EricBridgeford

Statistician

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languages

English, basic French

programming

Python, R, UNIX
Java, Matlab, SQL
C++, C, solidity, fabric
Javascript, CSS & HTML

tools

Rmarkdown, FSL, Git
jupyter, Docker, AWS,
Android, Django,
tidyverse

education

2018 – 2023 **Ph.D.** in the Department of Biostatistics — Johns Hopkins University, Baltimore, MD
Principal Investigators: Joshua Vogelstein, Brian Caffo
Work focused on measurement error and measurement replicability; particularly, optimal strategies for maximizing replicability and mitigating batch effects in multivariate data
Coursework Includes: Probability Theory, Statistical Theory, Advanced Data Science, Bayesian Statistics, Graph Statistics, Advanced Statistical Methods, Approximation Theory, Causal Inference, Financial Derivatives

2013 – 2017 **B.S.** in Biomedical Engineering and Computer Science
minor in Mathematics — Johns Hopkins University, Baltimore, MD
Thesis work supervised by Dr. Joshua T. Vogelstein on project entitled:
Functional Neurodata Graphs Service: a One-Click Pipeline for the Reliable Estimation of Functional Connectomes.
Coursework Includes: High Dimensional Approximation, Statistical Learning and Signal Processing, Machine Learning, Probability and Statistics, Discrete Mathematics, Database Systems, Algorithm and Computation Theory, Systems Bioengineering, Object Oriented Software Engineering, Data Structures

2009 – 2013 **High School** La Salle College High School — Wyndmoor, PA

experience

Academic Experience

Positions

09/24 – now **Johns Hopkins University** — Baltimore, MD
Lecturer in Department of Applied Bioengineering
Provide lectures in network science as part of advanced graph analytics modules.

01/24 – now **Department of Psychology, Stanford University** — Stanford, CA
Postdoctoral Scholar under Russell Poldrack
Work focusing on developing causal frameworks for conceptualizing and overcoming current hurdles in neuroimaging.

08/23 – 01/24 **Center for Imaging Science, Johns Hopkins University** — Baltimore, MD
Postdoctoral Fellow under Joshua T. Vogelstein
Work focusing on applying frameworks from causal inference to multi-site consortium studies.

10/17 – 2023 **Center for Imaging Science, Johns Hopkins University** — Baltimore, MD
Graduate Research Assistant under Joshua T. Vogelstein and Brian Caffo
Statistical work focusing on quantifying batch-effects and maximizing predictive inferences from graphs with applications to fMRI and dMRI connectomes.

08/14 – 05/17 **Center for Imaging Science, Johns Hopkins University** Baltimore, MD
Undergraduate Researcher under Joshua T. Vogelstein
Design and implementation of an open-source, cloud-deployable fMRI and DWI pipeline for robust one-click analysis.

05/14 – 02/16 **Complex Systems Group, University of Pennsylvania** Philadelphia, PA
Undergraduate Researcher under Danielle S. Bassett
Assisted in the development of novel network theory statistic and code package to compare the small worldness of weighted, real world networks.

Teaching

01/22 – now **Whiting School of Engineering, Johns Hopkins University** Baltimore, MD
Provide lectures on network-valued data and applications to connectomics as part of Introduction to Computational Medicine undergraduate course.

08/23 **Joint Statistical Meetings (JSM) Continuing Education Course** Toronto, CA
Taught 4 hour continuing education course with Jaewon Chung on introducing the basics of network data, statistical network modeling, and statistical analysis of network data. Included hands-on instruction in `python` programming language.

01/21 – 06/23 **School of Public Health, Johns Hopkins University** Baltimore, MD
Teaching Assistant for Master's Capstone Projects under Dr. Marie Diener-West. Responsibilities include end-to-end project advisement and project scoping on a weekly basis with 8-10 students for about 30 minutes per meeting over the course of the semester.

08/19 – 06/23 **Department of Biostatistics, Johns Hopkins University** Baltimore, MD
Teaching assistant for Statistical Methods I, II, III, and IV. Responsibilities include grading and office hours.

03/22 – 05/22 **ABCD-ReproNim Course** online
Provided lectures on unsupervised machine learning with network data with applications to Human Connectomes.

08/20 – 12/21 **Department of Biostatistics, Johns Hopkins University** Baltimore, MD
Teaching Assistant for Advanced Data Science I/II, under Drs. Jeff Leek and Roger Peng. Responsibilities include grading, class design, and leading breakout sessions for class meetings.

08/17 – 05/18 **Biomedical Engineering Department, Johns Hopkins University** Baltimore, MD
Teaching Assistant for 580.437/697 Neuro Data Design 1 under Dr. Joshua Vogelstein. Responsibilities include end-to-end project advisement, project scoping, and grading for about 20 students, with weekly meetings totaling about 5 hours.

01/17 – 05/17 **Computer Science Department, Johns Hopkins University** Baltimore, MD
Course Assistant for 600.475 Introduction to Machine Learning under Dr. Raman Arora.

Funding

01/18 – 01/19 **AWS Cloud for Credits** Baltimore, MD
Awarded compute credits for benchmarking and evaluating different strategies for connectome acquisition in neuroimaging data.

Professional Experience

01/18 – 09/18 **Atana, Inc.** Baltimore, MD

Vice President of Engineering

As the Vice President of Engineering, I was responsible for contributing technological vision, coauthoring technical documents, and managing the software and data analytics teams. We raised $500,000 dollars through pre-seed and bridge funding. I vacated this position due to educational commitments of my Ph.D. The team has since reconsolidated as Operator.io, a Y-Combinator backed venture focused on the development of large-language models for querying blockchains.

Organizations and Volunteer Work

03/08 – 05/17 **Special Olympics Male Gymnastics Coach, Hatboro YMCA** Hatboro, PA

Volunteer work mentoring & coaching special needs gymnasts. Head male gymnastics coach from 03/11 – 05/14.

04/14 – 05/17 **Sigma Chi Fraternity, $\mathrm{K\Upsilon}$ Chapter** JHU, Baltimore, MD

Chapter Risk manager from 09/14 – 05/15.

awards

02/18 **b0x Sponsor Prize** ETHDenver, Denver, CO

developed Delphi, a framework for a decentralized oracle service between Hyperledger Fabric private networks and the Ethereum public network.

09/17 **JP Morgan and Booz Allen Hamilton Sponsor Prizes** JHU Hophacks, Baltimore, MD

developed Illuminate, an application that empowers verifiable, frictionless donations for worldwide disaster relief by leveraging the Ethereum public network at Hop Hacks.

05/17 **CS Departmental Honors with Thesis** JHU, Baltimore, MD

awarded for maintaining a cumulative GPA of 3.5 or higher within courses specific to the computer science department and acceptance of senior research thesis.

05/17 **BME Departmental Honors** JHU, Baltimore, MD

awarded for maintaining a cumulative GPA of 3.5 or higher within courses specific to the Biomedical Engineering department.

05/17 **General Honors** JHU, Baltimore, MD

awarded for maintaining cumulative GPA of 3.5 or higher.

09/14 – 05/17 **Martha A. Laverty Scholar** JHU, Baltimore, MD

Grant awarded for merit achievement.

05/15 – 05/17 **Dean's List** JHU, Baltimore, MD

Awarded for maintaining a GPA above a 3.5/4.0.

09/15 **Pennapps Everyblock Sponsor Prize** UPenn, Philadelphia, PA

Awarded for development of Strollsafe, an application that enables users to seamlessly view crime risk for a given area while maneuvering Philadelphia at University of Pennsylvania's PennApps.

05/13 **National Merit Finalist** LSCHS, Wyndmoor, PA

Awarded to the top 15,000 high school students nationally on basis of PSAT scores and academic achievement while a student La Salle College High School.

interests

professional: causal inference, graph inference, statistical inference, omics statistics, machine learning, mixed-effects modeling, pipeline engineering, cloud computing, data analysis, neuroscience, reproducibility, timeseries analysis, semi-parametric modeling, visualization, exploratory analysis, big (dimensionality or sample size) data, blockchain, financial

modelling, healthcare.
personal: guitar, cooking, hiking, biking, rock climbing.

publications

Books and Book Chapters

1. Hands on Network Machine Learning with Python

   Eric W. Bridgeford, Alexander Loftus, Joshua T. Vogelstein

   Upcoming publication with Cambridge University Press, 2025.

2. What Is Connectome Coding?

   Eric W. Bridgeford, Daniel Sussman, Vince Lyzinski, Yichen Qin, Youngser Park, Brian Caffo, Carey Priebe, Joshua T. Vogelstein

   In: Functional, Structural, and Molecular Imaging, and Big Data Analysis (edited by E. Boyden and K. Chung) pp. 63–74, Society for Neuroscience, 2018.

In progress

1. Measure Theoretic Probability Theory: A Hands-On, Proof-Based Introduction

   Eric W. Bridgeford

   In preparation (2025).

2. How causal perspectives can inform problems in computational neuroscience

   Eric W. Bridgeford, Brian Caffo, Maya B. Mathur, Russell A. Poldrack

   Under review at Nature Neuroscience (Jan. 2025).

3. Network Biomarkers of Alzheimer's Disease Risk Derived from Joint Volume and Texture Covariance Patterns in Mouse Models

   Eric W. Bridgeford, Jaewon Chung, Robert J. Anderson, Ali Mahzarnia, Jacques A. Stout, Hae Sol Moon, Zay Yar Han, Joshua T. Vogelstein, Alexandra Badea

   Under review at PLoS One (Feb. 2025) p. 2025.02.05.636582. Cold Spring Harbor Laboratory.

4. The Heritability of Human Connectomes: a Causal Modeling Analysis

   Jaewon Chung, **Eric W. Bridgeford**, Michael Powell, Derek Pisner, Ting Xu, Joshua T. Vogelstein

   bioRxiv, Under internal revision (Nov. 2023). Cold Spring Harbor Laboratory.

5. Learning sources of variability from high-dimensional observational studies

   Eric W. Bridgeford, Jaewon Chung, Brian Gilbert, Sambit Panda, Ashwin DeSilva, Censheng Shen, Brian Caffo, Joshua T. Vogelstein

   In preparation (2023).

6. A low-resource reliable pipeline to democratize multi-modal connectome estimation and analysis

   Ross Lawrence, Alex Loftus, Gregory Kiar, **Eric W. Bridgeford**, William Gray Roncal, Vikram Chandrashekhar, Disa Mhembere, Sephira Ryman, Xi-Nian Zuo, Daniel S. Margulies, R. Cameron Craddock, Carey E. Priebe, Rex Jung, Vince D. Calhoun, Brian Caffo, Randal Burns, Michael P. Milham, Joshua T. Vogelstein, Consortium for Reliability and Reproducibility (CoRR)

   bioRxiv vol. 8.78 (Nov. 2021). Cold Spring Harbor Laboratory.

7. Discovery of Multi-Level Network Differences Across Populations of Heterogeneous Connectomes

   Vivek Gopalakrishnan, Jaewon Chung, **Eric W. Bridgeford**, Benjamin D. Pedigo, Jess Arroyo, Lucy Upchurch, G. Allan Johnson, Nian Wang, Youngser Park, Carey E. Priebe, Joshua T. Vogelstein

   arXiv (Nov. 2020).

8. hyppo: A Multivariate Hypothesis Testing Python Package

   Sambit Panda, Satish Palaniappan, Junhao Xiong, **Eric W. Bridgeford**, Ronak Mehta, Cencheng Shen, Joshua T. Vogelstein

   arXiv (July 2019).

Articles Accepted to Peer-Reviewed Journals

1. When no answer is better than a wrong answer: A causal perspective on batch effects

   Eric W. Bridgeford, Michael Powell, Gregory Kiar, Stephanie Noble, Jaewon Chung, Sambit Panda, Ross Lawrence, Ting Xu, Michael Milham, Brian Caffo, Joshua T. Vogelstein

   Imaging Neuroscience 3 (Mar. 2025). MIT Press.

2. Statistical Analysis of Data Repeatability Measures

   Zeyi Wang, **Eric W. Bridgeford**, Shangsi Wang, Joshua T. Vogelstein, Brian Caffo

   Accepted at International Statistical Review (June 2024).

3. Generative network modeling reveals quantitative definitions of bilateral symmetry exhibited by a whole insect brain connectome

   Benjamin D. Pedigo, Mike Powell, **Eric W. Bridgeford**, Michael Winding, Carey E. Priebe, Joshua T. Vogelstein

   eLife (Mar. 2023). eLife Sciences Publications, Ltd.

4. ReX: an integrative tool for quantifying and optimizing measurement reliability for the study of individual differences

   Ting Xu, Gregory Kiar, Jae Wook Cho, **Eric W. Bridgeford**, Aki Nikolaidis, Joshua T. Vogelstein, Michael P. Milham

   Nature Methods 20 (June 2023) pp. 1025–1028. Nature Publishing Group.

5. Statistical Connectomics

   Jaewon Chung, **Eric W. Bridgeford**, Jess Arroyo, Benjamin D. Pedigo, Ali Saad-Eldin, Vivek Gopalakrishnan, Liang Xiang, Carey E. Priebe, Joshua T. Vogelstein

   Annu. Rev. Stat. Appl. 8.1 (Mar. 2021) pp. 463–492. Annual Reviews.

6. Eliminating accidental deviations to minimize generalization error and maximize replicability: applications in connectomics and genomics

   Eric W. Bridgeford, Shangsi Wang, Zhi Yang, Zeyi Wang, Ting Xu, Cameron Craddock, Jayanta Dey, Gregory Kiar, William Gray-Roncal, Carlo Colantuoni, Christopher Douville, Stephanie Noble, Carey E. Priebe, Brian Caffo, Michael Milham, Xi-Nian Zuo, Consortium for Reliability and Reproducibility, Joshua T. Vogelstein

   PLoS Computational Biology 17.9 (Sept. 2021).

7. The phantom alignment strength conjecture: practical use of graph matching alignment strength to indicate a meaningful graph match

   Donniell E. Fishkind, Felix Parker, Hamilton Sawczuk, Lingyao Meng, **Eric W. Bridgeford**, Avanti Athreya, Carey Priebe, Vince Lyzinski

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† *co-first author*

Appl. Network Sci. 6.62 (Dec. 2021) pp. 1–27. SpringerOpen.

8. Standardizing human brain parcellations

   Ross M. Lawrence, **Eric W. Bridgeford**, Patrick E. Myers, Ganesh C. Arvapalli, Sandhya C. Ramachandran, Derek A. Pisner, Paige F. Frank, Allison D. Lemmer, Aki Nikolaidis, Joshua T. Vogelstein

   Sci. Data 8.78 (Mar. 2021) pp. 1–9. Nature Publishing Group.

9. Diagnosing Data Analytic Problems in the Classroom

   Roger Peng, Athena Chen, **Eric W. Bridgeford**, Jeff Leek, Stephanie Hicks

   Journal of Statistics and Data Science Education (Aug. 2021) pp. 267–276.

10. Supervised dimensionality reduction for big data

    Joshua T. Vogelstein†, **Eric W. Bridgeford**†, Minh Tang, Da Zheng, Christopher Douville, Randal Burns, Mauro Maggioni

    Nat. Commun. 12.2872 (May 2021) pp. 1–9. Nature Publishing Group.

11. Vertex nomination: The canonical sampling and the extended spectral nomination schemes

    Jordan Yoder, Li Chen, Henry Pao, **Eric W. Bridgeford**, Keith Levin, Donniell E. Fishkind, Carey Priebe, Vince Lyzinski

    Comput. Statist. Data Anal. 145 (May 2020) p. 106916. North-Holland.

12. GraSPy: Graph Statistics in Python

    Jaewon Chung, Benjamin D. Pedigo, **Eric W. Bridgeford**, Bijan K. Varjavand, Hayden S. Helm, Joshua T. Vogelstein

    Journal of Machine Learning Research (JMLR) 20.158 (Jan. 2019).

13. On a two-truths phenomenon in spectral graph clustering

    Carey E. Priebe, Youngser Park, Joshua T. Vogelstein, John M. Conroy, Vince Lyzinski, Minh Tang, Avanti Athreya, Joshua Cape, **Eric W. Bridgeford**

    Proc. Natl. Acad. Sci. U.S.A. 116.13 (Mar. 2019) pp. 5995–6000. National Academy of Sciences.

14. Connectal coding: discovering the structures linking cognitive phenotypes to individual histories

    Joshua T. Vogelstein, **Eric W. Bridgeford**, Benjamin D. Pedigo, Jaewon Chung, Keith Levin, Brett Mensh, Carey E. Priebe

    Curr. Opin. Neurobiol. 55 (Apr. 2019) pp. 199–212. Elsevier Current Trends.

15. Discovering and deciphering relationships across disparate data modalities

    Joshua T. Vogelstein, **Eric W. Bridgeford**, Qing Wang, Carey E. Priebe, Mauro Maggioni, Cencheng Shen

    eLife (Jan. 2019). eLife Sciences Publications, Ltd.

16. A community-developed open-source computational ecosystem for big neuro data

    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 W. 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, Randal Burns

    Nat. Methods 15.11 (Nov. 2018) pp. 846–847. Nature Publishing Group.

17. Small-World Propensity and Weighted Brain Networks

    Sarah Feldt Muldoon, **Eric W. Bridgeford**, Danielle S. Bassett

    Sci. Rep. 6.22057 (Feb. 2016) pp. 1–13. Nature Publishing Group.

Articles Accepted to Peer-Reviewed Conferences

1. Why do networks have inhibitory/negative connections?

   Qingyang Wang, Michael A. Powell, Ali Geisa, **Eric W. Bridgeford**, Carey E. Priebe, Joshua T. Vogelstein

   IEEE/CVF International Conference on Computer Vision (ICCV) (Oct. 2023) pp. 01–06. IEEE.

2. Polarity Is All You Need to Learn and Transfer Faster

   Qingyang Wang, Michael Alan Powell, **Eric W. Bridgeford**, Ali Geisa, Joshua T. Vogelstein

   ICML (2023).

Conference Posters

1. Batch Effects are Causal Effects: Applications in Connectomics

   Eric W. Bridgeford

   Organization for Human Brain Mapping (June 2022).

2. A Principled Approach to Statistical Connectomics and Mega-Analysis

   Gregory Kiar, William R Gray Roncal, Disa Mhembere, **Eric W. Bridgeford**, Shan gsi Wang, Carey Priebe, Randal Burns, Joshua T Vogelstein

   Organization for Human Brain Mapping (OHBM) (June 2018).

3. MRImages to Graphs: A One Click Community Pipeline for MR Connectome Analysis

   Eric W. Bridgeford, Gregory Kiar, Will Gray Roncal, Disa Mehembre, Randal Burns, Joshua T Vogelstein

   Institute for Computational Medicine Poster Session (2015).

4. Community Connectomics via Cloud Computing Utilizing m2g - a Reference Pipeline

   Gregory Kiar, et al.

   Organization for Human Brain Mapping (OHBM) (2015).

5. Quantifying Small Worldness in Weighted Brain Networks: Small-World Propensity

   Sarah Muldoon, **Eric W. Bridgeford**, Danielle Bassett

   Society for Neuroscience (SfN) (Oct. 2015).

6. The Open Connectome Project & NeuroData: Enabling Data Driven Neuroscience at Scale

   Joshua T. Vogelstein, et al.

   Society for Neuroscience (SfN) (Oct. 2015).

Talks and Invited Lectures

1. Hands on Network Machine Learning

   Eric W. Bridgeford, Jaewon Chung

Joint Statistical Meetings Continuing Education Course (2023).

2. An Introduction to Network-Valued Data and Network Analysis

   Eric W. Bridgeford

   Introduction to Computational Medicine (2022). JHU BME Dept.

3. An Introduction to Network-Valued Data and Network Analysis

   Eric W. Bridgeford

   Introduction to Computational Medicine (2022). JHU BME Dept.

4. Hands on Network Machine Learning with Scikit-Learn and Graspologic

   Eric W. Bridgeford

   Brain Informatics PI Meeting (2022).

5. Hands on Network Machine Learning with Scikit-Learn and Graspologic

   Eric W. Bridgeford

   Berlin Connectomics Meeting (2022).

6. Hands on Network Machine Learning with Scikit-Learn and Graspologic

   Eric W. Bridgeford

   Institute of Computational Medicine Night (2022). JHU BME Dept.

7. Unsupervised Machine Learning with Connectomics Data

   Eric W. Bridgeford

   ABCD Reproducible Neuroimaging Course (2022).

8. A Principled Approach to Statistical Connectomics and Mega-Analysis

   Eric W. Bridgeford

   Organization of Human Brain Mapping (2018).

9. Cross Modality Connectome Properties

   Joshua T Vogelstein, **Eric W. Bridgeford**

   (2017). Society for Neuroscience.

10. From the Functional Brain to the Connectome: An Introduction to Neuroscience Research in the 21st Century

    Eric W. Bridgeford

    JHU Splash (2016).

Software Packages

1. Causal Batch Effects

   Eric W. Bridgeford, Michael Powell, Brian Caffo, Joshua T. Vogelstein

   R package (2024).

2. Neurodata MRI Graphs

   Derek Pisner, Alex Loftus, Gregory Kiar[†], **Eric Bridgeford**[†], Will Gray Roncal, Joshua Vogelstein

   Dockerized python package (2022).

3. GraSPy: Graph Statistics in Python

   Jaewon Chung, Benjamin D Pedigo, **Eric W. Bridgeford**, Bijan K Varjavand, Hayden Helm, Joshua T Vogelstein

   Pypi >1.4M downloads (May 2018).

4. Linear Optimal Low-Rank Projection

   Eric W. Bridgeford, Minh Tang, Jason Yim, Joshua T Vogelstein

   CRAN > 12,000 downloads (May 2018).

5. Hyppo

   Sambit Panda, Satish Palaniappan, Junhao Xiong, **Eric W. Bridgeford**, Ronak Mehta, Cencheng Shen, Joshua T. Vogelstein

   Pypi >1.2M downloads (May 2018).