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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,
(100 papers; top 10 cited 3,997 times; H-index 38; 12 first, 17 last, 53 middle authorships) as of 2023/10/20

[100] 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.

[99] 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.

[98] 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.

[97] Dhireesha Kudithipudi, Mario Aguilar-Simon, Jonathan Babb, Maxim Bazhenov, Douglas Blackiston, Josh Bongard, Andrew P. Brna, Suraj Chakravarthi Raja, Nick Cheney, Jeff Clune, Anurag Daram, Stefano Fusi, Peter Helfer, Leslie Kay, Nicholas Ketz, Zsolt Kira, Soheil Kolouri, Jeffrey L. Krichmar, Sam Kriegman, Michael Levin, Sandeep Madireddy, Santosh Manicka, Ali Marjaninejad, Bruce McNaughton, Risto Miikkulainen, Zaneta Navratilova, Tej Pandit, Alice Parker, Praveen K. Pilly, Sebastian Risi, Terrence J. Sejnowski, Andrea Soltoggio, Nicholas Soures, Andreas S. Tolias, Darío Urbina-Meléndez, Francisco J. Valero-Cuevas, Gido M. van de Ven, **Joshua T. Vogelstein**, Felix Wang, Ron Weiss, Angel Yanguas-Gil, Xinyun Zou, and Hava Siegelmann. "Biological underpinnings for lifelong learning machines". In: *Nature Machine Intelligence* 4.3 (Mar. 2022), pp. 196–210. ISSN: 2522-5839. DOI: 10.1038/s42256-022-00452-0. URL: https://doi.org/10.1038/s42256-022-00452-0.

[96] 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.

[95] **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.

[94] Jean-Baptiste Poline, David N Kennedy, Friedrich T Sommer, Giorgio A Ascoli, David C Van Essen, Adam R Ferguson, Jeffrey S Grethe, Michael J Hawrylycz, Paul M Thompson, Russell A Poldrack, Satrajit S Ghosh, David B Keator, Thomas L Athey, Joshua T Vogelstein, Helen S Mayberg, and Maryann E Martone. "Is Neuroscience FAIR? A Call for Collaborative Standardisation of Neuroscience Data". In: *Neuroinformatics* (Jan. 2022). URL: https://link.springer.com/article/10.1007/s12021-021-09557-0.

[93] 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 Tsaioun, 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).

[92] 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.

[91] Jaewon Chung, Bijan Varjavand, Jesús Arroyo-Relión, Anton Alyakin, Joshua Agterberg, Minh Tang, Carey E Priebe, 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.

[90] Michael Powell, Allison Koenecke, James Byrd, Akihiko Nishimura, Maximilian Konig, 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.

[89] 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.

[88] 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?%20utm_source=Email_to_authors_%20utm_medium=Email%20utm_content=T1_11.5e1_author%20utm_campaign=Email_publication%20field=%20journalName=Frontiers_in_Neuroinformatics%20id=704627.

[87] 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.

[86] 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. Konig, 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.

[85] **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.

[84] 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**. "mvlearn: 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.

[83] 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.

[82] 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.

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[79] Ross M Lawrence, Eric W Bridgeford, Patrick E Myers, Ganesh C Arvapalli, Sandhya C Ramachandran, Derek A Pisner, Paige F Frank, Allison D Lemmer, Aki Nikolaidis, and Joshua T Vogelstein. "Standardizing human brain parcellations". In: *Scientific data* 8.1 (2021), pp. 1–9. URL: https://www.nature.com/articles/s41597-021-00849-3.

[78] 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.

[77] Jesús Arroyo, Avanti Athreya, Joshua Cape, Guodong Chen, Carey E. Priebe, and **Joshua T. Vogelstein**. "Inference for Multiple Heterogenous Networks with a Common Invariant Subspace". In: *Journal of Machine Learning Research* 22.142 (2021), pp. 1–49. URL: http://jmlr.org/papers/v22/19-558.html.

[76] Ting Xu, Karl-Heinz Nenning, Ernst Schwartz, Seok-Jun Hong, **Joshua T. Vogelstein**, Alexandros Goulas, Damien A. Fair, Charles E. Schroeder, Daniel S. Margulies, Jonny Smallwood, Michael P. Milham, and Georg Langs. "Cross-species functional alignment reveals evolutionary hierarchy within the connectome". In: *NeuroImage* 223 (Dec. 2020), p. 117346. ISSN: 1053-8119. DOI: https://doi.org/10.1016/j.neuroimage.2020.117346. URL: http://www.sciencedirect.com/science/article/pii/S1053811920308326.

[75] Seok-Jun Hong, Ting Xu, Aki Nikolaidis, Jonathan Smallwood, Daniel S. Margulies, Boris Bernhardt, **Joshua T. Vogelstein**, and Michael P. Milham. "Toward a connectivity gradient-based framework for reproducible biomarker discovery". In: *NeuroImage* 223 (Dec. 2020), p. 117322. ISSN: 1053-8119. DOI: https://doi.org/10.1016/j.neuroimage.2020.117322. URL: http://www.sciencedirect.com/science/article/pii/S1053811920308089.

[74] Jae Wook Chow, Annachiara Korchmaros, **Joshua T. Vogelstein**, Michael P. Milham, and Ting Xu. "Impact of concatenating fMRI data on reliability for functional connectomics". In: *Neuroimage* (Nov. 2020). DOI: https://doi.org/10.1016/j.neuroimage.2020.117549.

[73] Karl-Heinz Nenning, Ting Xu, Ernst Schwartz, Jesus 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.

[72] Nian Wang, Robert J Anderson, David G Ashbrook, Vivek Gopalakrishnan, Youngser Park, Carey E Priebe, Yi Qi, **Joshua T Vogelstein**, Robert W Williams, and Allan G Johnson. "Variability and heritability of mouse brain structure: Microscopic MRI atlases and connectomes for diverse strains". In: *NeuroImage (Cover Story)* 222 (Nov. 2020), p. 117274. ISSN: 1053-8119. DOI: https://doi.org/10.1016/j.neuroimage.2020.117274. URL: http://www.sciencedirect.com/science/article/pii/S1053811920307606.

[71] Melissa A Haendel, Christopher G Chute, Tellen D Bennett, David A Eichmann, Justin Guinney, Warren A Kibbe, Philip R O Payne, Emily R Pfaff, Peter N Robinson, Joel H Saltz, Heidi Spratt, Christine Suver, John Wilbanks, Adam B Wilcox, Andrew E Williams, Chunlei Wu, Clair Blacketer, Robert L Bradford, James J Cimino, Marshall Clark, Evan W Colmenares, Patricia A Francis, Davera Gabriel, Alexis Graves, Raju Hemadri, Stephanie S Hong, George Hripscak, Dazhi Jiao, Jeffrey G Klann, Kristin Kostka, Adam M Lee, Harold P Lehmann, Lora Lingrey, Robert T Miller, Michele Morris, Shawn N Murphy, Karthik Natarajan, Matvey B Palchuk, Usman Sheikh, Harold Solbrig, Shyam Visweswaran, Anita Walden, Kellie M Walters, Griffin M Weber, Xiaohan Tanner Zhang, Richard L Zhu, Benjamin Amor, Andrew T Girvin, Amin Manna, Nabeel Qureshi, Michael G Kurilla, Sam G Michael, Lili M Portilla, Joni L Rutter, Christopher P Austin, and the N3C Consortium Gersing Ken R. "The National COVID Cohort Collaborative (N3C): Rationale, design, infrastructure, and deployment". In: *Journal of the American Medical Informatics Association* (Oct. 2020). ocaa196. DOI: 10.1093/jamia/ocaa196. eprint: https://academic.oup.com/jamia/advance-article-pdf/doi/10.1093/jamia/ocaa196/34927041/ocaa196.pdf. URL: https://doi.org/10.1093/jamia/ocaa196.

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[69] Meghana Madhyastha, Gongkai Li, Veronika Strnadov-Neeley, James Browne, **Joshua T. Vogelstein**, Randal Burns, and Carey E. Priebe. "Geodesic Forests". In: KDD '20 (Aug. 2020), pp. 513–523. DOI: 10.1145/3394486.3403094. URL: https://doi.org/10.1145/3394486.3403094.

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[67] Marc-Andre Schulz, B.T. Thomas Yeo, **Joshua T. Vogelstein**, Janaina Mourao-Miranada, Jakob N. Kather, Konrad Kording, Blake Richards, and Danilo Bzdok. "Different scaling of linear models and deep learning in UKBiobank brain images versus machine-learning datasets". In: *Nat Commun* (Aug. 2020). DOI: 10.1038/s41467-020-18037-z. URL: https://doi.org/10.1038/s41467-020-18037-z.

[66] Marc-Ander Schulz, B.T. Thomas Yeo, **Joshua T. Vogelstein**, Janaina Mourao-Miranda, Jakob N. Kather, Konrad Kording, Blake Richards, and Danilo Bzdok. "Different scalling of linear models and deep learning in UKBiobank brain images versus machine-learning datasets". In: *Nat Commun* 11 (Aug. 2020). DOI: 10.1038/s41467-020-18037-z.

[65] Adam S. Charles, Benjamin Falk, Nicholas Turner, Talmo D. Pereira, Daniel Tward, Benjamin D. Pedigo, Jaewon Chung, Randal Burns, Satrajit S. Ghosh, Justus M. Kebschull, William Silversmith, and **Joshua T. Vogelstein**. "Toward Community-Driven Big Open Brain Science: Open Big Data and Tools for Structure, Function, and Genetics". In: *Annual Review of Neuroscience* 43.1 (July 2020), pp. 441–464. DOI: 10.1146/annurev-neuro-100119-110036. eprint:

https://doi.org/10.1146/annurev-neuro-100119-110036. URL: https://doi.org/10.1146/annurev-neuro-100119-110036.

[64] Maximilian F. Konig, Mike Powell, Verena Staedtke, Ren-Yuan Bai, David L. Thomas, Nicole Fischer, Sakibul Huq, Adham M. Khalafallah, Allison Koenecke, Ruoxuan Xiong, Brett Mensh, Nickolas Papadopoulos, Kenneth W. Kinzler, Bert Vogelstein, **Joshua T. Vogelstein**, Susan Athey, Shibin Zhou, and Chetan Bettegowda. "Preventing cytokine storm syndrome in COVID-19 using alpha-1 adrenergic receptor antagonists". In: *The Journal of Clinical Investigation* 130.7 (July 2020), pp. 3345–3347. DOI: 10.1172/JCI139642. URL: https://doi.org/10.1172/JCI139642.

[63] Ketan Mehta, Rebecca F. Goldin, David Marchette, Joshua T. Vogelstein, Carey E. Priebe, and Giorgio A. Ascoli. "Neuronal Classification from Network Connectivity via Adjacency Spectral Embedding". In: *bioRxiv* (June 2020). DOI: 10.1101/2020.06.18.160259. eprint: https://www.biorxiv.org/content/early/2020/06/20/2020.06.18.160259.full.pdf. URL: https://www.biorxiv.org/content/early/2020/06/20/2020.06.18.160259.

[62] Tyler M. Tomita, James Browne, Cencheng Shen, Jaewon Chung, Jesse L. Patsolic, Benjamin Falk, Jason Yim, Carey E. Priebe, Randal Burns, Mauro Maggioni, and **Joshua T. Vogelstein**. "Sparse Projection Oblique Randomer Forests". In: *Journal of Machine Learninig Research* (May 2020). URL: http://arxiv.org/abs/1506.03410.

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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. .

2020-2022 **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 .

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 arcitectures, 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 asses 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 foundaitonal 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 .

2019-2022 **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 – **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 .

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 – 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 .

External Research Support: Completed

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 – 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 – 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

[50] **Joshua T. Vogelstein**. “Surprise! IID++ Out of Distribution & Prospective Learning”. In: Simons Foundation, New York, NY, Sept. 2023.

[49] 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.

[48] Eric Bridgeford. “Eliminating Accidental Deviations in Human Connectomics”. In: JHU BME, Baltimore, MD, USA, 2021.

[47] Jayanta Dey. “Omnidirectional Lifelong Learning via Ensembling Representations”. In: JHU BME, Baltimore, MD, USA, 2021.

[46] **Joshua T. Vogelstein**. "FIRM Guiding Principles for scientific software development and stewardship". In: JHU BME, Baltimore, MD, USA, 2021.

[45] Jaewon Chung. "Heritablity of Human Structural Connectomes". In: JHU BME, Baltimore, MD, USA, 2021.

[44] Ali Geisa. "Towards a theory of out-of-distribution learning". In: JHU BME, Baltimore, MD, USA, 2021.

[43] **Joshua T. Vogelstein**. "Jovo++". In: JHU BME, Baltimore, MD, USA, 2021.

[42] **Joshua T. Vogelstein**. "Reality Transurfing: Chapter 1". In: JHU BME, Baltimore, MD, USA, 2021.

[41] **Joshua T. Vogelstein**. "Lifelong Learning: Theory and Practice". In: Darpa L2M PI Meeting, 2021.

[40] **Joshua T. Vogelstein**. "Lifelong Learning and Beyond". In: Darpa L2M PI Meeting, 2021.

[39] **Joshua T. Vogelstein**. "Lifelong Learning: Theory and Context". In: Darpa L2M PI Meeting, 2021.

[38] **Joshua T. Vogelstein**. "Lifelong Learning: Theory and Practice and Coresets". In: Darpa L2M PI Meeting, 2021.

[37] **Joshua T. Vogelstein**. "Lifelong Learning". In: North Carolina State University, Raleigh, NC, USA, Oct. 2020.

[36] **Joshua T. Vogelstein**. "Lifelong Learning". In: Morgan State University, Baltimore, MD, USA, Sept. 2020.

[35] **Joshua T. Vogelstein**. "Lifelong Learning: Moving Beyond Avoiding Catastrophic Forgetting". In: Johns Hopkins Mathematical Institute for Data Science, Baltimore, MD, USA, Feb. 2020.

[34] **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.

[33] **Joshua T. Vogelstein**. "Big Biomedical Data Science". In: Sol Goldman International Conference, Baltimore, MD, USA, Apr. 2019.

[32] **Joshua T. Vogelstein**. "Journey to Here". In: JHU BMES talks, Baltimore, MD, USA, Apr. 2019.

[31] **Joshua T. Vogelstein**. "NeuroData (Science)". In: Kavli, Baltimore, MD, USA, Apr. 2019.

[30] **Joshua T. Vogelstein**. "NeuroData Tools". In: NeuroData Hackashop, Baltimore, MD, USA, Mar. 2019.

[29] **Joshua T. Vogelstein**. "Biomedical Big Data and Data Science". In: JHU BME, Baltimore, MD, USA, Feb. 2019.

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

[27] **Joshua T. Vogelstein**. "Using Big Data Science to Understand What Goes On in our Heads". In: SOHOP Faculty Spotlight, Baltimore, MD, USA, Apr. 2018.

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

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

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

[23] **Joshua T. Vogelstein**. "Opportunities and Challenges in Big Data Neuroscience". In: Society for Neuroscience, Washington D.C., USA, 2017.

[22] **Joshua T Vogelstein**. "Using Big Data Science to Understand What Goes on in Our Heads". In: SOHOP Faculty Spotlight, Baltimore, MD, USA, 2017.

[21] **Joshua T. Vogelstein**. "NeuroStorm". In: Global Brain Workshop 2 JHU, Baltimore, MD, USA, 2017.

[20] **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.

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

[18] **Joshua T Vogelstein**. "Using Big Data Science to Understand What Goes on in Our Heads". In: SOHOP Faculty Spotlight, Baltimore, MD, USA, 2016.

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

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

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

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

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

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

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

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

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

[8] **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.

[7] **Joshua T. Vogelstein**. "Open Source Platform for Heterogenous Brain Data". In: figshare, 2015.

[6] **Joshua T Vogelstein**. "Big (Neuro) Statistics". In: Kavli Salon, Chicago, IL, USA: Big Data: Practice Across Disciplines, 2014.

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

[4] **Joshua T Vogelstein**. "Big (Neuro) Statistics". In: Kavli Salon, Baltimore, MD, USA: Big Data: Practice Across Disciplines, 2014.

[3] **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.

[2] **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.

[1] **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

[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.

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[14] William R Gray, **Joshua T Vogelstein**, J Bogovic, A Carass, J L Prince, B Landman, D Pham, L Ferrucci, S M Resnick, Carey E Priebe, and R Jacob Vogelstein. "Graph-Theoretical Methods for Statistical Inference on MR Connectome Data". In: DARPA Neural Engineering, Science and Technology Forum, San Diego, CA, USA, Nov. 2010. URL: http://dx.doi.org/10.6084/m9.figshare.1285815.

[13] **Joshua T Vogelstein**, J Bogovic, A Carass, WR Gray, JL Prince, B Landman, D Pham, L Ferrucci, SM Resnick, Carey E Priebe, and RJ Vogelstein. "Graph-Theoretical Methods for Statistical Inference on MR Connectome Data". In: Organization for Human Brain Mapping, Barcelona, Spain, June 2010. URL: http://dx.doi.org/10.6084/m9.figshare.1285813.

[12] **Joshua T Vogelstein**, RJ Vogelstein, and Carey E Priebe. "A Neurocognitive Graph-Theoretical Approach to Understanding the Relationship Between Minds and Brains". In: CSHL conference on Neural Circuits, Cold Shore Harbor, NY, USA, Mar. 2010. URL: http://dx.doi.org/10.6084/m9.figshare.1284694.

[11] **Joshua T Vogelstein**, Y Mishchenki, AM Packer, TA Machado, R Yuste, and L Paninski. "Towards Confirming Neural Circuit Inference from Population Calcium Imaging". In: COSYNE, Salt Lake City, UT, USA, Feb. 2010. URL: http://dx.doi.org/10.6084/m9.figshare.1284693.

[10] **Joshua T Vogelstein**, Y Mishchenki, AM Packer, TA Machado, R Yuste, and L Paninski. "Towards Inferring Neural Circuit Inference from Population Calcium Imaging". In: COSYNE, Salt Lake City, UT, USA, Feb. 2010. URL: http://dx.doi.org/10.6084/m9.figshare.1285819.

[9] **Joshua T Vogelstein**, Y Mishchchenko, A M Packer, T A Machado, R Yuste, and L Paninski. "Towards Confirming Neural Circuits from Population Calcium Imaging". In: NIPS Workshop on Connectivity Inference in Neuroimaging, Whistler, BC, Canada, Dec. 2009. URL: http://dx.doi.org/10.6084/m9.figshare.1285822.

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[7] **Joshua T Vogelstein**, B Babadi, BO Watson, R Yuste, and L Paninski. "From Calcium Sensitive Fluorescence Movies to Spike Trains". In: Society for Neuroscience, Washington DC, USA, Nov. 2008. URL: http://dx.doi.org/10.6084/m9.figshare.1285824.

[6] **Joshua T Vogelstein**, B Babadi, and L Paninski. "Model-Based Optimal Inference of Spike-Times and Calcium Dynamics given Noisy and Intermittent Calcium-Fluorescence Imaging". In: COSYNE, Salt Lake City, UT, USA, Feb. 2008. URL: http://dx.doi.org/10.6084/m9.figshare.1285826.

[5] **Joshua T Vogelstein** and L Paninski. "Inferring Spike Trains, Learning Tuning Curves, and Estimating Connectivity from Calcium Imaging". In: Integrative Approaches to Brain Complexity, 2008. URL: http://dx.doi.org/10.6084/m9.figshare.1285827.

[4] **Joshua T Vogelstein**, B Jedynak, K Zhang, and L Paninski. "Inferring Spike Trains, Neural Filters, and Network Circuits from in vivo Calcium Imaging". In: Society for Neuroscience, San Diego, CA, USA, Nov. 2007. URL: http://dx.doi.org/10.6084/m9.figshare.1285846.

[3] **Joshua T Vogelstein**, K Zhang, B Jedynak, and L Paninski. "Maximum Likelihood Inference of Neural Dynamics under Noisy and Intermittent Observations using Sequential Monnte Carlo EM Algorithms". In: COSYNE, Salt Lake City, UT, USA, Feb. 2007. URL: http://dx.doi.org/10.6084/m9.figshare.1285828.

[2] **Joshua T Vogelstein** and K Zhang. "A novel theory for simultaneous representation of multiple dynamic states in hippocampus". In: Society for Neuroscience, San Diego, CA, USA, 2004.

[1] **Joshua T Vogelstein**, LH Snyder, M Warchol, and DE Angelaki. "Up-down asymmetry in memory guided saccadic eye movements are independent of head orientation in space". In: Society for Neuroscience, Orlando, FL, USA, 2002.

Educational Activities

Teaching Experience - Ongoing Courses

Spring '21 **Course Director, JHU**, *EN.580.419*, Philosophy of Life - A Data Science Perspective, enrollment 10.

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.
ead 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 Ogihara 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 – 11/22 **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 Assitant 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 Assistent Professor in Department of Statistics at University of Delaware, and still an actice 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. Currenly a postdoc with Assistant Prof. Chris Honey of Psychology and Brain Sciences

Ph.D. Students

8/2023 - **Skyler Thomas BS, BSA**, *PhD Student (Rptation)*, 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 inset nervous systems.

08/19 – **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 – **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.
Data science for macroscale connectomes. Co-creator and maintainer of 'graspologic', a Python package for network statistics.

01/19 – **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 – 06/2022 **Meghana Madyastha BSE**, *PhD Co-advisee*, CS, JHU.
Dissertation will focus on computational aspects of accelerationg learning and inference using decision forests

08/16 – 12/21 **Vikram Chandrashekhar BSE**, *PhD advisee*, BME, JHU.
Dissertation has focused on extending LDDMM to whole cleared brain datasets, spearheads collaboration with Prof. Karl Deisseroth's lab at Stanford, one of the world's leading neuroscientists

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 – **Ziyan Li MSE**, *MS student*, BME, JHU.

05/20 – 12/21 **Ali Saad-Eldin BSE**, *MS advisee*, BME, JHU.
Working on implementing and improving cominatorial 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 populaitons 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 – **Anvii Mishra BS**, *Undergraduate*, BME, JHU.

10/22 – 3/23 **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 – 09/22 **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 – 06/2022 **Diane Lee** , *Undergraduate Researcher*, BME, JHU.
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 Initative program, with five original awardees, each with a dedicated Data Core and designated PI. I was elected the chair of the committee of Data Core PIs.

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

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

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

Journal Service

Editorial Board

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 Pistritto Fellowship.**, *Vivek Gopalakrishnan.*

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

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

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

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

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

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

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

Other Media

[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.

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

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.

2021 – **scikit-trees**, Scikit-tree is a package for modern tree-based algorithm unsupervised learning problems.It benchmarkIt extends the robust tree algorithms that achieve strong performance in benchmark tasks.
38 stars, 7 forks

2020 – **hyppo**, An comprehensiveAn open-source software package for multivariate hypothesis testing. It intends to be a comprehensive multivariate includes multivariate hypothesis testing package that runs on all major versions of operating systems. It also includes novel novel tests not found in other packages..
201 stars, 82 forks

2020 – **brainlit**, This repository is a container of methods that Neurodata usees 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 sharpenting.
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 worldś 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**, *d8alab*, Our services include evaluating model performance, building prototype R/Shiny web applications and basic data cleaning., Provides data science consulting for a variety of companies, specifically biomedical data science.
4 employees.

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.