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Joshua T. Vogelstein

Demographic & Personal Information

Current Appointments

09/19 – now **Joint Appointment**, *Department of Biostatistics*, Johns Hopkins University (JHU).
08/15 – now **Joint Appointment**, *Department of Applied Mathematics and Statistics*.
08/14 – now **Assistant Professor**, *Department of Biomedical Engineering*, Johns Hopkins University (JHU).
08/14 – now **Core Faculty**, *Institute for Computational Medicine (ICM)*.
08/14 – now **Core Faculty**, *Center for Imaging Science (CIS)*.
08/14 – now **Joint Appointment**, *Department of Neuroscience*.
08/14 – now **Joint Appointment**, *Department of Computer Science*.
08/14 – now **Assistant Research Faculty**, *Human Language Technology Center of Excellence*.
10/12 – now **Affiliated Faculty**, *Institute for Data Intensive Engineering and Sciences*.

Education & Training

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 **M.S. in Applied Mathematics & Statistics**, *Johns Hopkins University*.
2002 **B.A. in Biomedical Engineering**, *Washington University, St. Louis*.

Academic Experience

08/18 – now **Director of Biomedical Data Science Focus Area**.
05/16 – now **Visiting Scientist**, *Howard Hughes Medical Institute*, Janelia Research Campus.
10/12 – 08/14 **Endeavor Scientist**, *Child Mind Institute*.
08/12 – 08/14 **Affiliated Faculty**, *Kenan Institute for Ethics*.
Duke University
08/12 – 08/14 **Adjunct Faculty**, *Department of Computer Science*.
12/09 – 01/11 **Post-Doctoral Fellow**, *Department of Applied Mathematics and Statistics*, Supervised by Carey E. Priebe, Johns Hopkins University.
Research Statistics of populations of networks.
06/01 – 09/01 **Research Assistant**, *Prof. Randy O'Reilly, Dept. of Psychology*.
University of Colorado
06/00 – 09/00 **Clinical Engineer**, *Johns Hopkins Hospital*.
06/99 – 08/99 **Research Assistant under Dr. Jeffrey Williams**, *Dept. of Neurosurgery, Johns Hopkins Hospital*.
06/98 – 08/98 **Research Assistant under Professor Kathy Cho**, *Dept. of Pathology, Johns Hopkins School of Medicine*.

Publications

Published Peer-Reviewed Research Articles

Note: CV author in bold; Trainees in italics,
(55 papers; top 10 cited 3,128 times; H-index 30) as of 2019/12/30

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[40] Anish K. Simhal, Cecilia Aguerrebere, Forrest Collman, **Joshua T. Vogelstein**, Kristina D. Micheva, Richard J. Weinberg, Stephen J. Smith, and Guillermo Sapiro. "Probabilistic fluorescence-based synapse detection". In: PLoS Computational Biology 13.4 (2017). DOI: 10.1371/journal.pcbi.1005493. URL: https://doi.org/10.1371/journal.pcbi.1005493.

[39] *Da Zheng*, *Disa Mhembere*, Vince Lyzinski, **Joshua T. Vogelstein**, Carey E. Priebe, and Randal Burns. "Semi-external memory sparse matrix multiplication for billion-node graphs". In: IEEE Transactions on Parallel and Distributed Systems 28.5 (2017), pp. 1470–1483. ISSN: 10459219. DOI: 10.1109/TPDS.2016.2618791. arXiv: 1602.02864. URL: https://ieeexplore.ieee.org/abstract/document/7593270.

[38] *Cencheng Shen*, **Joshua T. Vogelstein**, and Carey E. Priebe. "Manifold matching using shortest-path distance and joint neighborhood selection". In: Pattern Recognition Letters 92 (2017), pp. 41–48. ISSN: 01678655. DOI: 10.1016/j.patrec.2017.04.005. arXiv: 1412.4098. URL: http://www.sciencedirect.com/science/article/pii/S016786551730106X.

[37] Norbert Binkiewicz, **Joshua T. Vogelstein**, and Karl Rohe. "Covariate-assisted spectral clustering". In: Biometrika 104.2 (2017), pp. 361–377. ISSN: 14643510. DOI: 10.1093/biomet/asx008. arXiv: 1411.2158. URL: https://doi.org/10.1093/biomet/asx008.

[36] Daniele Durante, David B. Dunson, and **Joshua T. Vogelstein**. "Nonparametric Bayes Modeling of Populations of Networks". In: Journal of the American Statistical Association 112.520 (2017), pp. 1516–1530. ISSN: 1537274X. DOI: 10.1080/01621459.2016.1219260. arXiv: 1406.7851. URL: https://doi.org/10.1080/01621459.2016.1219260.

[35] Qing Wang, Ming Zhang, *Tyler Tomita*, **Joshua T. Vogelstein**, Shibin Zhou, Nickolas Papadopoulos, Kenneth W. Kinzler, and Bert Vogelstein. "Selected reaction monitoring approach for validating peptide biomarkers". In: Proceedings of the National Academy of Sciences of the United States of America 114.51 (2017), pp. 13519–13524. ISSN: 10916490. DOI: 10.1073/pnas.1712731114. URL: http://www.pnas.org/content/114/51/13519.short.

[34] David Grant Colburn Hildebrand, Marcelo Cicconet, Russel Miguel Torres, Woohyuk Choi, Tran Minh Quan, Jungmin Moon, Arthur Willis Wetzel, Andrew Scott Champion, Brett Jesse Graham, Owen Randlett, George Scott Plummer, Ruben Portugues, Isaac Henry Bianco, Stephan Saalfeld, *Alexander David Baden*, *Kunal Lillaney*, Randal Burns, **Joshua Tzvi Vogelstein**, Alexander Franz Schier, Wei Chung Allen Lee, Won Ki Jeong, Jeff William Lichtman, and Florian Engert. "Whole-brain serial-section electron microscopy in larval zebrafish". In: Nature 545.7654 (2017), pp. 345–349. ISSN: 14764687. DOI: 10.1038/nature22356. URL: https://doi.org/10.1038/nature22356.

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

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

[31] Eva L. Dyer, *William Gray Roncal*, Hugo L. Fernandes, Doga Gürsoy, Vincent De Andrade, Rafael Vescovi, Kamel Fezzaa, Xianghui Xiao, **Joshua T. Vogelstein**, Chris Jacobsen, Konrad P. Körding, and Narayanan Kasthuri. "Quantifying Mesoscale Neuroanatomy Using X-Ray Microtomography". In: eNeuro 4 (2016). ISSN: 2373-2822. DOI: 10.1523/ENEURO.0195-17.2017. eprint: 1604.03629. URL: https://doi.org/10.1523/ENEURO.0195-17.2017.

[30] Raag D. Airan, **Joshua T. Vogelstein**, Jay J. Pillai, Brian Caffo, James J. Pekar, and Haris I. Sair. "Factors affecting characterization and localization of interindividual differences in functional connectivity using MRI". In: Human Brain Mapping 37.5 (2016), pp. 1986–1997. ISSN: 10970193. DOI: 10.1002/hbm.23150. URL: http://dx.doi.org/10.1002/hbm.23150.

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

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

[27] Kristen M. Harris, Josef Spacek, Maria Elizabeth Bell, Patrick H. Parker, Laurence F. Lindsey, Alexander D. Baden, **Joshua T. Vogelstein**, and Randal Burns. "A resource from 3D electron microscopy of hippocampal neuropil for user training and tool development". In: Scientific Data 2 (2015). ISSN: 20524463. DOI: 10.1038/sdata.2015.46. URL: https://doi.org/10.1038/sdata.2015.46.

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

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

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

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

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

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

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

[19] Nicholas C. Weiler, Forrest Collman, **Joshua T. Vogelstein**, Randal Burns, and Stephen J. Smith. "Synaptic molecular imaging in spared and deprived columns of mouse barrel cortex with array tomography". In: Scientific Data 1 (2014). ISSN: 20524463. DOI: 10.1038/sdata.2014.46. URL: http://www.nature.com/articles/sdata201446.

[18] Elizabeth M. Sweeney, **Joshua T. Vogelstein**, Jennifer L. Cuzzocreo, Peter A. Calabresi, Daniel S. Reich, Ciprian M. Crainiceanu, and Russell T. Shinohara. "A comparison of supervised machine learning algorithms and feature vectors for MS lesion segmentation using multimodal structural MRI". In: PLoS ONE 9.4 (2014). ISSN: 19326203. DOI: 10.1371/journal.pone.0095753. URL: https://doi.org/10.1371/journal.pone.0095753.

[17] **Joshua T. Vogelstein**, Youngser Park, Tomoko Ohyama, Rex A. Kerr, James W. Truman, Carey E. Priebe, and Marta Zlatic. "Discovery of brainwide neural-behavioral maps via multiscale unsupervised structure learning". In: Science 344.6182 (2014), pp. 386–392. ISSN: 10959203. DOI: 10.1126/science.1250298. URL: https://science.sciencemag.org/content/344/6182/386.

[16] R. Cameron Craddock, Saad Jbabdi, Chao Gan Yan, **Joshua T. Vogelstein**, F. Xavier Castellanos, Adriana Di Martino, Clare Kelly, Keith Heberlein, Stan Colcombe, and Michael P. Milham. "Imaging human connectomes at the macroscale". In: Nature Methods 10.6 (2013), pp. 524–539. ISSN: 15487091. DOI: 10.1038/nmeth.2482. eprint: NIHMS150003. URL: https://doi.org/10.1038/nmeth.2482.

[15] Dai Dai, Huiguang He, **Joshua T. Vogelstein**, and Zengguang Hou. "Accurate prediction of AD patients using cortical thickness networks". In: Machine Vision and Applications 24.7 (2013), pp. 1445–1457. ISSN: 09328092. DOI: 10.1007/s00138-012-0462-0. URL: https://doi.org/10.1007/s00138-012-0462-0.

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

[13] Carey E. Priebe, **Joshua Vogelstein**, and Davi Bock. "Optimizing the quantity/quality trade-off in connectome inference". In: Communications in Statistics - Theory and Methods 42.19 (2013), pp. 3455–3462. ISSN: 03610926. DOI: 10.1080/03610926.2011.630768. arXiv: 1108.6271. URL: https://doi.org/10.1080/03610926.2011.630768.

[12] *William R. Gray*, John A. Bogovic, **Joshua T. Vogelstein**, Bennett A. Landman, Jerry L. Prince, and R. Jacob Vogelstein. "Magnetic Resonance Connectome Automated Pipeline: An Overview". In: IEEE Pulse 3.2 (Mar. 2012), pp. 42–48. ISSN: 21542287. DOI: 10.1109/MPUL.2011.2181023. URL: http://ieeexplore.ieee.org/document/6173097/.

[11] Nicholas J Roberts, **Joshua T Vogelstein**, Giovanni Parmigiani, Kenneth W Kinzler, Bert Vogelstein, and Victor E Velculescu. "The predictive capacity of personal genome sequencing". In: Science Translational Medicine 4 (2012). ISSN: 19466234. DOI: 10.1126/scitranslmed.3003380. URL: https://doi.org/10.1126/scitranslmed.3003380.

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

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

[8] Yuriy Mishchencko, **Joshua T Vogelstein**, and Liam Paninski. "A Bayesian approach for inferring neuronal conectivity from calcium fluorescent imaging data". In: The annals of applied statistics 5 (2011). ISSN: 19326157. DOI: 10.1214/09-AOAS303. URL: https://doi.org/10.1214/09-AOAS303.

[7] Sonja B. Hofer, Ho Ko, Bruno Pichler, **Joshua Vogelstein**, Hana Ros, Hongkui Zeng, Ed Lein, Nicholas A. Lesica, and Thomas D. Mrsic-Flogel. "Differential connectivity and response dynamics of excitatory and inhibitory neurons in visual cortex". In: Nature Neuroscience 14.8 (2011), pp. 1045–1052. ISSN: 10976256. DOI: 10.1038/nn.2876. URL: https://doi.org/10.1038/nn.2876.

[6] Liam Paninski, Yashar Ahmadian, Daniel Gil Ferreira, Shinsuke Koyama, Kamiar Rahnama Rad, Michael Vidne, **Joshua Vogelstein**, and Wei Wu. "A new look at state-space models for neural data". In: Journal of Computational Neuroscience 29.1-2 (2010), pp. 107–126. ISSN: 09295313. DOI: 10.1007/s10827-009-0179-x. URL: https://doi.org/10.1007/s10827-009-0179-x.

[5] **Joshua T. Vogelstein**, Brendon O. Watson, Adam M. Packer, Rafael Yuste, Bruno Jedynak, and Liam Paninski. "Spike inference from calcium imaging using sequential Monte Carlo methods". In: Biophysical Journal 97.2 (2009), pp. 636–655. ISSN: 15420086. DOI: 10.1016/j.bpj.2008.08.005. URL: https://doi.org/10.1016/j.bpj.2008.08.005.

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

[3] R. Jacob Vogelstein, Udayan Mallik, **Joshua T. Vogelstein**, and Gert Cauwenberghs. "Dynamically reconfigurable silicon array of spiking neurons with conductance-based synapses". In: IEEE Transactions on Neural Networks 18.1 (2007), pp. 253–265. ISSN: 10459227. DOI: 10.1109/TNN.2006.883007. URL: https://doi.org/10.1109/TNN.2006.883007.

[2] **Joshua T. Vogelstein**, Lawrence H. Snyder, and Dora E. Angelaki. "Accuracy of saccades to remembered targets as a function of body orientation in space". In: Journal of Neurophysiology 90.1 (2003), pp. 521–524. ISSN: 00223077. DOI: 10.1152/jn.00141.2003. URL: https://doi.org/10.1152/jn.00141.2003.

[1] David L. Greenspan, Denise C. Connolly, Rong Wu, Rachel Y. Lei, **Joshua T.C. Vogelstein**, Young Tak Kim, Jung Eun Mok, Nubia Muñoz, F. Xavier Bosch, Keerti Shah, and Kathleen R. Cho. "Loss of FHIT expression in cervical carcinoma cell lines and primary tumors". In: Cancer Research 57 (1997). ISSN: 00085472. URL: http://cancerres.aacrjournals.org/content/57/21/4692.

Manuscripts in Preparation for Submission

[29] *Ronak Mehta*, Cencheng Shen, Ting Xu, and **Joshua T. Vogelstein**. "A Consistent Independence Test for Multivariate Time-Series". In: arxiv (Oct. 2019). URL: https://arxiv.org/abs/1908.06486.

[28] *Eric W. Bridgeford*, *Shangsi Wang*, Zhi Yang, Zeyi Wang, Ting Xu, Cameron Craddock, *Gregory Kiar*, William Gray-Roncal, Carey E. Priebe, Brian Caffo, Michael Milham, Xi-Nian Zuo, (CoRR), and **Joshua T. Vogelstein**. "Optimal Experimental Design for Big Data: Applications in Brain Imaging". In: bioRxiv (Oct. 2019). URL: https://doi.org/10.1101/802629.

[27] Marc-Andre Schulz, B.T. Thomas Yeo, **Joshua T. Vogelstein**, Janaina Mourao-Miranada, Jakob N. Kather, Konrad Kording, Blake Richards, and Danilo Bzdok. "Deep learning for brains?: Different linear and nonlinear scaling in UK Biobank brain images vs. machine-learning datasets". In: bioRxiv (Sept. 2019). DOI: 10.1101/757054. URL: https://www.biorxiv.org/content/early/2019/09/06/757054.

[26] *Ronan Perry*, *Tyler M Tomita*, Jesse Patsolic, Benjamin Falk, and **Joshua T Vogelstein**. "Manifold Forests: Closing the Gap on Neural Networks". In: arXiv (Sept. 2019). URL: https://arxiv.org/abs/1909.11799.

[25] *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: arXiv (Sept. 2019). URL: http://arxiv.org/abs/1506.03410.

[24] Ting Xu, Karl-Heinz Nenning, Ernst Schwartz, Seok-Jun Hong, **Joshua T. Vogelstein**, 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: bioRxiv (July 2019). URL: https://doi.org/10.1101/692616.

[23] Aki Nikolaidis, Anibal Solon Heinsfeld, Ting Xu, Pierre Bellec, **Joshua T. Vogelstein**, and Michael Milham. "Bagging Improves Reproducibility of Functional Parcellation of the Human Brain". In: bioRxiv (July 2019). URL: https://www.biorxiv.org/content/10.1101/343392v3.

[22] *Richard Guo*, Cencheng Shen, and **Joshua T. Vogelstein**. "Estimating Information-Theoretic Quantities with Random Forests". In: arXiv (July 2019). URL: https://arxiv.org/abs/1907.00325.

[21] *Meghana Madhyastha*, Percy Li, *James Browne*, Veronika Strnadova-Neely, Carey E. Priebe, Randal Burns, and **Joshua T. Vogelstein**. "Geodesic Learning via Unsupervised Decision Forests". In: arXiv (July 2019). URL: https://arxiv.org/abs/1907.02844.

[20] *Disa Mhembere*, *Da Zheng*, **Joshua T. Vogelstein**, Carey E. Priebe, and Randal Burns. "Graphyti: A Semi-External Memory Graph Library for FlashGraph". In: arXiv (July 2019). URL: https://arxiv.org/abs/1907.03335.

[19] 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. "Node-Specific Heritability in the Mouse Connectome". In: bioRxiv (July 2019). URL: https://www.biorxiv.org/content/10.1101/701755v1.

[18] *Sambit Panda*, Satish Palaniappan, Junhao Xiong, Ananya Swaminathan, Sandhya Ramachandran, *Eric W. Bridgeford*, Cencheng Shen, and **Joshua T. Vogelstein**. "mgcpy: A Comprehensive High Dimensional Independence Testing Python Package". In: arXiv (July 2019). URL: https://arxiv.org/abs/1907.02088.

[17] Seok-Jun Hong, **Joshua T Vogelstein**, G Gozzi, Boris C Bernhardt, Thomas B.T. Yeo, Michael P Milham, and Adriana Di Martino. "Towards Neurosubtypes in Autism". In: bioRxiv in press (July 2019).

[16] Junhao Xiong, Cencheng Shen, *Jesús Arroyo*, and **Joshua T. Vogelstein**. "Graph Independence Testing". In: arXiv (June 2019). URL: https://arxiv.org/abs/1906.03661.

[15] *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: arXiv (June 2019). URL: https://arxiv.org/abs/1906.10026.

[14] *Hayden Helm*, **Joshua V. Vogelstein**, and Carey E. Priebe. "Vertex Classification on Weighted Networks". In: arXiv (June 2019). URL: https://arxiv.org/abs/1906.02881.

[13] *Dia Mhembere*, *Da Zheng*, Carey E Priebe, **Joshua T Vogelstein**, and Randal Burns. "clusterNOR: A NUMA-Optimized Clustering Framework". In: arxiv (Feb. 2019). URL: https://arxiv.org/abs/1902.09527.

[12] *Audrey Branch*, Daniel Tward, **Joshua T Vogelstein**, Zhuhao Wu, and Michela Gallagher. "An optimized protocol for iDISCO+ rat brain clearing, imaging, and analysis". In: bioRxiv (2019). DOI: 10.1101/639674. eprint: https://www.biorxiv.org/content/early/2019/05/17/639674.full.pdf. URL: https://www.biorxiv.org/content/early/2019/05/17/639674.

[11] Cencheng Shen and **Joshua T Vogelstein**. "Decision Forests Induce Characteristic Kernels". In: arXiv (Dec. 2018). URL: https://arxiv.org/abs/1812.00029.

[10] David S Greenberg, Damian J Wallace, Kay-Michael Voit, Silvia Wuertenberger, Uwe Czubayko, Arne Monsees, Takashi Handa, **Joshua T Vogelstein**, Reinhard Seifert, Yvonne Groemping, and Jason ND Kerr. "Accurate action potential inference from a calcium sensor protein through biophysical modeling". In: bioRxiv (Nov. 2018). DOI: 10.1101/479055. eprint: https://www.biorxiv.org/content/early/2018/11/29/479055.full.pdf. URL: https://www.biorxiv.org/content/early/2018/11/29/479055.

[9] **Joshua T Vogelstein**, *Eric Bridgeford*, Minh Tang, Da Zheng, Randal Burns, and Mauro Maggioni. "Geometric Dimensionality Reduction for Subsequent Classification". In: arXiv 1050 (Nov. 2018), p. 21. URL: https://arxiv.org/abs/1709.01233.

[8] *Zeyi Wang*, Haris Sair, Ciprian Crainiceanu, Martin Lindquist, Bennett A Landman, Susan Resnick, **Joshua T. Vogelstein**, and Brian Scott Caffo. "On statistical tests of functional connectome fingerprinting". In: bioRxiv (Oct. 2018). URL: https://www.biorxiv.org/content/early/2018/10/15/443556.

[7] *Cencheng Shen* and **Joshua T. Vogelstein**. "The Exact Equivalence of Distance and Kernel Methods for Hypothesis Testing". In: arXiv (July 2018). URL: https://arxiv.org/abs/1806.05514.

[6] *Gregory Kiar*, *Eric Bridgeford*, *Will Gray Roncal*, (CoRR), *Vikram Chandrashekhar*, *Disa Mhembere*, Sephira Ryman, Xi-Nian Zuo, Daniel S Marguiles, R Cameron Craddock, Carey E Priebe, Rex Jung, Vince Calhoun, Brian Caffo, Randal Burns, Michael P Milham, and **Joshua Vogelstein**. "A High-Throughput Pipeline Identifies Robust Connectomes But Troublesome Variability". In: bioRxiv (Apr. 2018). DOI: 10.1101/188706. URL: https://www.biorxiv.org/content/early/2018/04/24/188706.

[5] *Shangsi Wang*, *Cencheng Shen*, Alexandra Badea, Carey E Priebe, and **Joshua T Vogelstein**. "Signal Subgraph Estimation Via Vertex Screening". In: arXiv (Jan. 2018). eprint: arXiv. URL: https://arxiv.org/abs/1801.07683.

[4] *Gregory Kiar*, *Eric Bridgeford*, *Vikram Chandrashekhar*, *Disa Mhembere*, Randal Burns, *William R Gray Roncal*, and **Joshua T Vogelstein**. "A comprehensive cloud framework for accurate and reliable human connectome estimation and meganalysis". In: bioRxiv (Sept. 2017), p. 188706. URL: https://www.biorxiv.org/content/early/2017/09/14/188706.

[3] *Guilherme Franca*, Maria L Rizzo, and **Joshua T. Vogelstein**. "Kernel k-Groups via Hartigan's Method". In: arXiv (Aug. 2017). URL: https://arxiv.org/abs/1710.09859.

[2] Runze Tang, Minh Tang, **Joshua T Vogelstein**, and Carey E Priebe. "Robust Estimation from Multiple Graphs under Gross Error Contamination". In: arXiv (July 2017). eprint: arXiv. URL: https://arxiv.org/abs/1707.03487.

[1] Heather Patsolic, Sancar Adali, **Joshua T. Vogelstein**, Youngser Park, Carey E. Priebe, Gongki Li, and Vince Lyzinski. "Seeded Graph Matching Via Joint Optimization of Fidelity and Commensurability". In: arXiv (Jan. 2014). eprint: 1401.3813. URL: http://arxiv.org/abs/1401.3813.

FUNDING

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

FY15: $113,761 ($168,924)
FY16: $360,123 ($524,225)
FY17: $459,523 ($709,019)
FY18: $550,011 ($887,186)
FY19: $850,836 ($1,366,308)

Current:

2017 – 20 Multiscale Generalized Correlation: A Unified Distance-Based Correlation Measure for Dependence Discovery
National Science Foundation Research Grant (132031)
Role on project: Co-Investigator (PI: Cencheng, S)
Term: 01-May-2017 to 30-April-2020
Budget: $124,189 (direct) $200,000 (total)
Establish a unified methodology framework for statistical testing in high-dimensional, noisy, big data, through theoretical advancements, comprehensive simulations, and real data experiments.

2017 - 20 CRCNS US-German Res Prop: functional computational anatomy of the auditory cortex
National Institutes of Health Research Grant 1R01DC016784-01 (126308)
Role on Project: Co-Investigator (PI: Ratnanather, J)
Term: 01-July-2017 to 30-June-2020
Budget: $458,519 (direct cost) $747,143 (total)
Create a robust computational framework for analyzing the cortical ribbon in a specific region: the auditory cortex.

2016 – 20 D3M: What Would Tukey Do?
Defense Advanced Research Projects Agency Research Grant FA8750-17-2-0112 (125863)
Role on project: Co-Investigator (PI: Priebe, C)
Term: 01-Oct-2016 to 30-Sep-2020
Budget: $2,746,050 (direct) $4,406,360 (total)
Develop theory & 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.

2017– 22 Sensorimotor processing, decision making, and internal states: towards a realistic multiscale circuit model of the larval zebrafish brain
NIH Researh Grant 1U19NS104653-01 (127940)
Role on Project: Co-Investigator (PI: Engert)
Term: 01-Sept-2017 to 31-Aug-2022
Budget: $655,206 (direct); $1,050,000 (total) (JHU sub-award)
Generate a realistic multiscale circuit model of the larval zebrafish's brain – the multiscale virtual fish (MSVF). The model will span spatial ranges from the nanoscale at the synaptic level, to local microcircuits to inter-area connectivity - and its ultimate purpose is to explain and simulate the quantitative and qualitative nature of behavioral output across various timescales.

2018 – 19 Connectome Coding at the Synaptic Scale
Schmidt Science Foundation (128503)

Role on Project: Investigator
Term: 01-Jan-2018 to 31-Dec-2019
Budget: $250,000 (total)
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 – 21 Lifelong Learning Forests
Defense Advanced Research Projects Agency Research Grant FA8650-18-2-7834 (128567)
Role on Project: Investigator
Term: 01-Jul-2018 to 30-Jun-2020
Budget: $1,123,474 (direct); $1,839,308 (total)
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 – 21 Continual Learning Across Synapses, Circuits, and Brain Areas
Defense Advanced Research Projects Agency Research Grant FA8650-18-2-7834 (129061)
Role on project: Co-Investigator (PI: Tolias)
Term: 01-Nov-2017 to 30-Oct-2021
Budget: $486,666 (direct) $796,715 (total)
Develop the pre-processing analysis pipeline for the imaging data collected in this project.

2017 – 19 NeuroNex Innovation Award: Towards Automatic Analysis of Multi-Terabyte Cleared Brains
National Science Foundation 1707298
Role on Project: Investigator
Term: 01-Sept-2017 to 31-aug-2020 (No Cost Extension)
Budget: $588,758 (direct) $959,999 (total)
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.

2018 – 21 SemiSynBio: Collaborative Research: YeastOns: Neural Networks Implemented in Communication Yeast Cells
National Science Foundation Research Grant (129439)
Role on project: Co-Investigator (PI: Schuman)
Term: 01-July-2018 to 30-June-2021
Budget: $172,971 (direct cost) $263,942 (total cost)
Provide neuroscience and machine learning expertise to guide the design of the computational learning capabilities of the system.

2019 – 20 Reproducible imaging-based brain growth charts for psychiatry
NIH R01 Research Grant
Role on project: Co-Investigator (PI: Saterthwaite)
Term: 01-Aug-2019 to 31-May-2020
Budget: $231,276 (direct cost) $362,861 (total cost)
Aggretage, harmonize, and analyze existing large-scale pediatric neuroimaging datsets to identify normative and clinical brain growth curves.

2019 - Microsoft Research Award
Mirco Soft Research Gift
Role on Project: Investigator
Term: Unrestricted Gift
Budget: 50,000 (total cost)

Research and development of neuroscience and connectomes around neuronal circuit and system modelling, application of time-series-of-graphs and dynamcis to neuronal signaling analysis and connectomes, and in the abstractions of matter, math, machines that point toward complex systmes composed of low-leve componets.

2019 – 22 Accessible technologies for high-throughput, whole-brain reconstructions of molecularly characterized mammalian neurons
NIH RO1
Role on project: Co-Investigator (PI: Muller, Miller)
Term: 01-Sept-2019 to 31-Aug-2022
Total budget: $753,974 (direct cost) $1,180,445 (total cost)
The overall goal of the proposal is to develop technologies for the brain wide reconstruction of axonal arbors of molecularly defined neurons. The proposal aims at overcoming barriers in neuronal labeling, imaging and computation to achieve this goal, and to develop a technology platform that can be scaled to all neurons of the brain

Pending:

2019 – 22 High throughput mapping pipeline for incomplete and censored neuroimaging data
NIH / MH-19-148
Role on Project: Co-Investigator (PI: Miller)
Term: 01-Dec-2019 to 30-Nov-2022
Budget: $1,107,698 (direct) $1,744,857 (total)
GOAL of Project

2020 – 25 CAREER: Foundational Statistical Theory and Methods for Analysis of Populations of Attributed
NSF 17-537
Role on project: Principal Investigator
Term: 01-Jan-2020 to 31-Dec-2025
Budget: $384,873 (direct) $630,230 (total)
The goal is to establish foundational theory and methods for analyzing populations of attributed connectomes.

2020 – 23 A Novel Framework for Mapping Brain Dynamics and Substrates of Human Cognition Across Species
NIH MH-20-120
Role on project: Co-Investigator (PI: Milham)
Term: 01-July-2020 to 30-June-2023
Budget: $178,898 (direct) $292,945 (total)
Develop and apply modern alignment methods to compare and contrast human and non-human brain imaging.

2020– 23 Graspy: A python package for rigorous statistical analysis of populations of attributed connectomes
NIH MN-19-147
Role on project: Principal Investigator
Term: 01-Jan-2020 to 31-Dec-2001-July-2020 to 30-June-2023
Budget: $861,240 (direct) $1,410,279 (total)
The goal of this project is to establish a state-of-the-art toolbox for analysis of connectomes, spanning taxa, scale, and complexity. More specifically, we will develop and extend implementations to enable neurobiologists to 1) estimate latent structure from attributed connectomes, (2) identify meaningful clusters among populations of connectomes, and (3) detect relationships between connectomes and multivariate phenotypes, such as behavior, genetics, and physiology.

2020 – 23 MBAc: Mouse Brain Atlasing in the Cloud
NIH MN-19-147
Role on project: Co-Investigator (PI: Osten)
Term: 01-July-2020 to 30-June-2023
Budget: $1,520,570 (direct) $2,489,933 (total)
Develop and disseminate CloudReg, a cloud brain atlasing tool for microscale whole mouse brains.

2020 – 24 Exploiting latent structure for efficient and robust inference
Role on project: Co-Investigatror (PI: Priebe)
Term: 01-July-2020 to 30-June-2024
Budget: $999,330 (direct) $1,504,662 (total)
Develop theory and methods for analysis of networks and populations thereof.

2020 – 24 Distributed ensemble neural representations of anxiety states
NIH 0 NS 18-303 BrainInitiative RO1
Role on project: Co-Investigator (PI: Adwanikar)
Term: 01-July-2020 to 30-June-2024
Budget: $2,672,969 (total)
Imaging the coordinated, multi-area, ensemble neural signaling of anxiety and attention states at cellular-resolution in freely behaving mice.

2020 – 25 NeuroNex: Enabling Identification and Impact of Synaptic Weight in Functional Networks
NSF 19-563
Role on project: Co-Investigator (PI: Harris)
Term: 01-April 2020 to 31-March-2025
Budget: $609,294 (direct) $997,719 (total)
Develop the requisite technology to understand the impact of synaptic weight on functional networks.

2020 – 25 Identifying Neurobehavioral Pathways for Cannabis Use Disorder: Multimodal MRI Investigations of Control and Reward Neural Networks
NIH18-062 - National Institute on Drug Abuse
Role on project: Co-Investigator (PI: Hanson)
Term: 01-April-2020 to 31-March-2025
Budget: $234,338 (direct) $383,727 (total)
This project will connect strong behavioral markers of addiction risk, measures of drug use, and measures of brain network connectivity to aid in understanding what causes drug use, versus what is a consequence of it.

2020 – 25 The NKI-Rockland Sample II: An open resource of multimodal brain, physiology, and behavior data from a community lifespan sample
NIH 19-056
Role on project: Co-Investigator (PI: Milham)
Term: 01-July-2020 to 30-June-2025
Budget: $30,713 (direct) $ 78,891 (total)
We will continue collecting, organizing, and analyzing another cohort of the NKI-Rockland Sample.

Previous:

2012 – 15 CRCNS: Data Sharing: The EM open Connectome Project
National Institute of Biomedical Imaging and Bioengineergng RO1EB16411
Role of Project: Co-Investigator (PI: Burns)

Develop cyberinfrastructure to support management, visualization, storage, and analysis of large-sacle electron microscopy data.

2014 – 16 Scalable Grain Graph Analyses Using Big-Memory, High-IPS Compute Architectures
Defense Advance Research Project Agency Grant N66001-14-1-4028
Role on Project: Co-Investigator (PI: Burns)
Build software infrastructure to enable analytics on billion node, terabyte sized networks using commodity hardware.

2014 - 19 Synaptomes of Mouse and Man
R01NS092474
Role on project: Co-Investigator (PI: Smith)
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.

2015 – 18 From RAGs to Riches: Utilizing Richly Attributed Graphs to Reason from
Defense Advance Research Project Agency Grant N66001-15-C-40401
Role on Project: Principal Investigator
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.

2016 – 19 A Scientific Planning Workshop for Coordinating Brain Research Around the Globe
National Science Foundation 1637376 Part 1 of 2
Role of the Project: Principal Investigator
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 – 19 A Scientific Planning Workshop for Coordinating Brain Research Around the Globe
National Science Foundation 1637376 Part 2 of 2
Role of the Project: Principal Investigator
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.

2017 – 18 The International Brain Station
The Kavli Foundation 90071826
Role of the Project: Principal Investigator
Take the first few steps towards building the international brain station.

2017 – 2018 Brain Comp Infra: EAGER: BrainLab CI: Collaborative, Community Experiments with
National Science Foundation ACI-1649880
Role of Project: Co-Investigator (PI: Miller, Burns)
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.

2017 – 18 The Brain Ark
Defense Advance Research Project Agency Grant 90076467
Role of the Project: Principal Investigator
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.

Talks

Institutional Talks

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

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

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

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

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

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

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

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

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

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

[27] **Joshua T Vogelstein**. "Discovering Relationships and their Geometry Across Disparate Data Modalities". In: Yale, Jan. 2018. URL: http://docs.neurodata.io/MGC-paper/.

[26] **Joshua T. Vogelstein**. "Discovering Relationships and their Geometry Across Disparate Data Modalities". In: Stanford, Aug. 2017. URL: http://docs.neurodata.io/MGC-paper/.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

International Talks

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Abstracts / Posters

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

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

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

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

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

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

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

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

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

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

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

[38] Stephen J. Smith, Randal Burns, Mark Chevillet, Ed Lein, Guillermo Sapiro, William Seeley, James Trimmer, **Joshua T Vogelstein**, and Richard Weinberg. "The Open Synaptome Project: Toward a Microscopy-Based Platform for Single-synapse Analysis of Diverse Populations of CNS Synapses". In: Society for Neuroscience, 2015. URL: https://figshare.com/articles/Open_Synaptome_Project/1585165.

[37] **Joshua T Vogelstein**. "Open Connectome Project & NeuroData: Enabling Data-Driven Neuroscience at Scale". In: Society for Neuroscience, 2015. URL: https://figshare.com/articles/NeuroData_amp_The_Open_Connectome_Project_Enabling_Big_Data_Neuroscience_at_Scale/1585167.

[36] Sharad Sikka, Brian Cheung, Ranjit Khanuja, Satra Ghosh, Chao-gan Yan, Qingyang Li, **Joshua Vogelstein**, Randal Burns, Stanley Colcombe, Cameron Craddock, Maarten Mennes, Clare Kelly, Adriana Dimartino, Francisco Castellanos, and Michael Milham. "Towards automated analysis of connectomes: The configurable pipeline for the analysis of connectomes (c-pac)". In: vol. 10. 5th INCF Congress of Neuroinformatics, Munich, Germany, 2014. URL: https://www.frontiersin.org/10.3389/conf.fninf.2014.08.00117/event_abstract.

[35] Sharad Sikka, Brian Cheung, Ranjit Khanuja, Satra Ghosh, Chao-gan Yan, Qingyang Li, **Joshua Vogelstein**, RandalTheChair Burns, Stanley Colcombe, Cameron Craddock, Maarten Mennes, Clare Kelly, Adriana Dimartino, Francisco Castellanos, and Michael Milham. "Towards Automated Analysis of Connectomes: The Configurable Pipeline for the Analysis of Connectomes (C-PAC)". In: 2013. URL: http://www.frontiersin.org/neuroinformatics/10.3389/conf.fninf.2014.08.00117/full.

[34] **Joshua T Vogelstein** and Carey E Priebe. "Nonparametric Two-Sample Testing on Graph-Valued Data." In: Duke Workshop on Sensing and Analysis of HighDimensional Data, 2013.

[33] Yichen Qin, *Disa Mhembere*, Sephira Ryman, Rex Jung, **R. Jacob Vogelstein**, Randal Burns, Joshua Vogelstein, and Carey Priebe. "Robust Clustering of Adjacency Spectral Embeddings of Brain Graph Data via Lq-Likelihood". In: OHBM, 2013. URL: http://dx.doi.org/10.6084/m9.figshare.1284153.

[32] Daniel L Sussman, *Disa Mhembere*, Sephira Ryman, Rex Jung, R. Jacob Vogelstein, Randal Burns, Joshua T Vogelstein, and Carey E Priebe. "Massive Diffusion MRI Graph Structure Preserves Spatial Information". In: OHBM, 2013. URL: http://dx.doi.org/10.6084/m9.figshare.1284155.

[31] *Disa Mhembere*, **Randal Burns**, Joshua T. Vogelstein, R. Jacob Vogelstein, Daniel Sussman, Carey Preibe, Rex Jung, and Sephira Ryman. "Multivariate Invariants from Massive Brain-Graphs". In: OHBM, 2013. URL: http://dx.doi.org/10.6084/m9.figshare.1284154.

[30] *William Gray Roncal*, Dean M. Kleissas, James M. Burck, Priya Manavalan, **Joshua T. Vogelstein**, Eric Perlman, Randal Burns, and R. Jacob Vogelstein. "Towards a Fully Automatic Pipeline for Connectome Estimation from High-Resolution EM Data". In: OHBM, 2013. URL: http://dx.doi.org/10.6084/m9.figshare.1284151.

[29] N. Sismanis, D. L. Sussman, **J. T. Vogelstein**, *W. Gray*, R. J. Vogelstein, E. Perlman, *D. Mhembere*, S. Ryman, R. Jung, R. Burns, C. E. Priebe, N. Pitsianis, and X. Sun. "Feature Clustering from a Brain Graph for Voxel-to-Region Classification". In: 5th Panhellic Conference on Biomedical Technology, 2013. URL: http://dx.doi.org/10.6084/m9.figshare.1284143.

[28] **Joshua T Vogelstein** et al. "Anomaly Screening and Clustering of Multi-OBject Movies via Multiscale Structure Learning". In: DARPA XDATA Colloquium, 2013.

[27] Eftychios A. Pnevmatikakis, Tim Machado, Logan Grosenick, Ben Poole, **Joshua T. Vogelstein**, and Paninsk Liam. "Rank-penalized nonnegative spatiotemporal deconvolution and demixing of calcium inaging data". In: COSYNE, 2013. URL: http://dx.doi.org/10.6084/m9.figshare.1284170.

[26] Airan Raag D, **Joshua Vogelstein**, Brian Caffo, James J Pekar, and Sair Haris I. "Reproducible differentiation of individual of individual subjects with minimal acquisition time via resting state fMRI". In: Proc ISMRM, 2013, p. 1932. URL: http://dx.doi.org/10.6084/m9.figshare.1284146.

[25] Danai Koutra, Yu Gong, Sephira Ryman, Rex Jung, **Joshua T. Vogelstein**, and Christos Faloutsos. "Are All Brains Wired Equally?" In: vol. 1. 4.2. Proceedings of the 19th Annual Meeting of the Organization for Human Brain Mapping (OHBM), 2013, p. 3. URL: http://dx.doi.org/10.6084/m9.figshare.1284149.

[24] *William R. Gray*, Dean M. Kleissas, James M. Burck, **Joshua T. Vogelstein**, Eric Perlman, Philippe M. Burlina, Randal Burns, and Vogelstein R. Jacob. "Towards a Fully Automatic Pipeline for Connectome Estimation from High-Resolution EM Data". In: Cold Spring Harbor Laboratory, Neuronal Circuits, 2012. URL: http://dx.doi.org/10.6084/m9.figshare.1284176.

[23] **Joshua T. Vogelstein**, Davi Bock, *William Gray*, Daniel Sussman, Randal Burns, Dean Kleissas, David Marchette, Donniell E. Fishkind, Minh Tang, Greg Hager, R. Jacob Vogelstein, and Priebe Carey E. "Statistical Connectomics". In: Janelia Farm conference, Statistical Inference and Neuroscience, 2012. URL: http://dx.doi.org/10.6084/m9.figshare.1284174.

[22] **J. Vogelstein**, S. Sikka, B. Cheung, R. Khanuja, Q. Li, .G. Yan C, C. Priebe, V. Calhoun, R. J. Vogelstein, M. Milham, and R. Burns. "BRAINSTORM towards clinically and scientifically useful neuroimaging analytics". In: Neuroinformatics, 2012. URL: http://dx.doi.org/10.6084/m9.figshare.1284173.

[21] **J T Vogelstein**, D E Fishkind, D L Sussman, and C E Priebe. "Large graph classification: theory and statistical connectomics applications". In: IMA conference on Large Graphs, 2011. URL: http://dx.doi.org/10.6084/m9.figshare.1284184.

[20] **Joshua T Vogelstein**, D L Sussman, M Tang, D E Fishkind, and Carey E Priebe. "Dot product embedding in large (errorfully observed) graphs with applications in statistical connectomics". In: IMA conference on Large Graphs, 2011.

[19] **Joshua T Vogelstein**, *William R Gray*, R Jacob Vogelstein, J Bogovic, S Resnick, J Prince, and Carey E Priebe. "Connectome Classification: Statistical Graph Theoretic Methods for Analysis of MR-Connectome Data". In: Organization for Human Brain Mapping, 2011. URL: http://dx.doi.org/10.6084/m9.figshare.1284179.

[18] **Joshua T Vogelstein**, E Perlman, D Bock, W C Lee, M Chang, B Kasthuri, M Kazhdan, C Reid, J Lichtman, R Burns, and R Jacob Vogelstein. "Open Connectome Project: collectively reverse engineering the brain one synapse at a time". In: Neuroinformatics (2011). URL: http://dx.doi.org/10.6084/m9.figshare.1284181.

[17] **Joshua T Vogelstein**, *W Gray*, J G Martin, G C Coppersmith, M Dredze, J Bogovic, J L Prince, S M Resnick, Carey E Priebe, and R J Vogelstein. "Connectome Classification using statistical graph theory and machine learning". In: Society for Neuroscience, 2011. URL: http://dx.doi.org/10.6084/m9.figshare.1284178.

[16] *William R Gray*, J A Bogovic, **Joshua T Vogelstein**, C Ye, B A Landman, J L Prince, and R Jacob Vogelstein. "Magnetic resonance connectome automated pipeline and repeatability analysis". In: Society for Neuroscience, 2011. URL: http://dx.doi.org/10.6084/m9.figshare.1284177.

[15] **Joshua T Vogelstein**, Carey E Priebe, R Burns, R Jacob Vogelstein, and J Lichtman. "Measuring and reconstructing the brain at the synaptic scale: towards a biofidelic human brain in silico". In: DARPA Neural Engineeering, Science and Technology Forum, 2010. URL: http://dx.doi.org/10.6084/m9.figshare.1285813.

[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, 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, 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, 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, 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, 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 Workshop on Connectivity Infernence in Neuroimaging, 2009. URL: http://dx.doi.org/10.6084/m9.figshare.1285822.

[8] **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, 2009. URL: http://dx.doi.org/10.6084/m9.figshare.1285821.

[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, 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, 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, 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, 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, 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, 2002.

Educational Activities

New Courses Created

Fall '19 **NeuroData Design I**, *EN.580.237/437/637*, Course Director, enrollment 46.
Spring '19 **NeuroData Design II**, *EN.580.438/638*, Course Director, enrollment 18.
Fall '18 **NeuroData Design I**, *EN.580.237/437/637*, Course Director, enrollment 22.
Spring '17 **NeuroData Design II**, *EN.580.238/438/638*, Course Director, enrollment 14.
Winter '17 **BME Research Intersession**, *EN.580.574*, Course Director, enrollment 6.
Fall '17 **NeuroData Design I**, *EN.580.247/437/637*, Course Director, enrollment 15.
Spring '16 **The Art of Data Science**, *EN.580.468*, Course Director, enrollment 24.
Fall '16 **NeuroData Design I**, *EN.580.437*, Course Director, enrollment 16.
Spring '15 **Statistical Connectomics**, *EN.580.694*, Course Director, enrollment 26.

Courses Co-Taught

Fall '15 **Introduction to Computational Medicine**, Co-Teaching, Course Co-Director.
Spring '19 **Systems Bioengineering II**, *EN.580.422*, 2 Lectures.
Spring '19 **Computational Neuroscience**, *AS.080.321*, 2 Lectures.
Spring '18 **Systems Bioengineering II**, *EN.580.422*, 2 Lectures.

Spring '18 **Computational Neuroscience**, *AS.080.321*, 2 Lectures.
Spring '17 **Systems Bioengineering II**, *EN.580.422*, 2 Lectures.
Spring '16 **Systems Bioengineering II**, *EN.580.422*, 2 Lectures.
Winter '16 **Introduction to Connectomics**, *EN.600.221*, 1 Lecture.
Fall '16 **BME Modeling and Design**, *EN.580.111*, 1 Lecture.

Educational Workshops

Summer '19 **DiPy Workshop**, Bloomington, Indiana, 1 day lecture on statistical connectomics.
Fall '18 **Society for Neuroscience Annual Meeting**, *Educational Workshop*, San Diego, CA, 1 day lecture on statistical connectomics.
Fall '17 **Society for Neuroscience Annual Meeting**, *Educational Workshop*, San Diego, CA, 1 day lecture on statistical connectomics.
Summer '16 **CRCNS Course on Mining and Modeling of Neuroscience Data**, *Redwood Center for Theoretical Neuroscience*, University of California, Berkeley, 2 day lecture on statistical connectomics.

Mentorship

Research Track Faculty Mentorship

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

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

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

Staff Research Scientists

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

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

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

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

Postdoctoral Fellows

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

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

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

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

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

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

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

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

Doctoral Student Supervision

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

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

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

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

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

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

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

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

Visiting Doctoral Student Supervision

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

Master's Student Supervision

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

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

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

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

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

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

Undergraduate Student Supervision

06/19 – now **Vivek Gopalakrishnan**, *BSE*, BME, JHU.
Winner of Pistritto Fellowship.

06/19 – now **Ronan Perry**, *BSE*, BME, JHU.

06/19 – 12/19 **Richard Guo**, *BSE*, BME, JHU.

08/14 – 08/18 **Eric Bridgeford, BSE**, BME, JHU.
Currently a PhD student in Biostatistics at JHSPH in my lab.

08/15 – 08/16 **Albert Lee,BSE**, BME, JHU.

06/15 – 12/15 **Ron Boger, BSE**, BME, JHU.
Currenly working at a computational medicine start-up in Silicon Valley.

05/15 – 05/16 **Jordan Matelsky, BSE**, CS and Neuroscience, JHU.
Currently a data scientist at APL.

02/15 – 05/16 **Ivan Kuznetsov, BSE**, BME, JHU.
Currently an MD/PhD Candidate at the UPenn, winner of Soros Fellowship.

Summer Interns

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

Summer '19 **Shunan Wu**, *Summer Intern*, BME, JHU.
Applied to BME PhD Program for fall

Summer '19 **Shiyu Sun**, *Summer Intern*, BME, JHU.
Applied to BME PhD Program for fall

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 for fall

Examining Committees

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

University Service

08/15 – now **Steering Committee**, *Kavli Neuroscience Discovery Institute (KNDI)*.

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

05/15 – 07/17 **Co-Founder and Faculty Advisor**, *MedHacks*.

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

Winter '17 **Faculty Superviser**, *MedHacks*, `http://medhacks.org/`.

Winter '16 **Faculty Superviser**, *MedHacks*, `http://medhacks.org/`.

Winter '15 **Faculty Superviser**, *MedHacks*, http://medhacks.org/.

Department Service

2019 **Member**, *Search Committee*, BME, Neuroengineering, 2019.
2019 **Member**, *Search Committee*, BME, Data Science, 2019.
2018 **Member**, *Search Committee*, BME, Neuroengineering, 2018.

Journal Service

Editorial Board

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

Conference and Journal Reviewer

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

Conferences and Hackathon Organizer

Winter '19 **Organizer**, *Decision Forest Hackathon*.
Summer '19 **Organizer**, *NeuroData Workshop*, https://neurodata.devpost.com, Hackashop to train brain scientists in machine learning for big data ($\sim$ 50) participants from around the country..
March '19 **Organizer**, *Neuro Reproducibility Hackashop*, https://brainx3.io/, Hackashop to train brain scientists in best practices in reproducible science, co-organized with two startups: Vathes, LLC and Gigantum ($\sim$ 50 participants).
Spring '18 **Organizer**, *NeuroData Hackathon*.
Fall '17 **Organizer**, *NeuroData Mini-Hackathon*.

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

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

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

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

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

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

Awards and Recognition

Individual

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

Shared

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)*.

Translation / Technology Transfer Activities

Open Datasets

1. Allen Atlas These anatomical reference atlases illustrate the adult mouse brain in coronal and sagittal planes of section. They are the spatial framework for datasets such as in situ hybridization, cell projection maps, and in vitro cell characterization. More information at atlas.brain-map.org
2. Amunts et al. (2015) Enabling an unprecedented look into the human brain, BigBrain spans micro- and macro-scopic scales. While previously available reference brains have been restricted to a single scale, such as whole-brain magnetic resonance imaging in humans or electron microscopy of small sections from small animals, BigBrain is an ultrahigh-resolution three-dimensional model of a full human brain at 20 micrometer resolution, coming closer to touching both camps than any previous dataset
3. Bhatla et al. (2015) Using high-pressure freezing, serial section transmission electron microscopy (ssTEM) imaging, digital alignment and manual tracing, Nikhil Bhatla and Rita Droste in Bob Horvitz's Lab reconstructed the anterior half of the C. elegans feeding organ, the pharynx. Volumes are available for three adult hermaphrodite worms and include volumetric tracing of all neurons and selected cell types, as well as synapses identified from the I2 neurons. Sections were approximately 50 nm thick with an image resolution of 2 nm per pixel. The largest volume comprises 1199 slices. These data were published in a paper entitled "Distinct neural circuits control rhythm inhibition and spitting by the myogenic pharynx of C. elegans" (Current Biology, 2015)

4. Bloss et al. (2016) Neuronal circuit function is governed by precise patterns of connectivity between specialized groups of neurons. The diversity of GABAergic interneurons is a hallmark of cortical circuits, yet little is known about their targeting to individual postsynaptic dendrites. We examined synaptic connectivity between molecularly defined inhibitory interneurons and CA1 pyramidal cell dendrites using correlative light-electron microscopy and large-volume array tomography. We show that interneurons can be highly selective in their connectivity to specific dendritic branch types and, furthermore, exhibit precisely targeted connectivity to the origin or end of individual branches. Computational simulations indicate that the observed subcellular targeting enables control over the nonlinear integration of synaptic input or the initiation and backpropagation of action potentials in a branchselective manner. Our results demonstrate that connectivity between interneurons and pyramidal cell dendrites is more precise and spatially segregated than previously appreciated, which may be a critical determinant of how inhibition shapes dendritic computation
5. Bloss et al. (2018) —
6. Bock et al. (2011) Layer 2/3 - Davi Bock, Ph.D. and Wei-Chung Allen Lee, Ph.D., in the laboratory of Clay Reid, M.D., Ph.D. acquired a beautiful volume of mouse primary visual cortical data, spanning layers 1, 2/3, and upper layer 4. In addition to the electron microscope (EM) data, they used two-photon microscopy to determine the functional properties of about 14 of the cells in the same volume. Images were collected at approximately 4x4x45 cubic nanometers with a total volume of approximately 450x350x50 cubic microns
7. Branch (2018) Adult generated neurons in aging M. musculus (iDisco)
8. Bumbarger et al. (2013) These serial thin section data were 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. (Cell 2013, 152:109–119). In P. pacificus they found clearly homologous neurons for all of the 20 pharyngeal neurons in C. elegans, but were surprised to uncover a massive rewiring of synaptic connectivity between the two species. These changes seem to correlate with known behavioral difference, most interestingly with the novel predatory feeding behaviors found in Diplogastrid nematodes such as P. pacificus
9. Collman et al. (2015) Synapses of the mammalian CNS are diverse in size, structure, molecular composition, and function. Synapses in their myriad variations are fundamental to neural circuit development, homeostasis, plasticity, and memory storage. Unfortunately, quantitative analysis and mapping of the brain's heterogeneous synapse populations has been limited by the lack of adequate single-synapse measurement methods. Electron microscopy (EM) is the definitive means to recognize and measure individual synaptic contacts, but EM has only limited abilities to measure the molecular composition of synapses. This report describes conjugate array tomography (AT), a volumetric imaging method that integrates immunofluorescence and EM imaging modalities in voxel-conjugate fashion. We illustrate the use of conjugate AT to advance the proteometric measurement of EM-validated single-synapse analysis in a study of mouse cortex
10. 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)
11. Dyer et al. (2016) Methods for resolving the 3D microstructure of the brain typically start by thinly slicing and staining the brain, and then imaging each individual section with visible light photons or electrons. In contrast, X-rays can be used to image thick samples, providing a rapid approach for producing large 3D brain maps without sectioning. Here we demonstrate the use of synchrotron X-ray microtomography (microCT) for producing mesoscale (1 cubic micron resolution) brain maps from millimeter-scale volumes of mouse brain. We introduce a pipeline for mircoCT-based brain mapping that combines methods for sample preparation, imaging, automated segmentation of image volumes into cells and blood vessels, and statistical analysis of the resulting brain structures. Our results demonstrate that X-ray tomography promises rapid quantification of large brain volumes, complementing other brain mapping and connectomics efforts
12. Harris et al. (2015) From the laboratory of Kristen M Harris, PhD, three volumes of hippocampal CA1 neuropil in adult rat were imaged at an XY resolution of 2 nm on serial sections of 50-60 nm thickness. All axons, dendrites, glia, and synapses were reconstructed in a cube surrounding a large dendritic spine, a cylinder surrounding an oblique dendritic segment, and a parallelepiped surrounding an apical dendritic segment
13. Hildebrand et al. (2017) Hildebrand and colleagues acquired a multi-resolution serial-section electron microscopy data set containing the anterior quarter of a 5.5 days post fertilization larval zebrafish, in-

cluding its complete brain. A draft projectome consisting of central and peripheral myelinated neurons was then reconstructed. Electron micrographs and reconstructions are available for view in CATMAID. A manuscript describing the data and methods used to generate it has been published in Nature

14. Kasthuri et al. (2015) We describe automated technologies to probe the structure of neural tissue at nanometer resolution and use them to generate a saturated reconstruction of a sub-volume of mouse neocortex in which all cellular objects (axons, dendrites, and glia) and many sub-cellular components (synapses, synaptic vesicles, spines, spine apparati, postsynaptic densities, and mitochondria) are rendered and itemized in a database. We explore these data to study physical properties of brain tissue. For example, by tracing the trajectories of all excitatory axons and noting their juxtapositions, both synaptic and non-synaptic, with every dendritic spine we refute the idea that physical proximity is sufficient to predict synaptic connectivity (the so-called Peters' rule). This online minable database provides general access to the intrinsic complexity of the neocortex and enables further data-driven inquiries
15. Lee et al. (2016) Electron Microscopy data used in a study of an excitatory network in Mouse V1
16. Micheva et al. (2015) Multi-channel array tomography data which is barrel cortex from an adult mouse (C57BL/6J)
17. Ohyama et al. (2015) Understanding brain function and development would be facilitated enormously by being able to perform all experiments on the basis of known circuitry. Over 20 laboratories world wide have contributed towards the reconstruction of neurons in the central nervous system of Drosophila larva, led by the Cardona lab at HHMI Janelia. Here, we see a side view of the approximately 7,000 neurons reconstructed so far, either in full or partially, of the approximately 12,000 neurons of this animal. The 0111-8 data set was originally sectioned and imaged by Richard D. Fetter and his two tech assistants, and funded by the HHMI Janelia Fly EM Project Team. There are now many more papers now using the 0111-8 data (see publications below)
18. Takemura et al. (2013) The right part of the brain of a wild-type Oregon R female fly 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
19. 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 traditionally requires exquisite manual skills and is tedious and unreliable. In MagC introduced here, sample blocks are augmented with a magnetic resin enabling remote actuation and collection of hundreds of sections on wafer. MagC allowed the correlative visualization of neuroanatomical tracers within their ultrastructural volumetric electron microscopy context
20. Tobin et al. (2017) Wiring variations that enable and constrain neural computation in a sensory microcircuit
21. Wanner et al. (2016 Large-scale reconstructions of neuronal populations are critical for structural analyses of neuronal cell types and circuits. Dense reconstructions of neurons from image data require ultrastructural resolution throughout large volumes, which can be achieved by automated volumetric electron microscopy (EM) techniques. We used serial block face scanning EM (SBEM) and conductive sample embedding to acquire an image stack from an olfactory bulb (OB) of a zebrafish larva at a voxel resolution of $9.25 \times 9.25 \times 25$ nm3 (Wanner et al., 2016). Skeletons of 1,022 neurons, $\sim 98\%$ of all neurons in the OB, were reconstructed by manual tracing and efficient error correction procedures
22. Weiler (2014) The lab of Stephen J Smith has been developing array tomography technology for nearly a decade (Micheva et al., 2007). This technology is unique in its ability to measure many proteins (20 or more) in biological tissue samples with superresolution precision. In this dataset, we are using array tomography to uncover molecular signatures synaptic diversity (O'Rourke et al., 2012), which is fundamental to neural circuit design and function. Images generously donated by Nick Weiler
23. Randlett et al. (2015) Light microscopy data

Open-source Software: Active

1. GraSPy (Graph Statistics) Utilities and algorithms designed for processing and analysis of graphs with specialized graph statistical algorithms
2. MGC (Non-parametric hypothesis testing) Multiscale Graph Correlation (MGC) is a framework for universally consistent testing high-dimensional and non-Euclidean data.
3. ndcloud (NeuroData Cloud) The deployment of tools which support the Open Connectome Project
4. 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.
5. LOL (Supervised dimensionality reduction) Linear Optimal Low-rank (LOL) projection for improved classification performance in high-dimensional classification tasks
6. m2g (MR graph analysis) m2g uses diffusion MRI data from individuals to estimate connectomes reliably and scalably.
7. reg (Image registration) Performs non-linear affine and deformable image registration.
8. Uncertainty-Forest A Python package containing estimation procedures for posterior distributions, conditional entropy, and mutual information between random variables X and Y
9. Open-Data-Registry This bucket contains multiple neuroimaging datasets (as Neuroglancer Precomputed Volumes) across multiple modalities and scales, ranging from nanoscale (electron microscopy), to microscale (cleared lightsheet microscopy and array tomography), and mesoscale (structural and functional magnetic resonance imaging). Additionally, many of the datasets include segmentations and meshes.
10. OCP The Open Connectome Project
11. 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.
12. ndex Python 3 command-line program to exchange (download/upload) image data with NeuroData's cloud deployment of APL's BOSS spatial database
13. ndwebtools ndwebtools (ndweb) is a Django application to provide a user-friendly interface for interacting with NeuroData resources and data.
14. Non-Parametric-Clustering

Open-source Software: Contributed

1. scipy Added mgc, a state of the art method for hypothesis testing we developed in the lab.
2. render Added cloud support.
3. neuroglancer Added multispectral support to enable light microscopy data use.
4. boss Developed core functionality.
5. cloud-volume Added support for additional file types.
6. igraph Added spectral clustering functionality.
7. C-PAC Added streamlined reproducible pipeline.

Open-source Software: Archived

1. FlashGraph (Scalable Analytics)
2. FlashX (Scalable machine learning)
3. knor (Clustering)
4. MEDA (Matrix Exploratory Data Analysis)
5. oopsi (Calcium Spike Sorting)
6. SynapseAnalysis (Synapse Detection)
7. VESICLE (EM Synapse Detection)
8. ndviz
9. ndstore
10. CAJAL
11. DMG
12. vesicle

Consultancy

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

Advisory Board Appointments

10/18 – now **Advisory Board**, *Mind-X*.
01/17 – now **Advisory Board**, *PivotalPath*.

Startups

01/17 – now **Co-Founder**, *gigantum*.
01/16 – now **Co-Founder**, *d8alab*.
01/11 – now **Co-Founder & Co-Director**, *NeuroData (formerly Open Connectome Project)*.