouse brains.

2020 – 2024 **Exploiting latent structure for efficient and robust inference**,
NSF
Role on project: Co-Investigatror (PI: Priebe)
Term: 01-July-2020 to 30-June-2024
Budget: $999,330 (direct) $505,332 (indirect) $1,504,662 (total)
Develop theory and methods for analysis of networks and populations thereof.

2020 – 2024 **Distributed ensemble neural representations of anxiety states**,
NIH 0 NS 18-303 BrainInitiative RO1
Role on project: Co-Investigator (PI: Adwanikar)
Term: 01-July-2020 to 30-June-2024
Budget: $2,672,969 (total)
Imaging the coordinated, multi-area, ensemble neural signaling of anxiety and attention states at cellular-resolution in freely behaving mice.

2020 – 2025 **The NKI-Rockland Sample II: An open resource of multimodal brain, physiology, and behavior data from a community lifespan sample**,
NIH 19-056
Role on project: Co-Investigator (PI: Milham)
Term: 01-July-2020 to 30-June-2025
Budget: $30,713 (direct) $48,178 (indirect) $78,891 (total)
We will continue collecting, organizing, and analyzing another cohort of the NKI-Rockland Sample.

Previous

2017 – 2018 **The Brain Ark**,
Defense Advance Research Project Agency Grant 90076467
Role of the Project: Principal Investigator
Budget: $56,499.08 (direct) $35,876.92 (indirect) $92,376 (total cost)
Characterize the statistical properties of the individual graphs, to identify circuit motifs, both that specialize in a species specific fashion, and that are preserved across species. As a test, will compare the connectomes of sea lions and coyotes.

2017 – 2018 **The International Brain Station**,
The Kavli Foundation 90071826
Role of the Project: Principal Investigator
Budget: $50,000 (direct) $50,000 (total cost)
Take the first few steps towards building the international brain station.

2017 – 2018 **Brain Comp Infra: EAGER: BrainLab CI: Collaborative, Community Experiments**,
National Science Foundation ACI-1649880
Role of Project: Co-Investigator (PI: Miller, Burns)
Budget: $180,736 (direct) $113,863 (indirect) $294,599 (total cost)
The BrainLab CI prototype system will deploy an experimental-management infrastructure that allows users to construct community-wide experiments that implement data and metadata controls on the inclusion and exclusion of data.

2016 – 2019 **A Scientific Planning Workshop for Coordinating Brain Research Around the Globe National Science Foundation 1637376 Part 1 of 2**,
Role of the Project: Principal Investigator
Budget: $97,950 (direct) $97,950 (total cost)
This travel grant is for the expressed purposes of gathering researchers from around the globe to discuss the new way to further brain research during part one of a two day conference.

2016 – 2019 **A Scientific Planning Workshop for Coordinating Brain Research Around the Globe National Science Foundation 1637376 Part 2 of 2**,
Role of the Project: Principal Investigator
Budget: $14,491 (direct) $1,836 (indirect) $16,327 (total cost)
This travel grant is for the expressed purposes of gathering researchers from around the globe to further discuss advancements in brain research during the second part of a two day conference.

2015 – 2018 **From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from**,
Defense Advance Research Project Agency Grant N66001-15-C-40401
Role on Project: Principal Investigator
Budget: $1,298,204 (direct) $804,886.60 (indirect) $2,103,091.60 (total cost)
Multiple, large, multifarious brain imaging datasets are rapidly becoming standards in neuroscience. Yet, we lack the tools to analyze individual datasets, much less populations thereof. Therefore, we will develop theory and methods to analyze and otherwise make such data available.

2014 – 2016 **Scalable Grain Graph Analyses Using Big-Memory, High-IPS Compute Architectures**,
Defense Advance Research Project Agency Grant N66001-14-1-4028
Role on Project: Co-Investigator (PI: Burns)
Budget: $28,272 (direct) $11,610 (indirect) $39,882 (total cost)
Build software infrastructure to enable analytics on billion node, terabyte sized networks using commodity hardware.

2014 – 2019 **Synaptomes of Mouse and Man**,
R01NS092474
Role on project: Co-Investigator (PI: Smith)
Budget: $491,341 (direct) $265,076 (indirect) $756,417 (total cost)
The major goals of this project are to discover the synaptic diversity and complexity in mammalian brains, specifically comparing and contrasting humans with mice, the leading experimental animal.

2012 – 2015 **CRCNS: Data Sharing: The EM open Connectome Project**,
National Institute of Biomedical Imaging and Bioengineergng RO1EB16411
Role of Project: Co-Investigator (PI: Burns)
Budget: $46,517 (direct) $24,306 (indirect) $70,823 (total cost)
Develop cyberinfrastructure to support management, visualization, storage, and analysis of large-scale electron microscopy data.

Talks

Invited Talks (Local)

[39] **Joshua T. Vogelstein**. "Open Access to the Brain: a Computer "Connectome" Links Brain Images in Fine Detail". In: JHM Boot Camp, June 2019. URL: https://neurodata.io/talks/bootcamp19.html.

[38] *Jaewon Chung*. "Statistical Methods for Population of Connectomes". In: Organization of Human Brain Mapping, June 2019. URL: https://neurodata.io/talks/ohbm19.html.

[37] **Joshua T. Vogelstein**. "Statistical Foundations For Connectomics". In: Max Planck / HHMI Connectomics Meeting, Apr. 2019. URL: https://neurodata.io/talks/connectomics19.html.

[36] **Joshua T. Vogelstein**. "Big Biomedical Data Science". In: Sol Goldman International Conference, Apr. 2019. URL: https://neurodata.io/talks/goldman19.html.

[35] **Joshua T. Vogelstein**. "Connectal Coding". In: Dipy Workshop, Mar. 2019. URL: https://neurodata.io/talks/DiPy19.html.

[34] **Joshua T. Vogelstein**. "Connectome Coding". In: Society for Neuroscience, Nov. 2018. URL: https://neurodata.io/talks/SFN18.html.

[33] **Joshua T Vogelstein**. "A Community-Developed Open-Source Computational Ecosystem for Big Neuro Data". In: Princeton, Aug. 2018. URL: https://neurodata.io/talks/princeton2018.html.

[32] *Eric W Bridgeford*. "A High-Throughput Pipeline Identifies Robust Connectomes but Troublesome Variability". In: Organization of Human Brain Mapping, July 2018. URL: http://ericwb.me/lectures/ohbm/ohbm_ndmg.html#/.

[31] Eric Perlman. "NeuroData: Embracing Open Source for Big Data Neuroscience". In: NSF NeuroNex Workshop on Super 3DEM, July 2018. URL: https://neurodata.io/talks/neuronex-3dem.html.

[30] **Joshua T. Vogelstein**. "Using Big Data Science to Understand What Goes On in our Heads". In: SOHOP Faculty Spotlight, Apr. 2018. URL: https://neurodata.io/talks/big-data-science/.

[29] **Joshua T Vogelstein**. "Discovering Relationships and their Geometry Across Disparate Data Modalities". In: Yale, Jan. 2018. URL: https://neurodata.io/talks/mgc.html.

[28] **Joshua T Vogelstein**. "Data Coordination and Data Resources for the BRAIN Initiative". In: 4th Annual BRAIN Iniative Investigators Meeting, 2018.

[27] **Joshua T. Vogelstein**. "Discovering Relationships and their Geometry Across Disparate Data Modalities". In: Stanford, Aug. 2017. URL: https://neurodata.io/talks/mgc.html.

[26] **Joshua T. Vogelstein**. "Opportunities and Challenges in Big Data Neuroscience". In: Society for Neuroscience, 2017.

[25] **Joshua T Vogelstein**. "Using Big Data Science to Understand What Goes on in Our Heads". In: SOHOP Faculty Spotlight, 2017. URL: https://neurodata.io/talks/big-data-science/.

[24] **Joshua T Vogelstein**. "Challenges and Opportunities in Big Data for Neuroscientists". In: Society for Neuroscience: DC Metro Area Chapter Keynote Address, 2017. URL: https://neurodata.io/talks/sfn17.html.

[23] **Joshua T Vogelstein**. "NeuroData: Enabling Terascale Neuroscience for Everyone". In: 4rd Annual BRAIN Iniative Investigators Meeting, 2016.

[22] **Joshua T Vogelstein**. "Using Big Data Science to Understand What Goes on in Our Heads". In: SOHOP Faculty Spotlight, 2016. URL: https://neurodata.io/talks/big-data-science/.

[21] **Joshua T Vogelstein**. "NeuroData: Enabling Terascale Neuroscience for Everyone". In: Keystone Symposia: State of the Brain, 2016.

[20] **Joshua T. Vogelstein**. "The International Brain Station (TIBS)". In: Kavli Foundation, 2016.

[19] **Joshua T. Vogelstein**. "The International Brain Station (TIBS)". In: United Nations Global Brain Workshop Meeting, 2016.

[18] **Joshua T Vogelstein** and Liam Paninski. "Spike inference from calcium imaging using sequential Monte Carlo methods". In: AMSI Program on Sequential Monte Carlo, 2015. URL: https://figshare.com/articles/Spike_Inference_from_Calcium_Imaging_using_Sequential_Monte_Carlo_Methods/1285825.

[17] **Joshua T Vogelstein**. "Top Challenges of Big Data Neuroscience". In: BRAIN Initiative Workshop, Dec. 2014.

[16] **Joshua T Vogelstein**. "Big (Neuro) Statistics". In: Kavli Salon: Big Data: Practice Across Disciplines, 2014. URL: http://figshare.com/articles/Big%5C_Neuro%5C_Statistics/1142907.

[15] **Joshua T Vogelstein**. "Open-Science Platform for Heterogeneous Brain Data: Opportunities and Challenges". In: Kavli, 2014.

[14] **Joshua T Vogelstein**. "Beyond Little Neuroscience". In: Beyond Optogenetics workshop at Cosyne, 2013.

[13] **Joshua T Vogelstein**. "Statistical Inference on Graphs". In: University of Michigan, 2013.

[12] **Joshua T Vogelstein**. "Statistical Inference on Graphs". In: Scientific Computing Institute, University of Utah, 2013.

[11] **Joshua T Vogelstein**. "BIG NEURO". In: Theory and Neurobiology, Duke University, 2012.

[10] **Joshua T Vogelstein**. "Connectome Classification: Statistical Graph Theoretic Methods for Analysis of MR-Connectome Data". In: Organization for Human Brain Mapping, 2011.

[9] **Joshua T Vogelstein**. "Consistent Connectome Classification". In: Math/Bio Seminar, Duke University, 2011.

[8] **Joshua T Vogelstein**. "Once we get connectomes, what the %#* are we going to do with them?" In: Krasnow Institute for Advanced Study at George Mason Univeristy, 2011.

[7] **Joshua T Vogelstein**. "Once we get connectomes, what the %#* are we going to do with them?" In: Institute of Neuroinformatics, 2011.

[6] **Joshua T Vogelstein**. "Statistical Connectomics". In: Harvard University Connectomics Labs, 2011.

[5] **Joshua T Vogelstein**. "What can Translational neuroimaging Research do for Clinical Practice". In: Child Mind Institute, 2011.

[4] **Joshua T Vogelstein**. "Inferring Spike Trains Given Calcium-Sensitive Fluorescence Observations". In: Statistical Analysis of Neural Data, 2008.

[3] **Joshua T Vogelstein**. "Inferring spike trains from Calcium Imaging". In: Redwood Center for Theoretical Neuroscience, University of California, Berkeley, 2008.

[2] **Joshua T Vogelstein**. "Inferring spike trains from Calcium Imaging". In: Cambridge University, Gatsby Unit, and University College London, 2008.

[1] **Joshua T Vogelstein**. "Model based optimal inference of spike times and calcium dynamics givern noisy and intermittent calcium-fluorescence observations". In: Neurotheory Center of Columbia University, 2007.

Invited Talks (International)

[66] **Joshua T. Vogelstein**. "Ailey in an Hour: (A "Soup-to-Nuts" Pipeline for Analysis of Whole Cleared Brain Data)". In: NeuroNex, Oct. 2019. URL: https://neurodata.io/talks/neuronex19.html.

[65] **Joshua T. Vogelstein**, *Hayden Helm*, *Ronak Mehta*, Carey E. Priebe, and Raman Arora. "A Theory and Practice of the Lifelong Learnable". In: L2M, Sept. 2019. URL: https://neurodata.io/talks/L2F_18mo.html.

[64] **Joshua T. Vogelstein** and Randal Burns. "Data Science Core". In: Harvard University, July 2019. URL: https://neurodata.io/talks/ZZ_MSCZ_U19.pptx.

[63] *James Browne*. "Forest Packing: Fast Parallel, Decision Forests". In: SIAM International Conference on Data Mining, May 2019. URL: https://neurodata.io/talks/ForestPacking2019JamesBrowne.pptx.

[62] Daniel Tward. "Brain mapping tools for neuroscience research". In: NeuroNex, May 2019. URL: https://neurodata.io/talks/tward_neuronex2.pdf.

[61] **Joshua T. Vogelstein**. "Big Data and the Life Sciences". In: Sloan Foundation, May 2019. URL: https://neurodata.io/talks/SloanFoundation2019.pptx.

[60] **Joshua T. Vogelstein**. "Journey to Here". In: JHU BMES talks, Apr. 2019. URL: https://neurodata.io/talks/jhu-bmes19.html.

[59] **Joshua T. Vogelstein**. "NeuroData (Science)". In: Kavli, Apr. 2019. URL: https://neurodata.io/talks/kavli19.html.

[58] **Joshua T. Vogelstein**. "Statistical Foundations For Connectomics". In: Max Planck / HHMI Connectomics Meeting, Apr. 2019. URL: https://neurodata.io/talks/connectomics19.html.

[57] **Joshua T. Vogelstein**. "Lifelong Learning Forests". In: L2M, Mar. 2019. URL: https://neurodata.io/talks/L2F_1yr.html.

[56] **Joshua T. Vogelstein**. "NeuroData Tools". In: NeuroData Hackashop, Mar. 2019. URL: https://neurodata.io/talks/tools19.html#1.

[55] **Joshua T. Vogelstein**. "Biomedical Big Data and Data Science". In: JHU BME, Feb. 2019. URL: https://neurodata.io/talks/datascience19.html.

[54] **Joshua T. Vogelstein**. "NeuroData: A Community-developed open-source computational ecosystem for big neuro data". In: NeuroNex, Oct. 2018. URL: https://neurodata.io/talks/neuronex18.html.

[53] *C. Shen*. "The Exact Equivalence of Distance and Kernel Methods for Hypothesis Testing". In: Joint Statistical Meeting, Aug. 2018.

[52] **Joshua T Vogelstein**. "Multiscale Graph Correlation: A Knowledge Representation System for Discovering Latent Geometric Structure". In: DARPA SIMPLEX PI Review Meeting, Aug. 2018. URL: https://neurodata.io/talks/mgc-simplex.html.

[51] **Joshua T. Vogelstein** and *Vikram Chandrashekhar*. "NeuroNex + Stanford". In: NeuroNex-Stanford, July 2018.

[50] **Joshua T. Vogelstein**. "Data Intensive Brain Science". In: Kavli Neuroscience Discovery Institute, June 2018.

[49] *Gregory Kiar*. "Connectome Coding: what is it, how do we do it, and why do we care?" In: Data science in Neuroscience Symposium, June 2018.

[48] **Joshua T. Vogelstein**. "Lifelong Learning Forests". In: Darpa L2M PI Meeting, June 2018.

[47] **Joshua T. Vogelstein**. "Engineering the Future of Medicine: Data Intensive Biomedical Science". In: Johns Hopkins University Biomedical Engineering, Mar. 2018.

[46] *Disa Mhembere*. "knor: a NUMA-Optimized In-Memory, Distributed and Semi-External-Memory k-means library". In: HPDC, June 2017. URL: https://github.com/neurodata/talks/blob/master/p67-mhembere.pdf.

[45] **Joshua T. Vogelstein**. "NeuroData". In: 2017.

[44] **Joshua T. Vogelstein**. "The International Brain Station (TIBS)". In: JHU BME and Tsinghua University, 2017.

[43] **Joshua T. Vogelstein**. "Connectome Coding". In: Schmidt Sciences, 2017.

[42] *Gregory Kiar*. "Science in the Cloud (SIC): A use-case in MRI Connectomics". In: Open Science Special Interest Group, 2017.

[41] *Disa Mhembere*. "knor: K-means NUMA Optimized Routines Library". In: High-Performance Parallel and Distributed Computing, 2017. DOI: 10.1145/3078597.3078607.

[40] *Youjin Lee*. "Network Dependence Testing via Diffusion Maps and Distance-Based Correlations". In: Joint Statistical Meetings, 2017.

[39] **Joshua T. Vogelstein**. "NeuroStorm". In: Global Brain Workshop 2 JHU, 2017.

[38] *T. M. Tomita*. "ROFLMAO: Robust Oblique Forests with Linear Matrix Operations". In: SIAM International Conference on Data Mining, 2017. DOI: 10.1137/1.9781611974973.56.

[37] **Joshua T Vogelstein**. "Challenges and Opportunities in Big Data for Neuroscientists". In: Society for Neuroscience: DC Metro Area Chapter Keynote Address, 2017. URL: https://neurodata.io/talks/sfn17.html.

[36] *C. Shen*. "Multiscale Generalized Correlation". In: Joint Statistical Meeting, Aug. 2016.

[35] **Joshua T. Vogelstein**. "NeuroData:Enabling Terascale Neuroscience". In: JHU Kavli Neuroscience Discovery Institute, 2016.

[34] **Joshua T. Vogelstein**. "The International Brain Station (TIBS)". In: Kavli Foundation, 2016.

[33] **Joshua T. Vogelstein**. "NeuroData 2016". In: NeuroData Lab Retreat, 2016.

[32] **Joshua T. Vogelstein**. "Global Brain Workshop 2016". In: Global Brain Workshop NSF+JHU at Kavli, 2016.

[31] **Joshua T. Vogelstein**, Michael I. Miller, and Richard Hunganir. "Global Brain Workshop 2016". In: Kavli Neuroscience Discovery Institute & Center for Imaging Science @ JHU, 2016.

[30] **Joshua T. Vogelstein**. "Global Brain Workshop 2016". In: Kavli Neuroscience Discovery Institute & Center for Imaging Science, 2016.

[29] **Joshua T. Vogelstein**. "NeuroData:Enabling Terascale Neuroscience". In: Kavli Neuroscience Discovery Institute & Center for Imaging Science, 2016.

[28] **Joshua T. Vogelstein**. "Learning a Data-Driven Nosology:Progress, Challenges & Opportunities". In: Kavli Neuroscience Discovery Institute & Center for Imaging Science, 2016.

[27] **Joshua T. Vogelstein**. "The International Brain Station (TIBS)". In: United Nations Global Brain Workshop Meeting, 2016.

[26] *C. Shen*. "Local Distance Correlation for Testing Independence". In: Temple University, Nov. 2015.

[25] **Joshua T. Vogelstein**. "big time (series data in neuroscience)". In: figshare, 2015. URL: https://figshare.com/articles/big_time_series_data_for_neuroscience_/1591211.

[24] **Joshua T Vogelstein**. "Research Computing Support for Neuroscience and Other Life Sciences". In: CASC, 2015.

[23] **Joshua T Vogelstein**. "From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from Heterogeneous Data". In: SIMPLEX Kickoff, 2015.

[22] **Joshua T Vogelstein**. "From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from Heterogeneous Data: Part 1". In: DARPA SIMPLEX PI Meeting, 2015.

[21] **Joshua T Vogelstein**. "From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from Heterogeneous Data: Part 2". In: DARPA SIMPLEX PI Meeting, 2015.

[20] **Joshua T Vogelstein**. "Special Symposium: Neuroscience in the 21st Century". In: Kavli, 2015.

[19] **Joshua T Vogelstein**. "Law of Large Graphs". In: DARPA Graphs, 2015.

[18] **Joshua T Vogelstein**. "Open Connectome Project: Lowering the Barrier to Entry of Big Data Neuroscience". In: Institute for Computational Medicine at Johns Hopkins University, 2015.

[17] **Joshua T Vogelstein**. "Opportunities and Challenges in Big Data Neuroscience". In: DoE, 2015.

[16] **Joshua T. Vogelstein**. "Open Source Platform for Heterogenous Brain Data". In: figshare, 2015. URL: https://figshare.com/articles/Open_Source_Platform_for_Heterogeneous_Brain_Data/1381926.

[15] **Joshua T Vogelstein**. "Big Statistics for Brain Sciences". In: Baylor College of Medicine, Department of Neuroscience, May 2014.

[14] **Joshua T Vogelstein**. "Big (Neuro) Statistics". In: Kavli Salon: Big Data: Practice Across Disciplines, 2014. URL: http://figshare.com/articles/Big%5C_Neuro%5C_Statistics/1142907.

[13] **Joshua T Vogelstein**. "Open-Science Platform for Heterogeneous Brain Data: Opportunities and Challenges". In: Kavli, 2014.

[12] **Joshua T Vogelstein**. "Open Problems in Neuropsychiatry". In: Data Seminar, Duke University, 2013.

[11] **Joshua T Vogelstein**. "Statistical Models and Inference for big Brain-Graphs". In: NIPS Workshop on Acquiring and analyzing the activity of large neural ensembles, 2013.

[10] **Joshua T Vogelstein**. "Decision Theoretic Approach to Statistical Inference". In: guest Lecture in Current Topics in Machine Learning, Johns Hopkins University, 2012.

[9] **Joshua T Vogelstein**. "Open Connectome Project". In: Academic Medical Center, Amsterdam, 2012.

[8] **Joshua T Vogelstein**. "Are mental properties supervenient on brain properties". In: NIPS workshop on Philosophy and Machine Learning. 2011.

[7] **Joshua T Vogelstein**. "Consistent Graph Classification". In: Guest Lecture in Deisseroth Lab, Stanford University, 2011.

[6] **Joshua T Vogelstein**. "Neurocognitive Graph Theory". In: National Security Agency, 2009.

[5] **Joshua T Vogelstein**. "OOPSI: A Family of Optimal OPtical Spike Inference Algorithms for Inferring Neural Connectivity from Population Calcium Imaging". In: Dissertation Defense, 2009. URL: https://www.researchgate.net/publication/45657467%5C_OOPSI%5C_A%5C_family%5C_of%5C_optimal%5C_optical%5C_spike%5C_inference%5C_algorithms%5C_for%5C_inferring%5C_neural%5C_connectivity%5C_from%5C_population%5C_calcium%5C_imaging.

[4] **Joshua T Vogelstein**. "Sequential Monte Carlo in Neuroscience". In: SAMSI Program on Sequential Monte Carlo, Tracking Working Group, 2009.

[3] **Joshua T Vogelstein**. "Towards Inference and Analaysis of Neural Circuits Inferred from Population Calcium Imaging". In: Guest Lecture in Schnitzer Lab, 2009.

[2] **Joshua T Vogelstein**. "Towards Inferring Neural Circuits from Calcium Imaging". In: Guest Lecture in Yuste Lab, 2009.

[1] **Joshua T Vogelstein**. "Inferring spike times given typical time-series fluorescence observations". In: Department of Applied Mathematics and Statistics, Johns Hopkins University, 2008.

Abstracts / Posters

[49] Benjamin Falk and **Joshua T. Vogelstein**. "NeuroData's Open Data Cloud Ecosystem". In: Harvard University, July 2019. URL: https://neurodata.io/talks/25_NeuroDatas_Open_Data_Ecosystem.pdf.

[48] *Jaewon Chung*, *Benjamin D. Pedigo*, Carey E. Priebe, and **Joshua T. Vogelstein**. "Clustering Multi-Modal Connectomes". In: OHBM, 2019. URL: https://figshare.com/articles/Clustering_Multi-Modal_Connectomes/8309672.

[47] *James Browne*, *Disa Mhembere*, *Tyler M. Tomita*, **Joshua T. Vogelstein**, and Randal Burns. "Forest Packing: Fast Parallel Decision Forests". In: SIAM International Conference on Data Mining, 2019. URL: https://figshare.com/articles/Forest_Packing_Fast_Parallel_Decision_Forests/8194142.

[46] *Benjamin D. Pedigo*, *Jaewon Chung*, *Eric W. Bridgeford*, *Bijan Varjavand*, Carey E. Priebe, and **Joshua T. Vogelstein**. "GraSPy: an Open Source Python Package for Statistical Connectomics". In: Max Planck /HHMI Connectomics Meeting Berlin, 2019. URL: https://figshare.com/articles/GraSPy_an_Open_Source_Python_Package_for_Statistical_Connectomics/7982888.

[45] *Jaewon Chung*, *Benjamin D. Pedigo*, Carey E. Priebe, and **Joshua T. Vogelstein**. "Human Structural Connectomes are Heritable". In: BME data science poster session, 2019. URL: https://figshare.com/articles/Structural_Connectomes_are_Heritable/7800587.

[44] Eric Perlman. "NEURODATA: ENABLING BIG DATA NEUROSCIENCE". In: Kavli, 2017. URL: https://neurodata.io/talks/perlman_kndi_2017.pdf.

[43] *Alex Baden*, Eric Perlman, Forrest Collman, Stephen Smith, **Joshua T. Vogelstein**, and Randal Burns. "Processing and Analyzing Terascale Conjugate Array Tomography Data". In: Berlin, 2017. URL: https://neurodata.io/talks/berlin_2017.pdf.

[42] *Shaojie Chen*, **Joshua T Vogelstein**, Seonjoo Lee, Martin Lindquist, and Brian Caffo. "High Dimensional State Space Model with L-1 and L-2 Penalties". In: ENAR 2015, 2015. URL: http://www.enar.org/abstracts/2015_Program_Abstracts_03-02-15.pdf.

[41] *Shaojie Chen*, Kai Liu, Yang Yuguang, Lee Seonjoo, Martin Lindquist, Brian Caffo, and **Joshua T Vogelstein**. "A Sparse High Dimensional State-Space Model with an Application to Neuroimaging Data". In: Figshare, 2015. URL: https://figshare.com/articles/A_Sparse_High_Dimensional_State_Space_Model_with_an_Application_to_Neuroimaging_Data/1515020.

[40] *Shangsi Wang*, Zhi Yang, Xi-Nian Zuo, Michael Milham, Cameron Craddock, Carey E. Priebe, and **Joshua T. Vogelstein**. "Optimal Design for Discovery Science: Applications in Neuroimaging". In: Figshare, 2015. URL: https://figshare.com/articles/Optimal_Design_for_Discovery_Science_Applications_in_Neuroimaging/1515021.

[39] Eva L. Deyer, Hugo L. Fernandes, *Will Gray Roncal*, Doga Gursoy, **Joshua T Vogelstein**, Xianghui Xiao, Chris Jacobsen, Konrad P. Kording, and Narayanan Kasthuri. "X-Brain: Quantifying Mesoscale Neuroanatomy Using X-ray Microtomography". In: Figshare, 2015. URL: https://figshare.com/articles/X_Brain_Quantifying_Mesoscale_Neuroanatomy_Using_X_Ray_Microtomography/1585163.

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Educational Activities

New Courses Created

Fall '19 **NeuroData Design I**, *EN.580.237/437/637*, Course Director, enrollment 46.
Spring '19 **NeuroData Design II**, *EN.580.438/638*, Course Director, enrollment 18.
Fall '18 **NeuroData Design I**, *EN.580.237/437/637*, Course Director, enrollment 22.
Spring '17 **NeuroData Design II**, *EN.580.238/438/638*, Course Director, enrollment 14.
Winter '17 **BME Research Intersession**, *EN.580.574*, Course Director, enrollment 6.
Fall '17 **NeuroData Design I**, *EN.580.247/437/637*, Course Director, enrollment 15.
Spring '16 **The Art of Data Science**, *EN.580.468*, Course Director, enrollment 24.

Fall '16 **NeuroData Design I**, *EN.580.437*, Course Director, enrollment 16.

Spring '15 **Statistical Connectomics**, *EN.580.694*, Course Director, enrollment 26.

Courses Co-Taught

Fall '15 **Introduction to Computational Medicine**, Co-Teaching, Course Co-Director.

Spring '19 **Systems Bioengineering II**, *EN.580.422*, 2 Lectures.

Spring '19 **Computational Neuroscience**, *AS.080.321*, 2 Lectures.

Spring '18 **Systems Bioengineering II**, *EN.580.422*, 2 Lectures.

Spring '18 **Computational Neuroscience**, *AS.080.321*, 2 Lectures.

Spring '17 **Systems Bioengineering II**, *EN.580.422*, 2 Lectures.

Spring '16 **Systems Bioengineering II**, *EN.580.422*, 2 Lectures.

Winter '16 **Introduction to Connectomics**, *EN.600.221*, 1 Lecture.

Fall '16 **BME Modeling and Design**, *EN.580.111*, 1 Lecture.

Educational Workshops

Summer '19 **DiPy Workshop**, Bloomington, Indiana, 1 day lecture on statistical connectomics.

Fall '18 **Society for Neuroscience Annual Meeting**, *Educational Workshop*, San Diego, CA, 1 day lecture on statistical connectomics.

Fall '17 **Society for Neuroscience Annual Meeting**, *Educational Workshop*, San Diego, CA, 1 day lecture on statistical connectomics.

Summer '16 **CRCNS Course on Mining and Modeling of Neuroscience Data**, *Redwood Center for Theoretical Neuroscience*, University of California, Berkeley, 2 day lecture on statistical connectomics.

Mentorship

Research Track Faculty Mentorship (3)

02/19 – **Hayden Helm, MSE**, *Assistant Research Faculty*, BME, JHU.
Leading research efforts developing theory and methods for lifelong learning.

08/16 – 8/18 **Eric Perlman, PhD**, *Assistant Research Scientist*, BME, JHU.
Lead Scientist developing storage, transfer, and visualization solutions for large data in our cloud infrastructure.

03/16 – **Jesse Patsolic, MA**, *Assistant Research Faculty*, BME, JHU.
Lead developer converting our extensions to decision forests to be merged into sklearn.

Staff Research Scientists (4)

10/18 – **Alex Loftus**, *Research Assistant*, BME, JHU.
Current lead developer of NDMG, transitioning from a stand-alone package to be integrated with DiPy.

09/19 – **Ross Lawrence, BS**, *Research Assistant*, BME, JHU.
Responsible for documenting and bug fixing NDMG.

07/19 – **Ronak Mehta, MSE**, *Research Assistant*, BME, JHU.
Finalizing three manuscripts on (1) uncertainty forests, (2) time-series dependence quantification, and (3) lifelong learning forests.

06/18 – 12/19 **Benjamin Falk, PhD**, *Research Engineer*, BME, JHU.
Lead software engineer, oversees all development projects, solely responsible for all cloud infrastructure.

Postdoctoral Fellows (8)

07/19 – **Celine Drieu, PhD**, *Post-doctoral Fellow*, Kavli NDI, JHU.
Co-Advised by Assitant Prof. Kuchibhotla, Department of Psychological and Brain Sciences. Working on understanding learning and memory using two-photon calcium imaging.

07/19 – **Austin Grave, PhD**, *Post-doctoral Fellow*, Kavli NDI, JHU.
Co-Advised by Prof. Richard Huganir, Department of Neuroscience. Working on understanding whole brain synaptic plasticity using genetic engineering and light microscopy imaging.

06/19 – **Devin Crowley**, *Research Assistant*, BME, JHU.
Lead developer of our scalable Python implementaiton of LDDMM.

08/18 – **Jesús Arroyo, PhD**, *Post-doctoral Fellow*, CIS, JHU.
Working on graph matching and joint graph embedding.

07/18 – **Audrey Branch, PhD**, *Post-doctoral Fellow*, Kavli NDI, JHU.
Co-Advised by Prof Michela Gallagher, extending brain clearing experimental technology from mice to rats. Currently with a manuscript on biorxiv.

09/16 – 08/18 **Cencheng Shen, PhD**, *Post-Doctoral Fellow*, CIS, JHU.
Developed Multiscale Graph Correlation, which is currently the premiere hypothesis testing framework, and about to be integrated into SciPy, by far the world's leading scientific computing package. Currently an Assistent Professor in Department of Statistics at University of Delaware, and still an actice collaborator and grantee.

05/16 – 06/17 **Leo Duan, PhD**, *Post-doctoral Fellow*, CIS, JHU.
Went on to do a second postdoc with Leo Dunson (who I did my second postdoc with). Currently an Assistant Professor at University of Florida.

06/16 – 07/17 **Guilherme Franca, PhD**, *Post-doctoral Fellow*, CIS, JHU.
Worked on non-parametric clustering, with an article about to be accepted in PAMI, the leading machine learning journal. Currently a postdoc for Rene Vidal.

Doctoral Student Supervision (8)

08/19 – **Michael Powell, MSE**, *PhD advisee*, BME, JHU.
Dissertation will focus on explainable artificial intelligence, spearheads collaboration with Andreas Muller, Co-Director of scikit-learn, the world's leading machine learning package.

06/19 – **Jaewon Chung, MSE**, *PhD advisee*, BME, JHU.
Dissertation will focus on statistics of populations of human networks. Already co-first author and middle author on multiple manuscripts.

08/19 – **Tommy Athey, BSE**, *PhD advisee*, BME, JHU.
Dissertation will focus on MouseLight project, spearheads collaborations with Prof. Jeremias Sulam and Michael I. Miller.

08/19 – **Eric Bridgeford, BSE**, *PhD advisee*, Department of Biostatistics, JHU.
Dissertation will focus on statistics of human connectomes and mitigating batch effects. Already first author on several manuscripts under review, and spearheads collaboration with Prof Brian Caffo at Biostatistics.

08/18 – **Benjamin Pedigo, BSE**, *PhD advisee*, BME, JHU.
Dissertation will focus on analysis and modeling of the world's first whole animal connectome, in collaboration with Marta Zlatic and Albert Cardona (formerly of Janelia Research Campus). Already co-first author and middle author on multiple manuscripts.

08/18 – **Meghana Madyastha, BSE**, *PhD Co-advisee*, CS, JHU.
Dissertation will focus on computational aspects of accelerationg learning and inference using decision forests.

08/16 – **Vikram Chandrashekhar, BSE**, *PhD advisee*, BME, JHU.
Dissertation has focused on extending LDDMM to whole cleared brain datasets, spearheads collaboration with Prof. Karl Deisseroth's lab at Stanford, one of the world's leading neuroscientists.

08/14 – 01/18 **Tyler Tomita, PhD**, BME, JHU.
Developed Sparse Projection Oblique Randomer Forest in his dissertation, currently the best performing machine learning algorithm on a standard suite of over 100 benchmark problems. Currenly a postdoc with Assistant Prof. Chris Honey of Psychology and Brain Sciences.

Visiting Doctoral Student Supervision

03/19 – 09/19 **Derek Pisner**, *PhD advisee*, JHU/ UT Austin.

Master's Student Supervision (6)

06/19 – **Bijan Varjavand**, *MS advisee*, BME, JHU.
Submitted manuscript to PAMI on advancing statistics on populations of networks.

06/19 – **Sambit Panda**, *MS advisee*, BME, JHU.
Led development of Python implementation of MGC, to be integrated into SciPy.

06/19 – **Varun Kotharkar**, *MS advisee*, AMS, JHU.
Investigating theoretical advantages of oblique, as compared to axis-aligned, decision trees.

06/18 – **Drishti Mannan**, *MS advisee*, BME, JHU.
Preparing manuscript introducing novel specification for large attributed networks.

06/18 – 05/19 **Jaewon Chung**, *MSE advisee*, BME, JHU.
Co-first author of manuscript and co-lead developer of Python package for statistical analysis of networks. Currently a BME PhD student in my lab.

08/14 – 06/17 **Greg Kiar, MSE**, BME, JHU.
Lead deveoper of NDMG, the only existing "soup to nuts" pipeline for both functional and diffusion pipelines; co-first author of manuscript under review. Currently a PhD student at McGill University.

Undergraduate Student Supervision (8)

06/19 – **Vivek Gopalakrishnan**, *BSE*, BME, JHU.
Winner of Pistritto Fellowship, worked on statistics of populations of connectomes in Austim mouse models and human data.

06/19 – **Ronan Perry**, *BSE*, BME, JHU.
Developed generalized canonical correlation analysis code for analysis of high-dimensional brain imaging data in a novel meditation dataset.

06/19 – 12/19 **Richard Guo**, *BSE*, BME, JHU.
Developed uncertainty forests, an approach for estimated posterior class probabilities, conditional entropy, and mutual information for high-dimensional data common in brain science applications.

08/14 – 08/18 **Eric Bridgeford, BSE**, BME, JHU.
Currently a PhD student in Biostatistics at JHSPH in my lab. Developed and applied a number of R and Python packages, including an fMRI pipeline, dimensionality reduction, and various graph statistics.

08/15 – 08/16 **Albert Lee,BSE**, BME, JHU.
Developed big data visualization tools.

06/15 – 12/15 **Ron Boger, BSE**, BME, JHU.
Currenly working at a computational medicine start-up in Silicon Valley, worked on high-dimensional low-sample size theory.

05/15 – 05/16 **Jordan Matelsky, BSE**, CS and Neuroscience, JHU.
Currently a data scientist at APL, developed a number of simple WebApps in support of big data management.

02/15 – 05/16 **Ivan Kuznetsov, BSE**, BME, JHU.
Currently an MD/PhD Candidate at the UPenn, winner of Soros Fellowship, worked on analysis of data from Dr. Daniel Amen, developed matrix exploratory data analysis package.

Summer Interns

Summer '19 **Kareef Ullah**, *Summer Intern*, BME, JHU.
Will begin undergrad in BME at JHU in Fall 2020

Summer '19 **Shunan Wu**, *Summer Intern*, BME, JHU.
Applied to BME PhD Program in Fall 2020

Summer '19 **Shiyu Sun**, *Summer Intern*, BME, JHU.
Applied to BME PhD Program in Fall 2020

Summer '19 **Sander Shulhoff**, *Summer Intern*, BME, JHU.

Summer '19 **Kiki Zhang**, *Summer Intern*, BME, JHU.

Summer '18 **Papa Kobina Van Dyck**, *Summer Intern*, BME, JHU.
Applied to PhD Program in Fall 2019

Examining Committees (9)

2019 **Browne, James**, *Computer Science*, JHU Ph.D. Student, Graduated 2019.

2019 **Mhembere, Disa**, *Computer Science*, JHU Ph.D. Student, Graduated 2019.

2018 **Kutten, Kwame**, *JHU Ph.D. Student*, Graduated 2018.

2018 **Wang, Shangsi**, *Applied Mathematics and Statistics*, JHU Ph.D. Student, Graduated 2018.

2018 **Tang, Runze**, *Applied Mathematics and Statistics*, JHU Ph.D. Student, Graduated 2018.

2018 **Lee, Youjin**, *Biostatistics*, JHU Ph.D. Student, Graduated 2018.

2017 **Zheng, D**, *Computer Science*, JHU Ph.D. Student, Graduated 2017.

2017 **Binkiewicz, Norbert**, *Statistics*, University of Wisconsin Ph.D. Student, Graduated 2017.

2016 **Gray-Roncal, Will**, *Computer Science*, JHU Ph.D. Student, Graduated 2016.

Service

Grant Review Service

2015 **NSF Review Panel**, *Review for NSF BIG DATA Program.*

University Service

Winter '19 **Track Organizer**, *AI in Healthcare: From Bench to Bedside*, Organizer for Breakout Topic Sessions on artificial intelligence.

08/15 – 07/18 **Co-Developer**, *Computational Medicine Minor*.

05/15 – 07/17 **Co-Founder and Faculty Advisor**, *MedHacks*, Medhacks is one of the first and largest hackathons dedicated specifically to hacking on medical advances, started entirely by BME undergrads at JHU.

08/14 – 08/18 **Director of Undergraduate Studies**, *Institute for Computational Medicine*.

Department Service

2019 **Member**, *Search Committee*, BME, Neuroengineering, 2019.

2019 **Member**, *Search Committee*, BME, Data Science, 2019.

2018 **Member**, *Search Committee*, BME, Neuroengineering, 2018.

Service in Scientific Community

2017 – **Scientific Advisory Board**, *NSF NeuroNex*, Enhanced resolution for 3DEM analysis of synapses across brain regions and taxa, Provide scientific, computational, and statistical guidance to a flagship NSF funded BRAIN Initiative program.

2017 – **Chair of Committee of Data Cores**, *U19 Data Cores*, The U19 program is NIH's flagship BRAIN Initative program, with five original awardees, each with a dedicated Data Core and designated PI. I was elected the chair of the committee of Data Core PIs.

2017 **Consultant for Nature Publishing Group**, The journal Nature, flagship journal of Nature Publishing Group, decided to create a "Code and Software Submission Checklist". They consulted me on their first draft, and I helped re-write it. An image of the final checklist is available here.

2011 – **Open Connectome Project**, The co-founder of the "Open Connectome Project" (OCP), for several years, I was the only neuroscientist that could easily store, manage, and analyze very big datasets, spanning first tens of terabytes, and then hundreds. For that reason, I was an essential co-author on a number of big data papers. Specifically, though I sometimes contributed relatively little to the scientific ideas, I often was required to complete, visualize, and/or share the data. Perhaps more importantly, both funding agencies and journals began mandating that these large datasets be publicly shared, and OCP was literally the only option. This is despite often not having funding, nor being a co-author, on the manuscripts.

2010 – **AWS Open Neuro Data Registry**, Our lab co-founded the Registry of Open Data on Amazon Web Serivces (AWS). The implication of this is that now, pending a few minor considerations, any neuroscientist that collects large image data can deposit it online *for free*. This means that neither they nor we must request funding to store the data. Our lab maintains this repository, but only by virtue of ensuring instructions for uploading, visualizing, and downloading are up to date, and acting as a gatekeeper to ensure only appropriate data are deposited there.

Journal Service

Editorial Board

01/19 – **Associate Editor**, *Journal of the American Statistical Association*.

05/18 – **Editor**, *Neurons, Behavior, Data analysis, and Theory*.

08/16 – 10/16 **Guest Associate Editor**, *PLoS Computational Biology*.

Conference and Journal Reviewer

Annals of Applied Statistics (AOAS).
Bioinformatics.
International Conference on Learning Representations (ICLR).
Network Science.
Current Opinion in Neurobiology.
Biophysical Journal.
IEEE International Conference on eScience.
IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP).
IEEE Global Conference on Signal and Information Processing (GlobalSIP).
IEEE Signal Processing Letters.
IEEE Transactions on Signal Processing.
Frontiers in Brain Imaging Methods.
Journal of Machine Learning Research (JMLR).
Journal of Neurophysiology.
Journal of the Royal Statistical Society B (JRSSB).
Nature Communications.
Nature Methods.
Nature Reviews Neuroscience.
Neural Computation.
Neural Information Processing Systems (Neurips).
NeuroImage.
Neuroinformatics.
PLoS One.
PLoS Computational Biology.

Conferences and Hackathon Organizer

Winter '19 **Track Organizer**, *AI in Healthcare: From Bench to Bedside*, Organizer for Breakout Topic Sessions on artificial intelligence.

Winter '19 **Organizer**, *Decision Forest Hackathon*.

Summer '19 **Organizer**, *NeuroData Workshop*, https://neurodata.devpost.com, Hackashop to train brain scientists in machine learning for big data ($\sim$ 50) participants from around the country.

March '19 **Organizer**, *Neuro Reproducibility Hackashop*, https://brainx3.io/, Hackashop to train brain scientists in best practices in reproducible science, co-organized with two startups: Vathes, LLC and Gigantum ($\sim$ 50 participants).

Spring '18 **Organizer**, *NeuroData Hackathon*.

Fall '17 **Organizer**, *NeuroData Mini-Hackathon*.

Summer '17 **Organizer**, *NeuroStorm*, https://brainx2.io, Workshop to bring together thought leaders from academia, national labs, industry, and non-profits around the world to take next steps towards accelerating brain science discovery in the cloud ($\sim$ 50 participants and 5 observers from funding institutions).

Spring '16 **Organizer**, *Global Brain Workshop*, http://brainx.io, First ever international Brain Initiative workshop, bringing together leaders from around the world, covered by Nature and Science ($\sim$ 75 participants).

Fall '16 **Co-Organizer**, *Brains and Bits: Neuroscience Meets Machine Learning, NIPS Workshop*, http://www.stat.ucla.edu/~akfletcher/brainsbits_overview.html.

Winter '15 **Organizer**, *Hack@NeuroData*, http://hack.neurodata.io/.

Fall '15 **Co-Organizer**, *BigNeuro2015: Making Sense of Big Neural Data, NIPS Workshop*, http://neurodata.io/bigneuro2015.

Fall '12 **Co-Organizer**, *Scaling up EM Connectomics Conference*, The world's first connectomics workshop, now run annually alternating between Janelia Research and Max Plank locations ($\sim$ 80 participants).

Awards and Recognition

Individual

2002 **Dean's List**, *Washington University*.

Shared (10)

2019 **Kavli NDI Distinguished Postdoctoral Fellow**, *Celine Drieu, PhD*.

2019 **Kavli NDI Distinguished Postdoctoral Fellow**, *Austin Graves, PhD*.

2019 **Winner of Pistritto Fellowship.**, *Vivek Gopalakrishnan*.

2017 **Kavli NDI Distinguished Postdoctoral Fellow**, *Audrey Branch, PhD*.

2017 **Best Presentation Award HPDC**, *Mhembere et al. (2017)*.

2017 **Nonparametric Statistics of the American Statistical Association Student Paper Award**, *Lee et al. (2017)*.

2014 **F1000 Prime Recommended**, *Vogelstein et al. (2014)*.

2013 **Spotlight**, *Neural Information Processing Systems (NIPS)*.

2011 **Trainee Abstract Award**, *Organization for Human Brain Mapping*.

2008 **Spotlight**, *Computational and Systems Neuroscience (CoSyNe)*.

Other Media

Earned Media Coverage

2019 **Johns Hopkins Medicine**, *BME Pioneers: Joshua Vogelstein*, BME Pioneers.

2019 **Johns Hopkins Medicine**, *Technology Connecting the Brain to the Human Experience*.

2018 **J. M. Perkel.**, *Web service makes big data available to neuroscientists*, Nature.

2016 **Emerging Technology from the arXiv**, *Three Grand Challenges for Brain Science That Can Be Solved in 10 Years*, MIT.

2016 **P. Patel.**, *Johns Hopkins researchers want to use big data to chart the brain*, Johns Hopkins University.

2016 **S. Reardon.**, *Worldwide brain-mapping project sparks excitement — an concern*, Nature.

2016 **E. Underwood.**, *International brain projects proposed*, Science.

2016 **National Institutes of Health**, *International Brain Projects Considered*, BRAIN initiative.

2016 **Office of the Spokesperson**, *International Brain Initiative Launch and VIP Dialog: Towards an International Brain Station*, US Department of State.

2016 **The Kavli Foundation**, *International Brain Initiative*, Kavli.

2015 **Dale Keiger**, *The Open Connectome Project takes a close look at the brain*, Johns Hopkins Magazine.

2014 **S. Begley**, *Fly brain 'atlas' opens door to linking human neurons to actions*, Reuters.

2014 **L. Gatlin**, *Johns Hopkins mathematician receives grant to support study of brain's circuitry*, Johns Hopkins University.

2014 **T. O'Leary and E. Marder**, *Mapping Neural Activation onto Behavior in an Entire Animal*, Science.

2014 **L. Sanders**, *Ten thousand neurons linked to behaviors in fly*, ScienceNews.

2014 **D. Son and J. Lee**, *Research Highlights*, Nature.

2014 **K. Yandell**, *Linking Neurons to Behaviors*, TheScientist.

2014 **B. Yirka**, *Researchers create a reference atlas for neural circuits in fruit fly larvae*, MedicalXpress.

2012 **C. B. Begg and M. C. Pike**, *Comment on "The Predictive Capacity of Personal Genome Sequencing"*, Science.

2012 **B. Thomas**, *"Open Access to the Brain" – Podcast 1: Joshua Vogelstein*, The Connectome Podcast.

2012 **E. J. Topol**, *Comment on "The Predictive Capacity of Personal Genome Sequencing"*, Science.

Professional/Social Media Presence

@neuro_data, Twitter account with a approximately 6,000 followers, over 250K impressions in December 2019, and approximately 100 new followers, and upwards of 100 new tweets, per month, and 25 link clicks per day. Follower demographics include $< 50\%$ high school graduates, 46% female.

Bits and Brains, Professional blog reguarding all things academic, neurological, and statistical, with approximately 30 blog posts, approximately one new post per month (9,000 page views, 3,200 unique users)
Most Popular Post: 10 Simple Rules to Write a Paper from Start to Finish.

Translation / Technology Transfer Activities (as of 2020/01/25)

Open Datasets

2017 – **Allen Atlas**, Anatomical reference atlases that illustrate the adult mouse brain in coronal and sagittal planes. They are the spatial framework for datasets such as in situ hybridization, cell projection maps, and in vitro cell characterization.atlas.brain-map.org.
142 citations, 1058 unique visitors

2015 – **Amunts et al. (2015)**, BigBrain is an ultrahigh-resolution three-dimensional model of a full human brain at 20 micrometer resolution, enabling an unprecedented look into the human brain at micro- and macro-scopic scale.
262 citations, 1,041 unique visitors

2015 – **Bhatla et al. (2015)**, Nikhil Bhatla and Rita Droste in Bob Horvitz's Lab reconstruction of the anterior half of the C. elegans feeding organ, the pharynx. Volumes for three adult hermaphrodite worms include volumetric tracing of all neurons, selected cell types, I2 neuron synapses. 50 nm thick sections with an image resolution of 2 nm per pixel.
16 citations, 467 unique visitors

2016 – **Bloss et al. (2016)**, Images of molecularly defined inhibitory interneurons and CA1 pyramidal cell dendrites collected using correlative light-electron microscopy and large-volume array tomography.
41 citations, 701 unique visitors

2018 – **Bloss et al. (2018)**, Images of CA1 pyramidal neurons for analysis involving feature-selective firing as a result of dendritic integration of inputs from multiple brain regions. Show that single presynaptic axons form multiple, spatially clustered inputs onto the distal, but not proximal, dendrites of CA1 pyramidal neurons.
20 citations, 530 unique visitors

2011 – **Bock et al. (2011)**, Volume of mouse primary visual cortical data, spanning layers 1, 2/3, and upper layer 4 collected as electron microscope (EM) data and two-photon microscopy data collected by Davi Bock, Ph.D. and Wei-Chung Allen Lee, Ph.D.. Images have a resolution of 4x4x45 cubic nanometers.
430 citations, 511 unique visitors

2018 – **Branch (2018)**, Adult generated neurons in aging M. musculus imaged using array tomography, multi-spectral light microscopy, and electron microscopy.
2 citations, 223 unique visitors

2013 – **Bumbarger et al. (2013)**, Serial, thin section data generated by Dan Bumbarger in Ralf Sommer's lab in order to compare the pharyngeal connectomes of the pharyngeal nervous system between Caenorhabditis elegans and Pristionchus pacificus. In P. pacificus they found clearly homologous neurons for all of the 20 pharyngeal neurons in C. elegans, and massive rewiring of synaptic connectivity between the two species.
67 citations, 22 unique visitors

2015 – **Collman et al. (2015)**, Mouse cortex collected using conjugate array tomography (AT), a volumetric imaging method that integrates immunofluorescence and EM imaging modalities in voxel-conjugate fashion.
69 citations, 382 unique visitors

2015 – **Deisseroth et al. (2015)**, Twelve CLARITY mouse brains (5 wild type controls and 7 behaviorally challenged) were prepared by Li Ye, and imaged using CLARITY-Optimized Light-sheet Microscopy (COLM) (whole brain COLM imaging and data stitching performed by R. Tomer, in preparation).
5 citations, 208 unique visitors

2016 – **Dyer et al. (2016)**, Mesoscale (1 cubic micron resolution) resolution images generated with the use of synchrotron X-ray microtomography (microCT) from millimeter-scale volumes of mouse brain. X-ray tomography promises rapid quantification of large brain volumes.
21 citations, 216 unique visitors

2015 – **Harris et al. (2015)**, Three volumes of hippocampal CA1 neuropil in adult rat imaged by the laboratory of Kristen M Harris, PhD, at an XY resolution of 2 nm on serial sections of 50-60 nm thickness.
9 citations, 463 unique visitors

2017 – **Hildebrand et al. (2017)**, A multi-resolution serial-section electron microscopy data set containing the anterior quarter of a 5.5 days post fertilization larval zebrafish, including its complete brain acquired by Hildebrand and colleagues. Electron micrographs and reconstructions are available for view in CATMAID.
70 citations, 1,014 unique visitors

2015 – **Kasthuri et al. (2015)**, Saturated reconstruction of a sub-volume of mouse neocortex collected using automated technologies in which all cellular objects (axons, dendrites, and glia) and many sub-cellular components are rendered and itemized in a database. Provides access to the complexity of the neocortex and enables further data-driven inquiries.
323 citations, 1,299 unique visitors

2016 – **Lee et al. (2016)**, Electron microscopy data collected at $4 \times 4 \times 40$ nm per voxel from the visual cortex in Mouse V1 used in a study of an excitatory network.
132 citations, 725 unique visitors

2015 – **Micheva et al. (2015)**, Multi-channel array tomography data of the barrel cortex of an adult mouse (C57BL/6J).
57 citations, 190 unique visitors

2015 – **Ohyama et al. (2015)**, The side view of the approximately 7,000 neurons reconstructed so far, either in full or partially, of the approximately 12,000 neurons of the central nervous system of Drosophila larva. The 0111-8 data set was originally sectioned and imaged by Richard D. Fetter and his two tech assistants.
136 citations, 299 unique visitors

2013 – **Takemura et al. (2013)**, The right part of the brain of a wild-type Oregon R female fly that was serially sectioned into 40-nm slices. A total of 1,769 sections, traversing the medulla and downstream neuropils, were imaged at a magnification of 35,000X.
323 citations, 144 unique visitors

2019 – **Templier et al. (2019)**, The non-destructive collection of ultrathin sections onto silicon wafers for post-embedding staining and volumetric correlative light and electron microscopy using MagC. MagC allows the correlative visualization of neuroanatomical tracers within their ultrastructural volumetric electron microscopy context.
0 citations, 119 unique visitors

2017 – **Tobin et al. (2017)**, Wiring variations that enable and constrain neural computation in a sensory microcircuit.
28 citations, 43 unique visitors

2016 – **Wanner et al. (2016**, Serial block face scanning EM (SBEM) and conductive sample embedding image stack from an olfactory bulb (OB) of a zebrafish larva at a voxel resolution of $9.25 \times 9.25 \times 25$ nm3.
12 citations, 328 unique visitors

2014 – **Weiler (2014)**, Images of whisker-associated barrel columns of mouse somatosensory cortex stained with antibodies against selected antigens (DAPI, YFP), and indirect immunofluorescence. Images collected by the lab of Stephen J Smith.
6 citations, 123 unique visitors

2015 – **Randlett et al. (2015)**, Zebrafish brain atlas with surface mesh of different regions intended for the analysis of whole-brain activity mapping.
124 citations, 498 unique visitors

Open-source Software: Active

Stars denote an individual users appreciation, downloads indicates a user downloading the code, and a fork indicates a user modifying the code.

2016 – **Non-Parametric-Clustering**, A program which uses non-parametric-clustering to minimize or maximize a given criterion function.
3 stars, 2 forks

2018 – **MGC (Non-parametric hypothesis testing)**, Multiscale Graph Correlation (MGC) is a framework for universally consistent testing high-dimensional and non-Euclidean data.
28 stars, 11 forks, 120 downloads/month, 266 docker pulls

2018 – **ndcloud (NeuroData Cloud)**, The deployment of tools which support the Open Connectome Project.

2018 – **LOL (Supervised dimensionality reduction)**, Linear Optimal Low-rank (LOL) projection for improved classification performance in high-dimensional classification tasks.
8 stars, 6 forks, 60 downloads/month

2018 – **m2g (MR graph analysis)**, A Python pipeline which uses diffusion MRI data from individuals to generate connectomes reliably and scalably.
35 stars, 26 forks, 218 downloads/month, 7,900 docker pulls

2019 – **Sparse Projection Oblique Randomer Forests (Classification and regression)**, SPORF is an improved random forest algorithm that achieves better accuracy and scaling than previous implementations on a standard suite of > 100 benchmark problems.
54 stars, 35 forks, 73 downloads/month, 36 docker pulls

2019 – **reg (Image registration)**, A Python package which performs non-linear affine and deformable image registration.
6 stars, 4 forks, 61 downloads/month

2019 – **Uncertainty-Forest**, A Python package containing estimation procedures for posterior distributions, conditional entropy, and mutual information between random variables X and Y.
2 stars, 1 fork

2019 – **neuroparc**, This repository contains a number of useful parcellations, templates, masks, and transforms to (and from) MNI152NLin6 space. The files are named according to the BIDs specification.
26 stars, 4 forks

2019 – **GraSPy (Graph Statistics)**, Utilities and algorithms designed for processing and analysis of graphs with specialized graph statistical algorithms.
59 stars, 24 forks, 383 downloads/month

Open-source Software: Contributed

2017 **boss**, Developed core functionality.

2017 – 2018 **render**, Added cloud support.

2018 **igraph**, Added spectral clustering functionality.

2018 – 2019 **neuroglancer**, Added multispectral support to enable light microscopy data use.

2019 **cloud-volume**, Added support for additional file types.

2019 **C-PAC**, Added streamlined reproducible pipeline.

2019 **scipy**, Added mgc, a state of the art method for hypothesis testing we developed in the lab.

Open-source Software: Archived

2011 – 2016 **oopsi (Calcium Spike Sorting)**, Model-based spike train inference from calcium imaging.
20 stars, 9 forks

2011 – 2017 **ndstore**, Scalable database cluster for the spatial analysis and annotation of high-throughput brain imaging data.
37 stars, 13 forks

2012 – 2017 **FlashGraph (Scalable Analytics)**, General-purpose graph analysis framework that exposes vertex-centric programming interface for users to express varieties of graph algorithms.
220 stars, 42 forks

2012 – 2017 **FlashX (Scalable machine learning)**, A matrix computation engine that provides a small set of generalized matrix operations on sparse matrices and dense matrices to express varieties of data mining and machine learning algorithms.
220 stars, 42 forks

2015 **VESICLE (EM Synapse Detection)**, Reference synapse detection program for processing serial electron microscopy data.
3 stars, 3 forks

2015 – 2018 **ndviz**, Web visualization and analysis tools for neuroimaging datasets, powered by Neuroglancer.
8 stars, 4 forks, 48 docker pulls

2015 **CAJAL**, A MATLAB API that provides a simple to use interface with Open Connectome Project servers and provides RAMON Objects, unit tests, configuration scripts, and utilities.
6 stars, 5 forks

2015 – 2016 **DMG**, An implementation of a distributed multigrid Poisson solver for image stitching, smoothing, and sharpenting.
19 stars, 6 forks

2017 – 2019 **ndex**, Python 3 command-line program to exchange (download/upload) image data with NeuroData's cloud deployment of APL's BOSS spatial database.
3 stars, 0 forks, 89 downloads/month

2017 – 2018 **ndwebtools**, ndwebtools (ndweb) is a Django application to provide a user-friendly interface for interacting with NeuroData resources and data.
0 stars, 1 forks

2017 – 2019 **knor (Clustering)**, Python version of knor, a highly optimized and fast library for computing k-means in parallel with accelerations for Non-Uniform Memory Access (NUMA) architectures.
1 stars, 3 forks, 115 downloads/month

2017 – 2018 **MEDA (Matrix Exploratory Data Analysis)**, A python package for matrix exploratory data analysis.
0 stars, 3 forks, 56 downloads/month, 21 docker pulls

2017 – 2019 **SynapseAnalysis (Synapse Detection)**, A framework to evaluate synaptic antibodies for array tomography applications.
2 stars, 0 forks

Consultancy

2017 **Consultant**, *Greenspring Associates*.

2016 **Consultant**, *Scanadu*.

Advisory Board Appointments

10/18 – **Advisory Board**, *Mind-X*, A neurotechnology company combining brain-computer interfaces and artificial intelligence to make the world's information available with the speed and ease of a single thought., Incubated at Camden Partners Nexus, completed an initial round of funding for an undisclosed amount.
15 employees.

01/17 – **Advisory Board**, *PivotalPath*, PivotalPath is a leading hedge fund research and intelligence organization built by a team of experienced alternative investment professionals and fintech developers., Raised undisclosed amount of funding.
11 employees.

Startups

01/17 – **Co-Founder**, *gigantum*, The future of data science is open, decentralized and user friendly. That is why we created a platform that enables anybody to create and share totally reproducible computational work with the world., Completed initial round of seed funding for undisclosed amount from Digital Science, which also funds figshare, readcube, altmetric, overleaf, and more.
15 employees.

01/16 – **Co-Founder**, *d8alab*, Our services include evaluating model performance, building prototype R/Shiny web applications and basic data cleaning., Provides data science consulting for a variety of companies, specifically biomedical data science.
4 employees.