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Joshua T. Vogelstein

Personal Information

Primary Appointment

- 02/22 – **Associate Professor**, Department of Biomedical Engineering, JHU, Baltimore, MD, USA.
08/14 – 02/22 **Associate Professor**, Department of Biomedical Engineering, JHU, Baltimore, MD, USA.

Joint Appointments

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

Institutional and Center Appointments

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

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, Baltimore, MD, USA.
05/16 – **Visiting Scientist**, Howard Hughes Medical Institute, Janelia Research Campus, Ashburn, VA, USA.
10/12 – 08/14 **Endeavor Scientist**, Child Mind Institute, New York, NY, USA.
08/12 – 08/14 **Affiliated Faculty**, Kenan Institute for Ethics, Duke University, Durham, NC, USA.
08/12 – 08/14 **Adjunct Faculty**, Department of Computer Science, JHU, Baltimore, MD, USA.
12/09 – 01/11 **Post-Doctoral Fellow**, Department of Applied Mathematics and Statistics, Supervised by Carey E. Priebe, JHU, Baltimore, MD, USA.
Research Statistics of populations of networks.
06/01 – 09/01 **Research Assistant**, Prof. Randy O'Reilly, Dept. of Psychology, University of Colorado, Denver, CO, USA.

- 06/00 – 09/00 **Clinical Engineer**, *Johns Hopkins Hospital*, JHU, Baltimore, MD, USA.
- 06/99 – 08/99 **Research Assistant under Dr. Jeffrey Williams**, *Dept. of Neurosurgery, Johns Hopkins Hospital*, Baltimore, MD, USA.
- 06/98 – 08/98 **Research Assistant under Professor Kathy Cho**, *Dept. of Pathology, Johns Hopkins School of Medicine*, Baltimore, MD, USA.

Published Peer-Reviewed Research Articles

Note: CV author in bold; Trainees are underlined,

(102 papers; top 10 cited 3,997 times; H-index 38; 12 first, 17 last, 53 middle authorships) as of 2024/10/06

- [111] Sambit Panda, Shen Cencheng, Ronan Perry, Jelle Zorn, Antoine Lutz, Carey E. Priebe, and **Joshua T. Vogelstein**. “Universally consistent K-sample tests via dependence measures”. In: *Statistics and probability Letters* (Jan. 2025). URL: <https://www.sciencedirect.com/science/article/pii/S0167715224002475>.
- [110] Guodong Chen, Jesús Arroyo, Avanti Athreya, Joshua Cape, **Joshua T. Vogelstein**, Youngser Park, Chris White, Jonathan Larson, Weiwei Yang, and Carey E. Priebe. “Multiple Network Embedding for Anomaly Detection in Time Series of Graphs”. In: *Computational Statistics and Data Analysis* (Sept. 2024). arXiv: 2008.10055 [stat.ME]. URL: <https://arxiv.org/abs/2008.10055>.
- [109] Shen Cencheng, Shangi Wang, Alexandra Badea, Carey E. Priebe, and **Joshua T. Vogelstein**. “Discovering the signal subgraph: An iterative screening approach on graphs”. In: *Pattern Recognition Letters* (June 2024). URL: <https://www.sciencedirect.com/science/article/pii/S0167865524001818>.
- [108] Xinhui Li, Nathalia Bianchini Esper, Lei Ai, Steve Giavasis, Hecheng Jin, Eric Feczko, Ting Xu, Jon Clucas, Alexandre Franco, Anibal Sólón Heinsfeld, Azeez Adebimpe, **Joshua T. Vogelstein**, Chao-Gan Yan, Oscar Esteban, Russell A. Poldrack, Cameron Craddock, Damien Fair, Theodore Satterthwaite, Gregory Kiar, and Michael P. Milham. “Moving Beyond Processing and Analysis-Related Variation in Neuroscience”. In: *Nature Human Behaviour* (May 2024). DOI: 10.1101/2021.12.01.470790. URL: <https://doi.org/10.1101/2021.12.01.470790>.
- [107] Shen Cencheng, Chung Jaewon, Mehta Ronak, Xu Ting, and **Joshua T. Vogelstein**. “Independence Testing for Temporal Data”. In: *Transactions on Machine Learning Research* (May 2024). URL: <https://arxiv.org/abs/1908.06486>.
- [106] Zeyi Wang, Eric Bridgeford, Shangsi Wang, **Joshua T. Vogelstein**, and Brian Caffo. “Statistical Analysis of Data Repeatability Measures”. In: *International Statistical Review* (2024). arXiv: 2005.11911 [stat.AP]. URL: <https://arxiv.org/abs/2005.11911>.
- [105] Tiona Zuzul, Emily Cox Pahnke, Jonathan Larson, Patrick Bourke, Nicholas Caurvina, Neha Parikh Shah, Fereshteh Amini, Jeffrey Weston, Youngser Park, **Joshua Vogelstein**, Christopher White, and Carey E. Priebe. “Dynamic Silos: Increased Modularity and Decreased Stability in Intraorganizational Communication Networks During the COVID-19 Pandemic”. In: *Management Science* (2024). URL: <https://doi.org/10.1287/mnsc.2022.02797>.
- [104] Meghana Madhyastha, Tamas Budavari, Vladmir Braverman, **Joshua Vogelstein**, and Randal Burns. “T-Rex (Tree-Rectangles): Reformulating Decision Tree Traversal as Hyperrectangle Enclosure”. In: *2024 IEEE 40th International Conference on Data Engineering (ICDE)* (2024). URL: <https://doi.org/10.1109/ICDE60146.2024.00145>.
- [103] Ruoxuan Xiong, Allison Koenecke, Michael Powell, Zhu Shen, **Joshua T Vogelstein**, and Susan Athey. “Federated Causal Inference in Heterogeneous Observational Data”. In: *Statistics in Medicine* (Aug. 2023). DOI: 10.1002/sim.9868.
- [102] Michael Winding, Benjamin D Pedigo, Christopher L Barnes, Heather G Patsolic, Youngser Park, Tom Kazimiers, Akira Fushiki, Ingrid V Andrade, Avinash Khandelwal, Javier Valdes-Aleman, Feng Li, Nadine Randel, Elizabeth Barsotti, Ana Correia, Richard D Fetter, Volker Hartenstein, Carey E Priebe, **Joshua T Vogelstein**, Albert Cardona, and Marta Zlatic. “The connectome of an insect brain”. In: *science* (Mar. 2023). URL: <https://www.science.org/doi/abs/10.1126/science.add9330>.

- [101] Benjamin D Pedigo, Mike Powell, Eric W Bridgeford, Michael Winding, Carey E Priebe, and **Joshua T Vogelstein**. “Generative network modeling reveals quantitative definitions of bilateral symmetry exhibited by a whole insect brain connectome”. In: *eLife Sciences Publications, Ltd* (Mar. 2023). URL: <https://elifesciences.org/articles/83739>.
- [100] Benjamin D. Pedigo, Michael Winding, Carey E. Priebe, and **Joshua T. Vogelstein**. “Bisected graph matching improves automated pairing of bilaterally homologous neurons from connectomes”. In: *Network Neuroscience* (May 2022). bioRxiv: 2022.05.19.492713. URL: <https://www.biorxiv.org/content/10.1101/2022.05.19.492713>.
- [99] Thomas L Athey, Daniel J Tward, Ulrich Mueller, **Vogelstein Joshua T**, and Michael I Miller. “Hidden Markov modeling for maximum probability neuron reconstruction”. In: *Communications Biology* (Apr. 2022). ISSN: 5:388. DOI: 10.1038/s42003-022-03320-0. eprint: <https://www.nature.com/articles/s42003-022-03320-0.pdf>. URL: <https://doi.org/10.1038/s42003-022-03320-0>.
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- [97] Shilong Li, Tomi Jun, Jonathan Tyler, Emilio Schadt, Yu-Han Kao, Zichen Wang, Maximilian F Konig, Chetan Bettegowda, **Joshua T Vogelstein**, Nickolas Papadopoulos, Ramon E Parsons, Rong Chen, Eric E Schadt, Li Li, and William K Oh. “Inpatient Administration of Alpha-1-Adrenergic Receptor Blocking Agents Reduces Mortality in Male COVID-19 Patients”. In: *Front. Med.* 9 (Feb. 2022), p. 849222. URL: <https://www.frontiersin.org/articles/10.3389/fmed.2021.637647/full>.
- [96] **Joshua T Vogelstein**, Timothy Verstynen, Konrad P Kording, Leyla Isik, John W Krakauer, Ralph Etienne-Cummings, Elizabeth L Ogburn, Carey E Priebe, Randal Burns, Kwame Kutten, James J Knierim, James B Potash, Thomas Hartung, Lena Smirnova, Paul Worley, Alena Savonenko, Ian Phillips, Michael I Miller, Rene Vidal, Jeremias Sulam, Adam Charles, Noah J Cowan, Maxim Bichuch, Archana Venkataraman, Chen Li, Nitish Thakor, Justus M Kebschull, Marilyn Albert, Jinchong Xu, Marshall Hussain Shuler, Brian Caffo, Tilak Ratnanather, Ali Geisa, Seung-Eon Roh, Eva Yezerets, Meghana Madhyastha, Javier J How, Tyler M Tomita, Jayanta Dey, Ningyuan Huang, Jong M Shin, Kaleab Alemayehu Kinfu, Pratik Chaudhari, Ben Baker, Anna Schapiro, Dinesh Jayaraman, Eric Eaton, Michael Platt, Lyle Ungar, Leila Wehbe, Adam Kepecs, Amy Christensen, Onyema Osuagwu, Bing Brunton, Brett Mensh, Alysson R Muotri, Gabriel Silva, Francesca Puppo, Florian Engert, Elizabeth Hillman, Julia Brown, Chris White, and Weiwei Yang. “Prospective Learning: Back to the Future”. In: *arXiv [cs.LG]* (Jan. 2022). URL: <https://arxiv.org/abs/2201.07372>.
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- [94] Thomas Hartung, Lena Smirnova, Itzy E. M. Pantoja, Akwasi Akwaboah, Dowlette-Mary A. E. Din, Cindy Berlinicke, J L. Boyd, Brian S. Caffo, Ben Cappiello, Tzahi Cohen-Karni, Lowry Curley, Ralph Etienne-Cummings, Raha Dastgheyb, David H. Gracias, Frederic Gilbert, Christa W. Habela, Fang Han, Tim Harris, Kathrin Herrmann, Eric J. Hill, Qi Huang, Rabih E. Jabbour, Erik C. Johnson, Brett J. Kagan, Caroline Krall, Andre Levchenko,

- Paul Locke, Alexandra Maertens, Monica Metea, Alysson R. Muotri, Rheinallt Parri, Barton L. Paulhamus, Jesse D. Plotkin, Paul Roach, July C. Romero, Jens C. Schwamborn, Fenna Sille, Alexander Szalay, Katya Tsaïoun, Daniel Tornero, **Joshua T. Vogelstein**, Karl Wahlin, and Donald J. Zack. “The Baltimore Declaration toward the exploration of organoid intelligence”. In: *Frontiers in Science* (2022).
- [93] Mike Powell, Callahan Clark, Anton Alyakin, **Joshua T Vogelstein**, and Brian Hart. “Exploration of Residual Confounding in Analyses of Associations of Metformin Use and Outcomes in Adults With Type 2 Diabetes”. In: *JAMA Network Open* 5.11 (2022), e2241505–e2241505. URL: <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2798322>.
- [92] Jaewon Chung, Bijan Varjavand, Jesús Arroyo-Relión, Anton Alyakin, Joshua Agterberg, Minh Tang, Carey E. Pribe, and **Joshua T Vogelstein**. “Valid two-sample graph testing via optimal transport Procrustes and multiscale graph correlation with applications in connectomics”. In: *Stat* 11.1 (2022), e429.
- [91] Michael Powell, Allison Koenecke, James Byrd, Akihiko Nishimura, Maximilian König, Ruoxuan Xiong, Sadiqa Mahmood, Chetan Mucaj Veraand Bettegowda, Liam Rose, Suzanne Tamang, Adam Sacarny, Brian Caffo, Susan Athey, Elizabeth Stuart, and **Joshua Vogelstein**. “Ten Rules for Conducting Retrospective Pharmacoepidemiological Analyses: Example COVID-19 Study”. In: *Frontiers in Pharmacology* (July 2021), p. 1799. DOI: 10.3389/fphar.2021.700776. URL: <https://www.frontiersin.org/articles/10.3389/fphar.2021.700776/full>.
- [90] Vikram Chandrashekhar, Daniel J Tward, Devin Crowley, Ailey K Crow, Matthew A Wright, Brian Y Hsueh, Felicity Gore, Timothy A Machado, Audrey Branch, Jared S Rosenblum, Karl Deisseroth, and **Joshua T Vogelstein**. “CloudReg: automatic terabyte-scale cross-modal brain volume registration”. In: *Nature Methods* (July 2021). ISSN: 1548-7105. DOI: 10.1038/s41592-021-01218-z. eprint: <https://www.nature.com/articles/s41592-021-01218-z.pdf>. URL: <https://doi.org/10.1038/s41592-021-01218-z>.
- [89] Thomas L Athey, Jacopo Teneggi, **Joshua T Vogelstein**, Daniel Tward, Ulrich Mueller, and Michael I. Miller. “Fitting Splines to Axonal Arbors Quantifies Relationship between Branch Order and Geometry”. In: *Frontiers in Neuroinformatics* (June 2021). URL: https://www.frontiersin.org/articles/10.3389/fninf.2021.704627/full?utm_source=Email_to_authors_&utm_medium=Email&utm_content=T1_11.5e1_author&utm_campaign=Email_publication&utm_field=journalName=Frontiers_in_Neuroinformatics&utm_id=704627.
- [88] Cencheng Shen, Sambit Panda, and **Joshua T. Vogelstein**. “The Chi-Square Test of Distance Correlation”. In: *Journal of Computational and Graphical Statistics* 0.ja (June 2021), pp. 1–21. ISSN: 1061-8600. DOI: 10.1080/10618600.2021.1938585. URL: <https://www.tandfonline.com/doi/full/10.1080/10618600.2021.1938585>.
- [87] Allison Koenecke, Michael Powell, Ruoxuan Xiong, Zhu Shen, Nicole Fischer, Sakibul Huq, Adham M. Khalafallah, Marco Trevisan, Pr Sparen, Juan J Carrero, Akihiko Nishimura, Brian Caffo, Elizabeth A. Stuart, Renyuan Bai, Verena Staedtke, David L. Thomas, Nickolas Papadopoulos, Kenneth W. Kinzler, Bert Vogelstein, Shibin Zhou, Chetan Bettegowda, Maximilian F. König, Brett Mensh, **Joshua T. Vogelstein**, and Susan Athey. “Alpha-1 adrenergic receptor antagonists to prevent hyperinflammation and death from lower respiratory tract infection”, journal=Elife”. In: 10 (June 2021), e61700. DOI: 10.7554/eLife.61700. URL: <https://elifesciences.org/articles/61700>.
- [86] **Joshua T. Vogelstein**, Eric W. Bridgeford, Minh Tang, Da Zheng, Christopher Douville, Randal Burns, and Mauro Maggioni. “Supervised dimensionality reduction for big data”. In: *Nature Communications* 12.2872 (May 2021), pp. 1–9. ISSN: 2041-1723. DOI: 10.1038/s41467-021-23102-2.
- [85] Ronan Perry, Gavin Mischler, Richard Guo, Theodore Lee, Alexander Chang, Arman Koul, Cameron Franz, Hugo Richard, Iain Carmichael, Pierre Ablin, Alexandre Gramfort, and **Joshua T. Vogelstein**. “mvlarn: Multiview Machine Learning in Python”. In: *Journal of Machine Learning Research* 22.109 (May 2021), pp. 1–7. URL: <http://jmlr.org/papers/v22/20-1370.html>.

- [84] Shilong Li, Tomi Jun, Zichen Wang, Yu-Han Kao, Emilio Schadt, Maximilian F Konig, Chetan Bettegowda, **Joshua T Vogelstein**, Nickolas Papadopoulos, Ramon E Parsons, et al. "COVID-19 outcomes among hospitalized men with or without exposure to alpha-1-adrenergic receptor blocking agents". In: *Frontiers in Medicine* (Apr. 2021). URL: <https://www.medrxiv.org/content/10.1101/2021.04.08.21255148v1.full>.
- [83] Shangsi Wang, Jesús Arroyo, **Joshua T Vogelstein**, and Carey E Priebe. "Joint Embedding of Graphs". In: *Transactions on Pattern Analysis and Machine Intelligence* 43 (Apr. 2021). URL: <https://ieeexplore.ieee.org/document/8889404>.
- [82] Liam Rose, Laura Graham, Allison Koenecke, Michael Powell, Ruoxuan Xiong, Zhu Shen, Brett Mench, Kenneth W Kinzler, Chetan Bettegowda, Bert Vogelstein, et al. "The association between Alpha-1 adrenergic receptor antagonists and in-hospital mortality from COVID-19". In: *Frontiers in Medicine* 8 (Mar. 2021). DOI: 10.3389/fmed.2021.637647. URL: <https://www.frontiersin.org/articles/10.3389/fmed.2021.637647/full>.
- [81] Michael P. Milham, **Joshua T. Vogelstein**, and Ting Xu. "Removing the Reliability Bottleneck in Functional Magnetic Resonance Imaging Research to Achieve Clinical Utility". In: *JAMA Psychiatry* (Jan. 2021). DOI: 10.1001/jamapsychiatry.2020.4272. URL: <https://jamanetwork.com/journals/jamapsychiatry/article-abstract/2774875>.
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- [79] Eric W Bridgeford, Shangsi Wang, Zeyi Wang, Ting Xu, Cameron Craddock, Jayanta Dey, Gregory Kiar, William Gray-Roncal, Carlo Colantuoni, Christopher Douville, et al. "Eliminating accidental deviations to minimize generalization error and maximize replicability: Applications in connectomics and genomics". In: *PLoS computational biology* 17.9 (2021), e1009279. URL: <https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1009279>.
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- [74] Karl-Heinz Nenning, Ting Xu, Ernst Schwartz, Jesús Arroyo, Adelheid Woehrer, Alexandre R. Franco, **Joshua T. Vogelstein**, Daniel S. Margulies, Hesheng Liu, Jonathan Smallwood, Michael P. Milham, and Georg Langs. "Joint embedding: A scalable alignment to compare individuals in a connectivity space". In: *NeuroImage* 222 (Nov. 2020), p. 117232. ISSN: 1053-8119. DOI: <https://doi.org/10.1016/j.neuroimage.2020.117232>. URL: <http://www.sciencedirect.com/science/article/pii/S1053811920307187>.

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Funding

External Research Support: Current

- 2022-2027 **NIH**, *The Heart and the Mind: An Integrative Approach to Brain-Body Interactions in the Zebrafish*, 2U19NS104653,
 PI: F. Engert
 Role on Project: Co-Investigator
 Term: 01-Sep-2022 to 31-Aug-2024
 Funding to lab, entire period: \$412,500 (total)
 Funding to lab, current year:
 Johns Hopkins University will be responsible for developing all algorithms and software in support of the Atlas project, as well as running the Data Core. This will include writing software to store, manage, and visualize the data, as well as algorithms for scalable analysis and support of modeling. .
- 2020-2024 **NSF**, *Neural Net Learning for Graph*, NSF 2113099,
 PI: C. Shen
 Role on Project: Co-Investigator
 Term: 01-Sep-2021 to 31-Aug-2024
 Funding to lab, entire period: \$73,597 (total)
 Funding to lab, current year:
 Goal of this project is methodological development, theoretical investigation, and simulation and real data experimentation toward the end goal of principled understanding and advancement of the mathematics and science of graph neural network. .
- 2021-2024 **NIH**, *An Alignment Framework for Mapping Brain Dynamics and Substrates of Human Cognition Across Species*, 1RF1MH128696,
 PI: T. Xu
 Role on Project: Co-Investigator
 Term: 01-Sep-2021 to 31-Aug-2024
 Funding to lab, entire period: \$270,189 (total)
 Funding to lab, current year:
 We will continue collecting, organizing, and analyzing another cohort of the NKI-Rockland Sample. .

- 2021-2027 **NIH**, *The NKI Rockland Sample II: An Open Resource of Multimodal Brain, Physiology & Behavior Data from a Community Lifespan Sample*, 2U19NS104653,
 PI: M. Milham
 Role on Project: Co-Investigator
 Term: 01-Jul-2022 to 30-Apr-2026
 Funding to lab, entire period: \$3,831,854 (total)
 Funding to lab, current year:
 The major goal is to establish multimodal MRI and electrophysiology lifespan sample to open and prospectively share with the larger scientific community. .
- 2020-2025 **NSF**, *Collaborative Research: Transferable, Hierarchical, Expensive, Optimal, Robust, Interpretable Networks*, NSF 20-540,
 PI: R. Vidal
 Role on Project: Co-Investigator
 Term: 01-Sep-2020 to 31-Aug-2025
 Funding to lab, entire period: \$1,650,000 (direct)
 Funding to lab, current year: \$660,000 (direct)
 The goal of this project is to develop a mathematical, statistical and computational framework that helps explain the success of current network architectures, understand its pitfalls, and guide the design of novel architectures with guaranteed confidence, robustness, interpretability, optimality, and transferability. .
- 2020 – **Microsoft**, *Federated Causal Inference for Multi-site Real-World Evidence & Clinical Trial Analysis*, Studies in Pandemic Preparedness,
 PI: M. Powell
 Role on Project: Co-Investigator
 Term: 01-Aug-2020 to current
 Funding to lab, entire period: N/A
 Funding to lab, current year: N/A
 This project will conduct federated retrospective analyses designed to assess the benefit of off-label drug use by pooling multiple disparate databases, to help prioritize and guide subsequent initiation and recruitment of randomized clinical trials. This will include evaluating the impact of the target drugs on patient outcomes from diseases similar to COVID-19, such as pneumonia or acute respiratory distress, generating artificial datasets using generative adversarial networks to assess performance of methods when 'ground truth' is known, applying the best methods to analyze the effect of the target drugs on the outcomes of COVID-19 patients across hospital systems, and using the results to evaluate the potential of these drugs and suggest guidelines for clinical trials. .
- 2020-2023 **NIH**, *Graspy: A python package for rigorous statistical analysis of populations of attributed connectomes*, NIH MH-19-147,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: 01-Jul-2020 to 30-Jun-2023
 Funding to lab, entire period: \$861,240 (direct) \$1,416,279 (total)
 Funding to lab, current year: \$283,301 (direct) \$471,082 (total)
 The goal of this project is to establish a state-of-the-art toolbox for analysis of connectomes, spanning taxa, scale, and complexity. 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. .

- 2020-2025 **NSF**, *NeuroNex2: Enabling Identification and Impact of Synaptic Weight in Functional Networks*, NSF 2014862,
 PI: K. Harris
 Role on Project: Co-Investigator
 Term: 01-Apr-2020 to 31-Mar-2025
 Funding to lab, entire period: \$609,294 (direct) \$997,719 (total)
 Funding to lab, current year: \$121,587 (direct) \$199,543 (total)
 The goal is to develop the requisite technology to understand the impact of synaptic weight on functional networks .
- 2020-2025 **NSF**, *CAREER: Foundational Statistical Theory and Methods for Analysis of Populations of Attributed Connectomes*, NSF 17-537,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: 01-Jan-2020 to 31-Dec-2025
 Funding to lab, entire period: \$630,230 (total) \$384,873 (direct)
 Funding to lab, current year: \$126,046 (total) \$76,975 (direct)
 The goal is to establish foundational theory and methods for analyzing populations of attributed connectomes .
- 2019-2023 **NIH**, *Brain Networks in Mouse Models of Aging*, NIH RO1AG066184-01,
 PI: A. Badea
 Role on Project: Co-Investigator
 Term: 01-Dec-2019 to 30-Nov-2023
 Funding to lab, entire period: N/A
 Funding to lab, current year: \$205,998
 The goal of this grant is to generate connectomes and RNA-seq transcriptomes to characterize and differentiate APOE mice as a model of aging .
- 2019 – **Microsoft**, *Microsoft Research Award* ,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: Unrestricted Gift
 Funding to lab, entire period: \$50,000 (total)
 Funding to lab, current year: N/A
 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 .

External Research Support: Completed

- 2020-2022 **NSF**, *AI Institute: Planning: BI4ALL: Understanding Biological*, NSF 20-503,
 PI: K. Kording
 Role on Project: Co-Investigator
 Term: 01-Oct-2020 to 31-Jul-2022
 Funding to lab, entire period: N/A
 Funding to lab, current year: \$79,629 (direct)
 The goal of this project is to plan an AI institution via several meetings and workshops .

- 2019-2022 **NIH**, *Accessible technologies for high-throughput, whole-brain reconstructions of molecularly characterized mammalian neurons*, NIH RFA-MH-19-148,
 PI: M. Muller
 Role on Project: Co-Investigator
 Term: 01-Sep-2019 to 31-Aug-2022
 Funding to lab, entire period: \$1,180,445 (total) \$753,974 (direct)
 Funding to lab, current year: \$383,482 (total) \$251,325 (direct)
 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 **NIH**, *Reproducible imaging-based brain growth charts for psychiatry*, NIH R01MH120482-01,
 PI: T. Satterthwaite
 Role on Project: Co-Investigator
 Term: 01-Aug-2019 to 31-May-2020
 Funding to lab, entire period: \$362,861 (total) \$231,276 (direct)
 Funding to lab, current year: N/A
 Aggregate, harmonize, and analyze existing large-scale pediatric neuroimaging datasets to identify normative and clinical brain growth curves .
- 2018 – 2021 **NSF**, *SemiSynBio: Collaborative Research: YeastOns: Neural Networks Implemented in Communication Yeast Cells*, NSF 1807369,
 PI: E. Schulman
 Role on Project: Co-Investigator
 Term: 16-Jul-2018 to 30-Jun-2021
 Funding to lab, entire period: \$263,942 (total) \$172,971 (direct)
 Funding to lab, current year: \$87,980 (total) \$57,657 (direct)
 Provide neuroscience and machine learning expertise to guide the design of the computational learning capabilities of the system .
- 2018 – 2020 **Schmidt Science Foundation**, *Connectome Coding at the Synaptic Scale*, Nascent Innovation Grant 128503,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: 01-Jan-2018 to 31-Dec-2020
 Funding to lab, entire period: \$250,000 (total)
 Funding to lab, current year: N/A
 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 **DARPA**, *Lifelong Learning Forests*, FA8650-18-2-7834,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: 01-Nov-2017 to 31-Oct-2021
 Funding to lab, entire period: \$1,839,308 (total) \$1,123,474 (direct)
 Funding to lab, current year: \$199,179 (total) \$121,667 (direct)
 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 .

- 2017 – 2021 **DARPA**, *Continual Learning Across Synapses, Circuits, and Brain Areas*, FA8650-18-2-7834,
 PI: A. Tolias
 Role on Project: Co-Investigator
 Term: 01-Nov-2017 to 30-Oct-2021
 Funding to lab, entire period: \$796,715 (total) \$486,666 (direct)
 Funding to lab, current year: \$199,179 (total) \$121,667 (direct)
 Develop the pre-processing analysis pipeline for the imaging data collected in this project .
- 2017 – 2020 **NSF**, *NeuroNex Innovation Award: Towards Automatic Analysis of Multi-Terabyte Cleared Brains*, NSF 1707298,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: 01-Sep-2017 to 31-Aug-2020 (No Cost Extension)
 Funding to lab, entire period: \$959,999 (total) \$588,758 (direct)
 Funding to lab, current year: \$320,000 (total) \$196,252 (direct)
 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 **NIH**, *Sensorimotor processing, decision making, and internal states: towards a realistic multiscale circuit model of the larval zebrafish brain*, NIH 1U19NS104653-01,
 PI: F. Engert
 Role on Project: Co-Investigator
 Term: 01-Sep-2017 to 31-Aug-2022
 Funding to lab, entire period: \$1,050,000 (total) \$655,206 (direct) (JHU sub-award)
 Funding to lab, current year: \$210,000 (total) \$131,041 (direct)
 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 **NIH**, *CRCNS US-German Res Prop: functional computational anatomy of the auditory cortex*, NIH 1R01DC016784-01,
 PI: J. MRatnanather
 Role on Project: Co-Investigator
 Term: 01-Jul-2017 to 30-Jun-2020
 Funding to lab, entire period: \$747,143 (total) \$458,519 (direct)
 Funding to lab, current year: N/A
 Create a robust computational framework for analyzing the cortical ribbon in a specific region: the auditory cortex .
- 2017 – 2020 **NSF**, *Multiscale Generalized Correlation: A Unified Distance-Based Correlation Measure for Dependence Discovery*, NSF 1921310,
 PI: S. Cencheng
 Role on Project: Co-Investigator
 Term: 01-May-2017 to 30-Apr-2020
 Funding to lab, entire period: \$200,000 (total) \$124,189 (direct)
 Funding to lab, current year: N/A
 Establish a unified methodology framework for statistical testing in high-dimensional, noisy, big data, through theoretical advancements, comprehensive simulations, and real data experiments .

- 2017 – 2019 **NSF, NeuroNex Technology Hub: Towards the International Brain Station for Accelerating and Democratizing Neuroscience Data Analysis and Modeling**, NSF 16-569,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: 2017 to 2019
 Funding to lab, entire period: \$246,773
 Funding to lab, current year: N/A
 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 – 2018 **The Kavli Foundation, The International Brain Station**, 90071826,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: 2017 to 2018
 Funding to lab, entire period: \$50,000 (total) \$50,000 (direct)
 Funding to lab, current year: N/A
 Take the first few steps towards building the international brain station .
- 2017 – 2018 **DARPA, The Brain Ark**, 90076467,
 PI: J. Vogelstein
 Role on Project: Principal Investigator
 Term: 2017 to 2018
 Funding to lab, entire period: \$92,376 (total) \$56,499.08 (direct)
 Funding to lab, current year: N/A
 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 **NSF, Brain Comp Infra: EAGER: BrainLab CI: Collaborative, Community Experiments**, ACI-1649880,
 PI: B. Miller
 Role on Project: Co-Investigator
 Term: 2017 to 2018
 Funding to lab, entire period: \$294,599 (total) \$180,736 (direct)
 Funding to lab, current year: N/A
 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 – 2020 **DARPA, D3M: What Would Tukey Do?**, FA8750-17-2-0112,
 PI: C. Priebe
 Role on Project: Co-Investigator
 Term: 01-Oct-2016 to 30-Sep-2020
 Funding to lab, entire period: \$4,406,360 (total) \$2,746,050 (direct)
 Funding to lab, current year: N/A
 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 .

- 2016 – 2019 **NSF**, *A Scientific Planning Workshop for Coordinating Brain Research Around the Globe*, NIH RFA-MH-19-148,
PI: J. Vogelstein
Role on Project: Principal Investigator
Term: 2016 to 2019
Funding to lab, entire period: \$97,950 (total) \$97,950 (direct)
Funding to lab, current year:
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 **NSF**, *A Scientific Planning Workshop for Coordinating Brain Research Around the Globe*, NSF 1637376,
PI: J. Vogelstein
Role on Project: Principal Investigator
Term: 2016 to 2019
Funding to lab, entire period: \$16,327 (total) \$14,491 (direct)
Funding to lab, current year: N/A
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 **DARPA**, *From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from*, N66001-15-C-40401,
PI: J. Vogelstein
Role on Project: Principal Investigator
Term: 01-Sep-2019 to 31-Aug-2022
Funding to lab, entire period: \$2,103,091.60 (total) \$1,298,204 (direct)
Funding to lab, current year: N/A
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 **DARPA**, *Scalable Grain Graph Analyses Using Big-Memory, High-IPS Compute Architectures*, N66001-14-1-4028,
PI: R. Burns
Role on Project: Co-Investigator
Term: 2014 to 2016
Funding to lab, entire period: \$39,882 (total) \$28,272 (direct)
Funding to lab, current year: N/A
Build software infrastructure to enable analytics on billion node, terabyte sized networks using commodity hardware .
- 2014 – 2019 **NIH**, *Synaptomes of Mouse and Man*, NIH R01NS092474,
PI: S. Smith
Role on Project: Co-Investigator
Term: 2014 to 2019
Funding to lab, entire period: \$756,417 (total) \$491,341 (direct)
Funding to lab, current year: N/A
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 **National Institute of Biomedical Imaging and Bioengineering**, *CRCNS: Data Sharing: The EM open Connectome Project*, RO1EB16411,
 PI: R. Burns
 Role on Project: Co-Investigator
 Term: 2012 to 2015
 Funding to lab, entire period: \$70,823 (total) \$46,517 (direct)
 Funding to lab, current year: N/A
 Develop cyberinfrastructure to support management, visualization, storage, and analysis of large-scale electron microscopy data .

Invited Talks

- [55] **Joshua T Vogelstein**. “[Prospective Learning: Learning for a dynamic future](#)”. In: Cold Spring Harbor Laboratory, NY, USA, Sept. 2024.
- [55] **Joshua T Vogelstein**. “Moderator, SNF Global Center Third Expert Gathering: Consensus Building for Scalable Biometric Tools and Measures to Facilitate Global Mental Health Research”. In: Child Mind Institute, NY, USA, Sept. 2024.
- [54] **Joshua T Vogelstein**. “[Fixing Artificial Intelligence via Natural Intelligence](#)”. In: Nemertes Next, Royal Sonesta Harbor Court, Baltimore, MD, USA, Sept. 2024.
- [53] **Joshua T Vogelstein**. “[Learning the way that animals leaned to learn](#)”. In: Schizophrenia Center, Johns Hopkins University, Baltimore, MD, USA, Sept. 2024.
- [52] **Joshua T. Vogelstein**. “Surprise! IID++ Out of Distribution & Prospective Learning”. In: Simons Foundation, New York, NY, Sept. 2023.
- [51] Benjamin D Pedigo. “Hypothesis testing for connectome comparisons: a statistical analysis of bilateral symmetry in an insect brain connectome”. In: Drexel University, Philadelphia, PA, Mar. 2022.
- [50] Eric Bridgeford. “[Eliminating Accidental Deviations in Human Connectomics](#)”. In: JHU BME, Baltimore, MD, USA, 2021.
- [49] Jayanta Dey. “[Omnidirectional Lifelong Learning via Ensembling Representations](#)”. In: JHU BME, Baltimore, MD, USA, 2021.
- [48] **Joshua T. Vogelstein**. “[FIRM Guiding Principles for scientific software development and stewardship](#)”. In: JHU BME, Baltimore, MD, USA, 2021.
- [47] Jaewon Chung. “[Heritability of Human Structural Connectomes](#)”. In: JHU BME, Baltimore, MD, USA, 2021.
- [46] Ali Geisa. “[Towards a theory of out-of-distribution learning](#)”. In: JHU BME, Baltimore, MD, USA, 2021.
- [45] **Joshua T. Vogelstein**. “[Jovo++](#)”. In: JHU BME, Baltimore, MD, USA, 2021.
- [44] **Joshua T. Vogelstein**. “[Reality Transurfing: Chapter 1](#)”. In: JHU BME, Baltimore, MD, USA, 2021.
- [43] **Joshua T. Vogelstein**. “[Lifelong Learning: Theory and Practice](#)”. In: Darpa L2M PI Meeting, 2021.
- [42] **Joshua T. Vogelstein**. “[Lifelong Learning and Beyond](#)”. In: Darpa L2M PI Meeting, 2021.
- [41] **Joshua T. Vogelstein**. “[Lifelong Learning: Theory and Context](#)”. In: Darpa L2M PI Meeting, 2021.
- [40] **Joshua T. Vogelstein**. “[Lifelong Learning: Theory and Practice and Coresets](#)”. In: Darpa L2M PI Meeting, 2021.
- [39] **Joshua T. Vogelstein**. “Lifelong Learning”. In: North Carolina State University, Raleigh, NC, USA, Oct. 2020.
- [38] **Joshua T. Vogelstein**. “Lifelong Learning”. In: Morgan State University, Baltimore, MD, USA, Sept. 2020.
- [37] **Joshua T. Vogelstein**. “[Lifelong Learning: Moving Beyond Avoiding Catastrophic Forgetting](#)”. In: Johns Hopkins Mathematical Institute for Data Science, Baltimore, MD, USA, Feb. 2020.
- [36] **Joshua T. Vogelstein**. “[Open Access to the Brain: a Computer "Connectome" Links Brain Images in Fine Detail](#)”. In: JHM Boot Camp, Baltimore, MD, USA, June 2019.

- [35] **Joshua T. Vogelstein.** “[Big Biomedical Data Science](#)”. In: Sol Goldman International Conference, Baltimore, MD, USA, Apr. 2019.
- [34] **Joshua T. Vogelstein.** “[Journey to Here](#)”. In: JHU BMES talks, Baltimore, MD, USA, Apr. 2019.
- [33] **Joshua T. Vogelstein.** “[NeuroData \(Science\)](#)”. In: Kavli, Baltimore, MD, USA, Apr. 2019.
- [32] **Joshua T. Vogelstein.** “[NeuroData Tools](#)”. In: NeuroData Hackashop, Baltimore, MD, USA, Mar. 2019.
- [31] **Joshua T. Vogelstein.** “[Biomedical Big Data and Data Science](#)”. In: JHU BME, Baltimore, MD, USA, Feb. 2019.
- [30] **Joshua T. Vogelstein.** “[Data Intensive Brain Science](#)”. In: Kavli Neuroscience Discovery Institute, Baltimore, MD, USA, June 2018.
- [29] **Joshua T. Vogelstein.** “[Using Big Data Science to Understand What Goes On in our Heads](#)”. In: SOHOP Faculty Spotlight, Baltimore, MD, USA, Apr. 2018.
- [28] **Joshua T. Vogelstein.** “[Engineering the Future of Medicine: Data Intensive Biomedical Science](#)”. In: Johns Hopkins University Biomedical Engineering, Baltimore, MD, USA, Mar. 2018.
- [27] **Joshua T. Vogelstein.** “[Data Coordination and Data Resources for the BRAIN Initiative](#)”. In: 4th Annual BRAIN Initiative Investigators Meeting, Rockville, MD, USA, 2018.
- [26] **Joshua T. Vogelstein.** “[The International Brain Station \(TIBS\)](#)”. In: JHU BME and Tsinghua University, Baltimore, MD, USA, Feb. 2017.
- [25] **Joshua T. Vogelstein.** “[Opportunities and Challenges in Big Data Neuroscience](#)”. In: Society for Neuroscience, Washington D.C., USA, 2017.
- [24] **Joshua T. Vogelstein.** “[Using Big Data Science to Understand What Goes on in Our Heads](#)”. In: SOHOP Faculty Spotlight, Baltimore, MD, USA, 2017.
- [23] **Joshua T. Vogelstein.** “[NeuroStorm](#)”. In: Global Brain Workshop 2 JHU, Baltimore, MD, USA, 2017.
- [22] **Joshua T. Vogelstein.** “[Challenges and Opportunities in Big Data for Neuroscientists](#)”. In: Society for Neuroscience: DC Metro Area Chapter Keynote Address, Washington, DC, USA, 2017.
- [21] **Joshua T. Vogelstein.** “[The International Brain Station \(TIBS\)](#)”. In: United Nations Global Brain Workshop Meeting, Baltimore, MD, USA, Apr. 2016.
- [20] **Joshua T. Vogelstein.** “[Using Big Data Science to Understand What Goes on in Our Heads](#)”. In: SOHOP Faculty Spotlight, Baltimore, MD, USA, 2016.
- [19] **Joshua T. Vogelstein.** “[The International Brain Station \(TIBS\)](#)”. In: Kavli Foundation, Baltimore, MD, USA, 2016.
- [18] **Joshua T. Vogelstein.** “[NeuroData 2016](#)”. In: NeuroData Lab Retreat, 2016.
- [17] **Joshua T. Vogelstein.** “[Global Brain Workshop 2016](#)”. In: Global Brain Workshop NSF+JHU at Kavli, Baltimore, MD, USA, 2016.
- [16] **Joshua T. Vogelstein.** “[Global Brain Workshop 2016](#)”. In: Kavli Neuroscience Discovery Institute & Center for Imaging Science, Baltimore, MD, USA, 2016.
- [15] **Joshua T. Vogelstein,** Michael I. Miller, and Richard Hanganir. “[Global Brain Workshop 2016](#)”. In: Kavli Neuroscience Discovery Institute & Center for Imaging Science @ JHU, Baltimore, MD, USA, 2016.
- [14] **Joshua T. Vogelstein.** “[Learning a Data-Driven Nosology: Progress, Challenges & Opportunities](#)”. In: Kavli Neuroscience Discovery Institute & Center for Imaging Science, Baltimore, MD, USA, 2016.
- [13] **Joshua T. Vogelstein.** “[NeuroData: Enabling Terascale Neuroscience](#)”. In: Kavli Neuroscience Discovery Institute & Center for Imaging Science, Baltimore, MD, USA, 2016.
- [12] **Joshua T. Vogelstein.** “[NeuroData: Enabling Terascale Neuroscience](#)”. In: JHU Kavli Neuroscience Discovery Institute, Baltimore, MD, USA, 2016.
- [11] **Joshua T. Vogelstein.** “[Special Symposium: Neuroscience in the 21st Century](#)”. In: Kavli, Baltimore, MD, USA, 2015.
- [10] **Joshua T. Vogelstein.** “[Open Connectome Project: Lowering the Barrier to Entry of Big Data Neuroscience](#)”. In: Institute for Computational Medicine at Johns Hopkins University, Baltimore, MD, USA, 2015.

- [9] **Joshua T. Vogelstein.** “[Open Source Platform for Heterogenous Brain Data](#)”. In: figshare, 2015.
- [8] **Joshua T Vogelstein.** “[Big \(Neuro\) Statistics](#)”. In: Kavli Salon, Chicago, IL, USA: Big Data: Practice Across Disciplines, 2014.
- [7] **Joshua T Vogelstein.** “[Open-Science Platform for Heterogeneous Brain Data: Opportunities and Challenges](#)”. In: Kavli, Baltimore, MD, USA, 2014.
- [6] **Joshua T Vogelstein.** “[Big \(Neuro\) Statistics](#)”. In: Kavli Salon, Baltimore, MD, USA: Big Data: Practice Across Disciplines, 2014.
- [5] **Joshua T Vogelstein.** “Decision Theoretic Approach to Statistical Inference”. In: Guest Lecture in Current Topics in Machine Learning, Johns Hopkins University, Baltimore, MD, USA, 2012.
- [4] **Joshua T Vogelstein.** “Once we get connectomes, what the %#* are we going to do with them?” In: Institute of Neuroinformatics, Boston, MA, USA, Sept. 2011.
- [3] **Joshua T Vogelstein.** “[Inferring spike times given typical time-series fluorescence observations](#)”. In: Department of Applied Mathematics and Statistics, Johns Hopkins University, Baltimore, MD, USA, 2008.

Other Talks

- [79] **Joshua T Vogelstein.** “[Learning the way that animals leaned to learn](#)”. In: Department of Biomedical Engineering, McGill University, Canada, Sept. 2024.
- [78] **Joshua T. Vogelstein.** “[Probably Approximately Correct in the Future](#)”. In: Banff International Research Station for Mathematical Innovation and Discovery, Oaxaca, Mexico, June 2024.
- [77] Qingyang Wang. “Why do networks need negative weights?” In: Society for Neuroscience (nanosymposium - Networks: Functional Connectivity and Computation) San Diego, CA, Nov. 2022.
- [76] Eric Bridgeford. “[Simulating a Realization of a Stochastic Block Model](#)”. In: ABCD-ReproNim Program, Mar. 2022.
- [75] Eric Bridgeford. “[Community Detection and Model Selection in SBMs](#)”. In: ABCD-ReproNim Program, Mar. 2022.
- [74] Sambit Panda, Cencheng Shen, and **Joshua T Vogelstein.** “Nonparametric MANOVA via Independence Testing”. In: Global Young Scientists Summit, Jan. 2022.
- [73] Benjamin D Pedigo, Michael Winding, Marta Zlatic, Albert Cardona, Carey E Priebe, and **Joshua T Vogelstein.** “[Maggot brain, mirror image? A statistical analysis of bilateral symmetry in an insect brain connectome](#)”. In: Neuromatch 4.0, Dec. 2021.
- [72] Benjamin D Pedigo and **Joshua T Vogelstein.** “graspologic: A python package for rigorous statistical analysis of populations of attributed connectomes”. In: BRAIN Informatics Webinar, Oct. 2021.
- [71] Sambit Panda, Cencheng Shen, and **Joshua T Vogelstein.** “[Nonparametric MANOVA via Independence Testing](#)”. In: BRAIN Initiative Meeting, June 2021.
- [70] Benjamin D. Pedigo. “[Network data science for bilateral brains: Applications in the larval Drosophila connectome](#)”. In: NIH & DOE Brain Connectivity Workshop Series, Mar. 2021.
- [69] **Joshua T. Vogelstein.** “[OOD DARPA Presentation](#)”. In: DARPA, 2021.
- [68] **Joshua T. Vogelstein.** “[Lifelong Learning and Beyond](#)”. In: DARPA L2M, 2021.
- [67] **Joshua Vogelstein.** “[The role of the connectome in achieving artificial general intelligence](#)”. In: Yale School of Medicine, Whistler Scientific Workshop, Whistler, BC, Canada, Mar. 2020.
- [66] **Joshua Vogelstein.** “[Lifelong Learning via Ensembling General Representations](#)”. In: Microsoft Research. Feb. 2020.
- [65] Hayden Helm, Ronak Mehta, Carey E. Priebe, Raman Arora, and **Joshua T. Vogelstein.** “[A Theory and Practice of Lifelong Learnable Forest](#)”. In: Kavli Neural Systems Institute, Rockefeller University, New York City, NY, USA, Jan. 2020.
- [64] **Joshua T. Vogelstein.** “[Lifelong Learning](#)”. In: Columbia University, New York City, NY, USA, Jan. 2020.
- [63] **Joshua T. Vogelstein.** “[Ailey in an Hour: \(A "Soup-to-Nuts" Pipeline for Analysis of Whole Cleared Brain Data\)](#)”. In: NeuroNex, Cornell University, Ithaca, NY, USA, Oct. 2019.

- [62] **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.
- [61] **Joshua T. Vogelstein** and Randal Burns. “[Data Science Core](#)”. In: Harvard University, Carmridge, MA, USA, July 2019.
- [60] Jaewon Chung. “[Statistical Methods for Population of Connectomes](#)”. In: Organization of Human Brain Mapping, Rome, Italy, June 2019.
- [59] James Browne. “[Forest Packing: Fast Parallel, Decision Forests](#)”. In: SIAM International Conference on Data Mining, Calgary, Alberta, Canada, May 2019.
- [58] Daniel Tward. “[Brain mapping tools for neuroscience research](#)”. In: NeuroNex, Cornell University, Ithaca, NY, USA, May 2019.
- [57] **Joshua T. Vogelstein**. “[Big Data and the Life Sciences](#)”. In: Sloan Foundation, New York City, NY, USA, May 2019.
- [56] **Joshua T. Vogelstein**. “[Statistical Foundations For Connectomics](#)”. In: Max Planck / HHMI Connectomics Meeting, Berlin, Germany, Apr. 2019.
- [55] **Joshua T. Vogelstein**. “[Connectal Coding](#)”. In: Dipy Workshop, Bloomington, Indiana, USA, Mar. 2019.
- [54] **Joshua T. Vogelstein**. “[Lifelong Learning Forests](#)”. In: L2M, Mar. 2019.
- [53] **Joshua T. Vogelstein**. “[Connectome Coding](#)”. In: Society for Neuroscience, San Diego, CA, USA, Nov. 2018.
- [52] **Joshua T. Vogelstein**. “[NeuroData: A Community-developed open-source computational ecosystem for big neuro data](#)”. In: NeuroNex, Cornell University, Ithaca, NY, USA, Oct. 2018.
- [51] **Joshua T. Vogelstein**. “[A Community-Developed Open-Source Computational Ecosystem for Big Neuro Data](#)”. In: Princeton University, Princeton, NJ, USA, Aug. 2018.
- [50] **Joshua T. Vogelstein**. “[Multiscale Graph Correlation: A Knowledge Representation System for Discovering Latent Geometric Structure](#)”. In: DARPA SIMPLEX PI Review Meeting, New York City, NY, USA, Aug. 2018.
- [49] Eric Perlman. “[NeuroData: Embracing Open Source for Big Data Neuroscience](#)”. In: NSF NeuroNex Workshop on Super 3DEM, Austin, TX, USA, July 2018.
- [48] Eric W. Bridgeford. “[A High-Throughput Pipeline Identifies Robust Connectomes but Troublesome Variability](#)”. In: Organization of Human Brain Mapping, Suntec, Singapore, July 2018.
- [47] **Joshua T. Vogelstein** and Vikram Chandrashekhar. “[NeuroNex + Stanford](#)”. In: NeuroNex-Stanford, Stanford, CA, USA, July 2018.
- [46] Gregory Kiar. “Connectome Coding: what is it, how do we do it, and why do we care?” In: Data science in Neuroscience Symposium, Suntec, Singapore, June 2018.
- [45] **Joshua T. Vogelstein**. “[Lifelong Learning Forests](#)”. In: Darpa L2M PI Meeting, Arlington, VA, USA, June 2018.
- [44] **Joshua T. Vogelstein**. “[Discovering Relationships and their Geometry Across Disparate Data Modalities](#)”. In: Yale University, New Haven, CT, USA, Jan. 2018.
- [43] **Joshua T. Vogelstein**. “[Connectome Coding](#)”. In: Schmidt Sciences, Oct. 2017.
- [42] **Joshua T. Vogelstein**. “[Discovering Relationships and their Geometry Across Disparate Data Modalities](#)”. In: Stanford University, Stanford, CA, US, Aug. 2017.
- [41] Disa Mhembere. “[knor: a NUMA-Optimized In-Memory, Distributed and Semi-External-Memory k-means library](#)”. In: HPDC, Washington DC, USA, June 2017.
- [40] Gregory Kiar. “Science in the Cloud (SIC): A use-case in MRI Connectomics”. In: Open Science Special Interest Group, Oxford University, Oxford, England, 2017.
- [39] Youjin Lee. “[Network Dependence Testing via Diffusion Maps and Distance-Based Correlations](#)”. In: Joint Statistical Meetings, Baltimore, MD, USA, 2017.
- [38] T. M. Tomita. “ROFLMAO: Robust Oblique Forests with Linear Matrix Operations”. In: SIAM International Conference on Data Mining, Houston, TX, USA, 2017. DOI: [10.1137/1.9781611974973.56](#).

- [37] **Joshua T Vogelstein**. “NeuroData: Enabling Terascale Neuroscience for Everyone”. In: 3rd Annual BRAIN Initiative Investigators Meeting, Bethesda, MD, USA, Dec. 2016.
- [36] **C. Shen**. “Multiscale Generalized Correlation”. In: Joint Statistical Meeting, Chicago, IL, USA, Aug. 2016.
- [35] **Joshua T Vogelstein**. “[NeuroData: Enabling Terascale Neuroscience for Everyone](#)”. In: Keystone Symposia: State of the Brain, Alpbach, Austria, May 2016.
- [34] **C. Shen**. “Local Distance Correlation for Testing Independence”. In: Temple University, Philadelphia, PA, USA, Nov. 2015.
- [33] **Joshua T Vogelstein**. “[Law of Large Graphs](#)”. In: DARPA Graphs, Columbia University, New York City, NY, USA, Sept. 2015.
- [32] **Joshua T. Vogelstein**. “[big time \(series data in neuroscience\)](#)”. In: figshare, 2015.
- [31] **Joshua T Vogelstein**. “[Research Computing Support for Neuroscience and Other Life Sciences](#)”. In: CASC, Aachen, Germany, 2015.
- [30] **Joshua T Vogelstein**. “[From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from Heterogeneous Data](#)”. In: SIMPLEX Kickoff, New York City, NY, USA, 2015.
- [29] **Joshua T Vogelstein**. “[From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from Heterogeneous Data: Part 1](#)”. In: DARPA SIMPLEX PI Meeting, New York City, NY, USA, 2015.
- [28] **Joshua T Vogelstein**. “[From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from Heterogeneous Data: Part 2](#)”. In: DARPA SIMPLEX PI Meeting, New York City, NY, USA, 2015.
- [27] **Joshua T Vogelstein** and Liam Paninski. “[Spike inference from calcium imaging using sequential Monte Carlo methods](#)”. In: AMSI Program on Sequential Monte Carlo, 2015.
- [26] **Joshua T Vogelstein**. “[Opportunities and Challenges in Big Data Neuroscience](#)”. In: DoE, 2015.
- [25] **Joshua T Vogelstein**. “[Top Challenges of Big Data Neuroscience](#)”. In: BRAIN Initiative Workshop, Bethesda, MD, USA, Dec. 2014.
- [24] **Joshua T Vogelstein**. “[Big Statistics for Brain Sciences](#)”. In: Baylor College of Medicine, Department of Neuroscience, Houston, TX, USA, May 2014.
- [23] **Joshua T Vogelstein**. “[Beyond Little Neuroscience](#)”. In: Beyond Optogenetics workshop at Cosyne, Salt Lake City, UT, USA, Feb. 2013.
- [22] **Joshua T Vogelstein**. “Statistical Inference on Graphs”. In: University of Michigan, Ann Arbor, Michigan, 2013.
- [21] **Joshua T Vogelstein**. “Statistical Inference on Graphs”. In: Scientific Computing Institute, University of Utah, Salt Lake City, UT, USA, 2013.
- [20] **Joshua T Vogelstein**. “[Open Problems in Neuropsychiatry](#)”. In: Data Seminar, Duke University, Durham, NC, USA, 2013.
- [19] **Joshua T Vogelstein**. “[Statistical Models and Inference for big Brain-Graphs](#)”. In: NIPS Workshop on Acquiring and analyzing the activity of large neural ensembles, Lake Tahoe, NV, USA, 2013.
- [18] **Joshua T Vogelstein**. “[BIG NEURO](#)”. In: Theory and Neurobiology, Duke University, Durham, NC, USA, 2012.
- [17] **Joshua T Vogelstein**. “Open Connectome Project”. In: Academic Medical Center, Amsterdam, Netherlands, 2012.
- [16] **Joshua T Vogelstein**. “[Are mental properties supervenient on brain properties](#)”. In: NIPS workshop on Philosophy and Machine Learning, Sierra Nevada, Spain. Dec. 2011.
- [15] **Joshua T Vogelstein**. “What can Translational neuroimaging Research do for Clinical Practice”. In: Child Mind Institute, New York City, NY, USA, 2011.
- [14] **Joshua T Vogelstein**. “[Statistical Connectomics](#)”. In: Harvard University Connectomics Labs, Cambridge, MA, USA, 2011.
- [13] **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 University, Fairfax, VA, USA, 2011.

- [12] **Joshua T Vogelstein**. “[Consistent Connectome Classification](#)”. In: Math/Bio Seminar, Duke University, Durham, NC, USA, 2011.
- [11] **Joshua T Vogelstein**. “[Connectome Classification: Statistical Graph Theoretic Methods for Analysis of MR-Connectome Data](#)”. In: Organization for Human Brain Mapping, Quebec City, Canada, 2011.
- [10] **Joshua T Vogelstein**. “[Consistent Graph Classification](#)”. In: Guest Lecture in Deisseroth Lab, Stanford University, Stanford, CA, USA, 2011.
- [9] **Joshua T Vogelstein**. “[Neurocognitive Graph Theory](#)”. In: National Security Agency, 2009.
- [8] **Joshua T Vogelstein**. “[OOPSI: A Family of Optimal Optical Spike Inference Algorithms for Inferring Neural Connectivity from Population Calcium Imaging](#)”. In: Dissertation Defense, Johns Hopkins University, Baltimore, MD, USA, 2009.
- [7] **Joshua T Vogelstein**. “Sequential Monte Carlo in Neuroscience”. In: SAMSI Program on Sequential Monte Carlo, Tracking Working Group, 2009.
- [6] **Joshua T Vogelstein**. “[Towards Inference and Analysis of Neural Circuits Inferred from Population Calcium Imaging](#)”. In: Guest Lecture in Schnitzer Lab, Stanford University, Stanford, CA, USA, 2009.
- [5] **Joshua T Vogelstein**. “[Towards Inferring Neural Circuits from Calcium Imaging](#)”. In: Guest Lecture in Yuste Lab, Columbia University, New York City, NY, USA, 2009.
- [4] **Joshua T Vogelstein**. “Inferring Spike Trains Given Calcium-Sensitive Fluorescence Observations”. In: Statistical Analysis of Neural Data, Pittsburgh, PA, USA, May 2008.
- [3] **Joshua T Vogelstein**. “[Inferring spike trains from Calcium Imaging](#)”. In: Redwood Center for Theoretical Neuroscience, University of California, Berkeley, CA, USA, 2008.
- [2] **Joshua T Vogelstein**. “[Inferring spike trains from Calcium Imaging](#)”. In: Cambridge University, Gatsby Unit, and University College London, Cambridge, England, 2008.
- [1] **Joshua T Vogelstein**. “Model based optimal inference of spike times and calcium dynamics given noisy and intermittent calcium-fluorescence observations”. In: Neurotheory Center of Columbia University, New York City, NY, USA, 2007.

Abstracts/Poster Presentations

- [69] Benjamin D Pedigo, Mike Powell, Eric W Bridgeford, Michael Winding, Carey E Priebe, and **Joshua T Vogelstein**. “Generative network modeling reveals a first quantitative definition of bilateral symmetry exhibited by a whole insect brain connectome”. In: From Neuroscience to Artificially Intelligent Systems (NAISys), Cold Spring Harbor Laboratory, NY, USA, Mar. 2022. URL: https://figshare.com/articles/poster/Generative_network_modeling_reveals_a_quantitative_definition_of_bilateral_symmetry_exhibited_by_a_whole_insect_brain_connectome/19610013.
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Educational Activities

Teaching Experience - Ongoing Courses

- Spring '21 **Course Director, JHU, EN.580.419**, Philosophy of Life - A Data Science Perspective, enrollment 6.
- Spring '22 **Course Director, JHU, EN.580.438/638, NeuroData Design II**, enrollment 20.
- Fall '21 **Course Director, JHU, EN.580.437/697, NeuroData Design I**, enrollment 27.
- Spring '21 **Course Director, JHU, EN.580.438/638, NeuroData Design II**, enrollment 30.
- Fall '20 **Course Director, JHU, EN.580.237/437/697, NeuroData Design I**, enrollment 38.
- Spring '20 **Course Director, JHU, EN.580.438/638, NeuroData Design II**, enrollment 32.
- Fall '19 **Course Director, JHU, EN.580.237/437/637, NeuroData Design I**, enrollment 46.
- Spring '19 **Course Director, JHU, EN.580.438/638, NeuroData Design II**, enrollment 18.
- Fall '18 **Course Director, JHU, EN.580.237/437/637, NeuroData Design I**, enrollment 22.
- Spring '17 **Course Director, JHU, EN.580.238/438/638, NeuroData Design II**, enrollment 14.
- Winter '17 **Course Director, JHU, EN.580.574**, BME Research Intersession, enrollment 6.
- Fall '17 **Course Director, JHU, EN.580.247/437/637, NeuroData Design I**, enrollment 15.
- Spring '16 **Course Director, JHU, EN.580.468, The Art of Data Science**, enrollment 24.
- Fall '16 **Course Director, JHU, EN.580.437, NeuroData Design I**, enrollment 16.
- Spring '15 **Course Director, JHU, EN.580.694, Statistical Connectomics**, enrollment 26.

Teaching Experience - One-Time

- Spring '19 **Guest Lecturer, JHU, EN.580.422**, Systems Bioengineering II.
2 Lectures
- Spring '19 **Guest Lecturer, JHU, AS.080.321**, Computational Neuroscience.
2 Lectures
- Spring '18 **Guest Lecturer, JHU, EN.580.422**, Systems Bioengineering II.
2 Lectures
- Spring '18 **Guest Lecturer, JHU, AS.080.321**, Computational Neuroscience.
2 Lectures
- Spring '17 **Guest Lecturer, JHU, EN.580.422**, Systems Bioengineering II.
2 Lectures
- Spring '16 **Guest Lecturer, JHU, EN.580.422**, Systems Bioengineering II.
2 Lectures
- Winter '16 **Guest Lecturer, JHU, EN.600.221**, Introduction to Connectomics.
1 Lecture

- Fall '16 **Guest Lecturer, JHU, EN.580.111**, BME Modeling and Design.
1 Lecture
- Fall '15 **Course Co-Director, JHU, Introduction to Computational Medicine.**
[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

- 07/19 – 08/20 **Ronak Mehta MSE**, *Research Assistant*, BME, JHU.
Finalizing three manuscripts on (1) uncertainty forests, (2) time-series dependence quantification, and (3) lifelong learning forests
- 03/19 – 05/20 **Anton Alyakin BSE**, *Assistant Research Engineer*, BME, JHU.
Worked on various problems in statistical graph inference
- 02/19 – 12/19 **Hayden Helm MSE**, *Assistant Research Faculty*, BME, JHU.
Lead research efforts developing theory and methods for lifelong learning
- 08/16 – 08/18 **Eric Perlman Ph.D.**, *Assistant Research Faculty*, BME, JHU.
Lead Scientist in developing storage, transfer, and visualization solutions for large data in our cloud infrastructure
- 03/16 – 06/20 **Jesse Patsolic MA**, *Assistant Research Faculty*, BME, JHU.
Lead developer converting our extensions to decision forests to be merged into sklearn

Staff Research Scientists

- 10/23 – **Itsuki Ogiwara BME**, *Research Assistant*, MS, JHU.
- 09/20 – 04/23 **Jong Shin MSE**, *Software Engineer*, BME, JHU.
Currently investigating the effect of inductive bias innately coinciding with various machine learning models
- 03/20 – 08/22 **Ali Geisa MS**, *Research Assistant*, BME, JHU.
Researching progressive and lifelong learning theory
- 06/19 – 08/20 **Devin Crowley BS**, *Research Assistant*, BME, JHU.
Lead developer of our scalable Python implementation of LDDMM
- 06/18 – 12/19 **Benjamin Falk Ph.D.**, *Research Engineer*, BME, JHU.
Lead software engineer, oversees all development projects, solely responsible for all cloud infrastructure

Postdoctoral Fellows

- 09/22 – 12/22 **Adam Li Ph.D.**, *Postdoctoral Fellow*, BME, JHU.
- 11/20 – **Javier Josue How Ph.D.**, *Postdoctoral Fellow*, Neurosciences, UCSD.
Javier studies how larval zebrafish learn how to perform a task under one situation, and use this knowledge to learn another task more quickly. He hopes to use this understanding of biological transfer learning to improve machine learning, which tends to be unable to complete this feat.
- 07/19 – 08/21 **Celine Drieu Ph.D.**, *Post-doctoral Fellow*, Kavli NDI, JHU.
Co-Advised by Assistant Prof. Kuchibhotla, Department of Psychological and Brain Sciences. Working on understanding learning and memory using two-photon calcium imaging

- 07/19 – 08/21 **Austin Grave Ph.D.**, *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
- 08/18 – 08/20 **Jesús Arroyo Ph.D.**, *Post-doctoral Fellow*, CIS, JHU.
Worked on graph matching and joint graph embedding
- 07/18 – 07/20 **Audrey Branch Ph.D.**, *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 Ph.D.**, *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 Assistant Professor in Department of Statistics at University of Delaware, and still an active collaborator and grantee
- 06/16 – 07/17 **Guilherme Franca Ph.D.**, *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
- 05/16 – 06/17 **Leo Duan Ph.D.**, *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
- 08/14 – 05/22 **Tyler Tomita MSE**, *Postdoctoral Fellow*, 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. Currently a postdoc with Assistant Prof. Chris Honey of Psychology and Brain Sciences

Ph.D. Students

- 09/24 - **Rodrigo Guerra MS**, *PhD Student*, BME, The City College of New York.
Psychedelics - all
- 7/2024 - **Cecelia Shuai Bachelor**, *PhD student*, Neuroscience, Johns Hopkins.
I'm interested in lifelong learning and am now working on prospective learning in the simulated ecological environment. I also model cool animal learning data collected in my joint-mentor's lab
- 8/23 - 12/23 **Skyler Thomas BS, BSA**, *PhD Student (Rotation)*, BME, JHU.
Skyler is a rotation student in the lab. He is interested in applied mathematics and machine learning. He is currently working on prospective learning theory. He is currently a Ph.D. student in BME at JHU.
- 05/23 – **Yuxin Bai MSE**, *PhD Student*, BME, JHU.
- 05/22 – 05/23 **Jeremy Welland Ph.D.**, *PhD Student (Rotation)*, BME, JHU.
- 02/22 – **Alice Qingyang Wang Bsc**, *PhD candidate*, Neuroscience, JHU.
- 01/22 – 01/23 **Noga Mudrik Ph.D.**, *PhD Student (Rotation)*, BME, JHU.
- 08/21 – **Ashwin De Silva BS**, *PhD Student*, BME, University of Moratuwa.
Statistical Machine Learning
- 01/21 – **Haoyin Xu MSE**, *PhD Student*, BME, JHU.
A Research Assistant who was also a Master's student in the NeuroData lab, maintainer of proglearn, working on streaming trees and forests
- 08/20 – 08/22 **Kaleab A. Kinfu MSE**, *PhD Student*, BME, JHU.
Kaleab studied double descent phenomena in decision forests and deep learning methods and developed 'Partition and Decode' – a framework that formalizes an implicit internal representation of several modern machine learning methods. He is currently a Ph.D. student in CS at JHU.
- 05/20 – **Tingshan Liu B.A.**, *PhD Student*, Math Neuro, Smith College.
Implementing and applying clustering algorithms to the connectomes of insect nervous systems.

- 08/19 – 12/23 **Eric Bridgeford BSE, PhD Student**, 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
- 08/19 – 04/22 **Mike Powell MSE, PhD Candidate**, BME, Johns Hopkins University.
Mike has studied drug-repurposing options for potential COVID-19 treatments, proposed methodological improvements and best practices for drug-repurposing studies, and developed a taxonomy for describing and quantifying feature importance in machine learning models.
- 07/19 – 06/24 **Jayanta Dey MSE, PhD Student**, BME, JHU.
Currently working on lifelong learning that aims at training a machine learning model on multiple tasks and transferring knowledge among tasks
- 06/19 – **Sambit Panda MSE, PhD Student**, BME, JHU.
A Ph.D. student who was also a Master's student in the NeuroData lab. Currently, the maintainer of the 'hyppo' package, and works on creating more powerful and efficient multivariate hypothesis tests.
- 05/19 – **Jaewon Chung MSE, PhD Student**, BME, JHU.
07/24 Data science for macroscale connectomes. Co-creator and maintainer of 'graspologic', a Python package for network statistics.
- 01/19 – 01/24 **Thomas Athey BS, PhD Candidate**, BME, JHU.
Tommy analyzes terabyte-scale full brain images from light microscopy with a focus on neuromorphology. His expertise is in statistics and computer vision.
- 08/18 – 05/23 **Ben Pedigo BS, PhD Candidate**, BME, JHU.
Data science for nanoscale connectomes. Co-creator and maintainer of 'graspologic', a Python package for network statistics.
- 08/18 – **Meghana Madyastha BSE, PhD Co-advisee**, CS, JHU.
06/2022 Dissertation will focus on computational aspects of acceleration learning and inference using decision forests
- 08/16 – 12/21 **Vikram Chandrashekar 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

Visiting Doctoral Student

- 03/19 – 09/19 **Derek Pisner MSE, PhD advisee**, JHU/UT, Austin.
Worked on the ndmg pipeline, developing direct streamline normalization for structural connectome generation

M.S. Students

- 6/23 – 8/24 **Ziyan Li MSE, MS student**, BME, JHU.
- 05/20 – 12/21 **Ali Saad-Eldin BSE, MS advisee**, BME, JHU.
Working on implementing and improving combinatorial optimization algorithms, specifically the Quadratic Assignment Problem
- 02/20 – 12/20 **Will LeVine, MS advisee**, BME, JHU.
Exploring different sub-algorithms within progressive learning to alleviate harmful effects that result from training on unhelpful data
- 01/20 – 08/22 **Shreya Singh BS, Graduate Researcher**, BME, JHU.
brainlit' package, aws and azure data management
- 07/19 – 04/22 **Ross Lawrence BSE, MS advisee**, BME, JHU.
Lead m2g developer, maintainer of neuroparc, MRI connectome repositories
- 06/19 – 12/20 **Bijan Varjavand BSE, MS advisee**, BME, JHU.
Submitted manuscript to PAMI on advancing statistics on populations of networks
- 06/19 – 05/21 **Vivek Gopalakrishnan MSE, Combined BS/MSE Student**, BME, JHU.
Vivek developed multiscale hypothesis tests for multi-subject connectomics datasets, and is currently a PhD student in Medical Engineering and Medical Physics at the Harvard-MIT Program in Health Sciences and Technology.

- 01/19 – 06/21 **Ronan Perry MSE**, *MSE/BS Student*, BME, JHU.
Ronan studied random forest methods for structured data and improved prediction calibration, developed nonparametric hypothesis testing tools, and explored novel complexity measures of neural networks. He is currently a Fulbright Germany scholar with Bernhard Scholkopf.
- 10/18 – 04/22 **Alex Loftus BSE**, *MS advisee*, BME, JHU.
graph stats book, 'graspologic' package, ndmg development
- 06/18 – 06/19 **Drishti Mannan BSE**, *MS advisee*, BME, JHU.
Preparing manuscript introducing novel specification for large attributed networks
- 08/14 – 06/17 **Greg Kiar BSE**, *MSE advisee*, BME, JHU.
Developer of m2g, 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 Students

- 6/23 – 12/23 **Anvii Mishra BS**, *Undergraduate*, BME, JHU.
- 10/22 — **Hope Ugwuoke BS**, *Undergraduate*, BME, JHU.
- 06/22 – 02/23 **Sejal Srivastava BS**, *Undergraduate*, BME, JHU.
- 06/22 – 12/22 **Audrey Herskovits BS**, *Undergraduate (Visiting)*, BME, JHU.
- 09/21 – 08/24 **Kareef Ullah**, *Undergraduate Researcher*, BME, JHU.
Assisted with fixing issues in graspologic and hyppo
- 08/20 – 05/21 **Alisha Kodibagkar**, *Undergraduate Researcher*, BME, JHU.
Assisting in the integration of brainlit packages with Azure services
- 05/20 – **Diane Lee**, *Undergraduate Researcher*, BME, JHU.
06/2022 Assisting in the maintenance of graspologic
- 06/19 – 12/19 **Richard Guo**, *Undergraduate Researcher*, 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
- 06/21 – 08/21 **Dominique Allen**, *Undergraduate Researcher*, BME, JHU.
Assisted Thomas Athey in his work with statistics and computer vision
- 06/15 – 12/15 **Ron Boger BSE**, *Undergraduate Researcher*, BME, JHU.
Worked at a computational medicine start-up in Silicon Valley, worked on high-dimensional low-sample size theory
- 06/15 – 08/16 **Albert Lee BSE**, *Undergraduate*, BME, JHU.
Developed big data visualization tools
- 05/15 – 05/16 **Jordan Matelsky BSE**, , BME, 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.

Highschool Student

- 05/21 – 08/21 **MyCo Le**, *High School Intern*, BME, JHU.
- 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

Thesis Committee Service (BME unless noted otherwise)

- 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*, JHU, Baltimore, MD, USA.
- 2015 – 2017 **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*, JHU, Baltimore, MD, USA.

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

- 2019 – **Mentor**, *Black in AI*.
- 2017 – **Scientific Advisory Board**, *NSF NeuroNex*, Enhanced resolution for 3DEM analysis of synapses across brain regions and taxa. Provided 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 Initiative 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 Services](#) (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

- 2019 – **Associate Editor**, *Journal of the American Statistical Association*.
- 2018 – **Editor**, *Neurons, Behavior, Data analysis, and Theory*.
- 2016 **Guest Associate Editor**, *PLoS Computational Biology*.

Conference and Journal Reviewer

Neural Information Processing Systems (NeurIPS).
International Conference on Learning Representations (ICLR).
International Conference on Machine Learning (ICML).
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

- Summer '20 **Co-Chair**, *SciPy mini-symposium: Biology and Bioinformatics*.
- 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 (~ 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 (~ 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 (~ 50 participants and 5 observers from funding institutions).
- 2016 **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 (~ 75 participants).
- 2016 **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/>.
- 2015 **Co-Organizer**, *BigNeuro2015: Making Sense of Big Neural Data, NIPS Workshop*, <http://neurodata.io/bigneuro2015>.
- 2012 **Co-Organizer**, *Scaling up EM Connectomics Conference*, The world's first connectomics workshop, now run annually alternating between Janelia Research and Max Plank locations (~ 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 Pistrutto 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

- [31] NPR. Why scientists just mapped every synapse in a fly brain. NPR, 2023. URL: <https://www.npr.org/2023/03/28/1166541020/why-scientists-just-mapped-every-synapse-in-a-fly-brain>.
- [30] Science Friday. The First Fully Mapped Animal Brain Is The Larva Of A Fruit Fly. WNYC Studio, 2023. URL: <https://www.sciencefriday.com/segments/animal-brain-map-fruit-fly>.

- [29] Steven Salzberg. Prazosin Might Be A Treatment for COVID-19. More Data Is Urgently Needed. Forbes, 2020. URL: <https://www.forbes.com/sites/stevensalzberg/2020/04/08/a-possible-treatment-for-covid-19/?sh=9055d4975af2>.
- [28] James Hamblin. Why Some People Get Sicker Than Others: COVID-19 is proving to be a disease of the immune system. The Atlantic, 2020. URL: <https://www.theatlantic.com/health/archive/2020/04/coronavirus-immune-response/610228/>.
- [27] Apoorva Mandavilli. Coronavirus Can Set Off a 'Cytokine Storm.' These Drugs May Calm It. The New York Times, 2020. URL: <https://www.nytimes.com/2020/06/11/health/coronavirus-cytokine-storm.html>.
- [26] Joseph A. Ladapo. Too Much Caution Is Killing Covid Patients. The Wall Street Journal, 2020. URL: <https://www.wsj.com/articles/too-much-caution-is-killing-covid-patients-11606238928>.
- [25] Amy Mone and Valerie Mehl. Researchers Urge Clinical Trial of Blood Pressure Drug to Prevent Lethal Complication of Covid-19. Johns Hopkins Medicine, 2020. URL: <https://www.hopkinsmedicine.org/news/newsroom/news-releases/researchers-urge-clinical-trial-of-blood-pressure-drug-to-prevent-lethal-complication-of-covid-19#:~:text=Researchers%20in%20the%20Ludwig%20Center,SARS%2DCoV%2D2%20infection..>
- [24] Meghan Rosen. Preventing 'Cytokine Storm' May Ease Severe COVID-19 Symptoms. Howard Hughes Medical Institute, 2020. URL: <https://www.hhmi.org/news/preventing-cytokine-storm-may-ease-severe-covid-19-symptoms>.
- [23] Johns Hopkins Medicine. BME Pioneers: Joshua Vogelstein. BME Pioneers, 2019. URL: <https://vimeo.com/hartlove/review/331872774/9dacde8acb>.
- [22] Johns Hopkins Medicine. Technology Connecting the Brain to the Human Experience. Tomorrows Discoveries, 2019. URL: <https://www.youtube.com/watch?v=NqmbDPzJBgI>.
- [21] Jeffrey M. Perkel. Web service makes big data available to neuroscientists. Nature, 2018. URL: <https://www.nature.com/articles/d41586-018-07195-2>.
- [20] Prachi Patel. Johns Hopkins researchers want to use big data to chart the brain. Johns Hopkins University, 2016. URL: <https://hub.jhu.edu/2016/11/02/johns-hopkins-neuroscientists-brain-trust/>.
- [19] Emily Underwood. International brain projects proposed. Science, 2016. URL: <http://science.sciencemag.org/content/352/6283/277>.
- [18] The Kavli Foundation. International Brain Initiative. Kavli, 2016. URL: <http://www.kavlifoundation.org/international-brain-initiative>.
- [17] Sara Reardon. Worldwide brain-mapping project sparks excitement — and concern. Nature, 2016. URL: <http://www.nature.com/news/worldwide-brain-mapping-project-sparks-excitement-and-concern-1.20658>.
- [16] National Institutes of Health. International Brain Projects Considered. BRAIN initiative, 2016. URL: <http://www.braininitiative.org/2016/04/22/international-brain-projects-considered/>.
- [15] Emerging Technology from the arXiv. Three Grand Challenges for Brain Science That Can Be Solved in 10 Years. MIT Technology Review, 2016. URL: <https://www.technologyreview.com/s/602274/three-grand-challenges-for-brain-science-that-can-be-solved-in-10-years/>.
- [14] Office of the Spokesperson. International Brain Initiative Launch and VIP Dialog: Towards an International Brain Station. US Department of State, 2016. URL: <https://2009-2017.state.gov/r/pa/prs/ps/2016/09/262200.htm>.
- [13] Dale Keiger. The Open Connectome Project takes a close look at the brain. Johns Hopkins Magazine, 2015. URL: <https://hub.jhu.edu/magazine/2015/winter/open-connectome-project-joshua-vogelstein-randal-burns/>.

- [12] Latarsha Gatlin. Johns Hopkins mathematician receives grant to support study of brain's circuitry. Johns Hopkins University, 2014. URL: <https://hub.jhu.edu/2014/08/22/cary-priebe-nsf-eager-grant/>.
- [11] Timothy O'Leary and Eve Marder. Mapping Neural Activation onto Behavior in an Entire Animal. Science, 2014. URL: <http://science.sciencemag.org/content/344/6182/372.full>.
- [10] Bob Yirka. Researchers create a reference atlas for neural circuits in fruit fly larvae. MedicalXpress, 2014. URL: <https://medicalxpress.com/news/2014-03-atlas-neural-circuits-fruit-larvae.html>.
- [9] Kate Yandell. Linking Neurons to Behaviors. TheScientist, 2014. URL: <http://www.the-scientist.com/?articles.view/articleNo/39571/title/Linking-Neurons-to-Behaviors>.
- [8] Laura Sanders. Ten thousand neurons linked to behaviors in fly. ScienceNews, 2014. URL: <https://www.sciencenews.org/node/188288>.
- [7] Sharon Begley. Fly brain 'atlas' opens door to linking human neurons to actions. Reuters, 2014. URL: <http://www.reuters.com/article/us-science-flybrain/fly-brain-atlas-opens-door-to-linking-human-neurons-to-actions-idUSBREA2Q23B20140327>.
- [6] Donghee Son and Jongha Lee. Research Highlights. Nature, 2014. URL: <http://www.cis.jhu.edu/~parky/CEP-Publications/Nature-highlight.pdf>.
- [5] Ben Thomas. "Open Access to the Brain" – Podcast 1: Joshua Vogelstein. The Connectome Podcast, 2012. URL: <https://theconnectome.wordpress.com/2012/02/05/podcast-1-our-interview-with-joshua-vogelstein/>.
- [4] Colin B. Begg and Malcolm C. Pike. Comment on "The Predictive Capacity of Personal Genome Sequencing". Science, 2012. URL: <http://stm.sciencemag.org/content/4/135/1351e3.full>.
- [3] Eric J. Topol. Comment on "The Predictive Capacity of Personal Genome Sequencing". Science, 2012. URL: <http://stm.sciencemag.org/content/4/135/1351e5.full>.
- [2] Kristi Birch. Mapping the Mind. Johns Hopkins Engineering, 2011. URL: <https://engineering.jhu.edu/magazine/2011/09/mapping-mind/#.W9s9xJNKiPo>.
- [1] Joshua T. Vogelstein. Q&A: What is the Open Connectome Project? BMC Nature, 2011. URL: <https://neuralsystemsandcircuits.biomedcentral.com/articles/10.1186/2042-1001-1-16>.

Professional/Social Media Presence

@neuro_data, Twitter account with a approximately 7,000 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 regarding 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](#).

medium.com/@progl, My Medium account where I post articles on both personal and professional topics.

Translation / Technology Transfer Activities

Open Datasets

- 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

- 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
- 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
- 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
- 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
- 2017 – [Tobin et al. \(2017\)](#), Wiring variations that enable and constrain neural computation in a sensory microcircuit.
28 citations, 43 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
- 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
- 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
- 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
- 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
- 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

- 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
- 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
- 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
- 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
- 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
- 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
- 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
- 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

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.

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- 2021 – [scikit-trees](#), Scikit-tree is a package for unsupervised learning problems. It includes tree algorithms that achieve strong performance.
38 stars, 7 forks
- 2020 – [hyppo](#), An open-source software package for multivariate hypothesis testing. It intends to be a comprehensive multivariate hypothesis testing package that runs on all major versions of operating systems. It also includes novel tests not found in other packages..
201 stars, 82 forks

- 2020 – [brainlit](#), This repository is a container of methods that Neurodata uses to expose their open-source code while it is in the process of being merged with larger scientific libraries such as scipy, scikit-image, or scikit-learn. Additionally, methods for computational neuroscience on brains too specific for a general scientific library can be found here, such as image registration software tuned specifically for large brain volumes..
23 stars, 17 forks
- 2019 – [graspologic \(Graph Statistics\)](#), Co-developed with Microsoft Research: Utilities and algorithms designed for processing and analysis of graphs with specialized graph statistical algorithms.
134 stars, 56 forks, 2,516 downloads/month
- 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
- 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
- [Open-source Software: Contributed](#)
- 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.
- 2018 – 2019 [neuroglancer](#), Added multispectral support to enable light microscopy data use.
- 2018 [igraph](#), Added spectral clustering functionality.
- 2017 – 2018 [render](#), Added cloud support.
- 2017 [boss](#), Developed core functionality.
- [Open-source Software: Archived](#)
- 2020 – 2022 [ProgLearn \(Progressive Learning\)](#), A Python package for exploring and using progressive learning algorithms.
22 stars, 29 forks, 37 downloads/month
- 2019 – 2020 [ARDENT \(Affine and Regularized Deformative Numeric Transform\)](#), A Python package for performing automated image registration using LDDMM.
10 stars, 5 forks
- 2019 – 2021 [reg \(Image registration\)](#), A Python package which performs non-linear affine and deformable image registration.
6 stars, 4 forks, 61 downloads/month
- 2019 – 2029 [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 – 2020 [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
- 2018 – 2019 [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 – 2021 [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 – 2019 [ndcloud \(NeuroData Cloud\)](#), The deployment of tools which support the Open Connectome Project.

- 2016 – 2019 **Non-Parametric-Clustering**, A program which uses non-parametric-clustering to minimize or maximize a given criterion function.
3 stars, 2 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 – 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 – 2019 **SynapseAnalysis (Synapse Detection)**, A framework to evaluate synaptic antibodies for array tomography applications.
2 stars, 0 forks
- 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 – 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
- 2015 – 2018 **ndviz**, Web visualization and analysis tools for neuroimaging datasets, powered by Neuroglancer.
8 stars, 4 forks, 48 docker pulls
- 2015 – 2016 **DMG**, An implementation of a distributed multigrid Poisson solver for image stitching, smoothing, and sharpening.
19 stars, 6 forks
- 2015 **VESICLE (EM Synapse Detection)**, Reference synapse detection program for processing serial electron microscopy data.
3 stars, 3 forks
- 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
- 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
- 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

Consultancy

- 2017 **Consultant**, *Greenspring Associates*.
2016 **Consultant**, *Scanadu*.

Advisory Board Appointments

- 2018 – **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.

- 2017 – **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

- 2017 – **Chief Intelligent Officer**, [sensie](#), Sensie is a startup devoted to unblocking intelligence to optimize our collective wellness..
21 employees.
- 2017 – **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.
- 2016 – **Co-Founder**, *global domain partners*, Global Domain Partners is a quantitative hedge fund that was acquired by Mosaic Investment Partners in 2012.
6 employees.