

Brian Matejek

COMPUTER SCIENCE · ALGORITHMS · MACHINE LEARNING · COMPRESSION · DATA SCIENCE

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Summary

I am a research scientist at SRI International interested in machine learning, cybersecurity, compression, and algorithms. I received my Ph.D. from Harvard University, working under the guidance of Hanspeter Pfister in the Visual Computing Group. My doctoral research concerned biologically-aware algorithms for connectomics, the interdisciplinary field between computer science and neuroscience. Specifically, I focused on the compression, error correction, and volume processing of the terabyte label volumes and graph analysis on the neuronal wiring diagrams.

Education

Harvard University

Cambridge, MA 02138

PH.D. IN COMPUTER SCIENCE

Aug 2016 - May 2021

- Thesis: Biologically-Aware Algorithms for Connectomics
- Advisor: Hanspeter Pfister
- Committee Members: Michael Mitzenmacher, Todd Zickler
- GPA: 4.00 / 4.00

Princeton University

Princeton, NJ 08544

M.S.E. IN COMPUTER SCIENCE

Sep 2014 - May 2016

- Thesis: Learning Global Features for Neuron Reconstruction in EM Images
- Advisor: Thomas Funkhouser
- GPA: 3.85 / 4.00

B.S.E. IN COMPUTER SCIENCE

Sep 2010 - Jun 2014

- Independent Research: Detecting Objects Using Google Street View Data
- Independent Research: A Computational Analysis of Arbitrage Opportunities in Sports Gambling
- GPA: 3.79 / 4.00, High Honors

Publications

- 2024 Akshata Tiwari, **Brian Matejek**, Daniel Haehn. Non-Invasive Stress Monitoring from Video, in *IEEE International Symposium on Biomedical Imaging (ISBI)*.
- 2024 Adam Cobb, **Brian Matejek**, Daniel Elenius, Anirban Roy, Susmit Jha. Direct Amortized Likelihood Ratio Estimation, in *Thirty-Eighth AAAI Conference on Artificial Intelligence (AAAI)*.
- 2022 Tianyi Chen, **Brian Matejek**, Michael Mitzenmacher, and Charalampos E. Tsourakakis. Algorithmic Tools for Understanding the Motif Structure of Networks, in *Proceedings of European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML PKDD)*.
- 2022 **Brian Matejek**, Donglai Wei, Tianyi Chen, Charalampos E. Tsourakakis, Michael Mitzenmacher, and Hanspeter Pfister. Edge-Colored Directed Subgraph Enumeration on the Connectome, in *Nature Scientific Reports*.
- 2022 **Brian Matejek**[†], Tim Franzmeyer[†], Donglai Wei, Xueying Wang, Jinglin Zhao, Kálmán Palágyi, Jeff W. Lichtman, and Hanspeter Pfister. Scalable Biologically-Aware Skeleton Generation for Connectomic Volumes, in *IEEE: Transactions on Medical Imaging*.
- 2021 Donglai Wei, Kisuk Lee, Hanyu Li, Ran Lu, J. Alexander Bae, Zequan Liu, Lifu Zhang, Márcia dos Santos, Zudi Lin, Thomas Uram, Xueying Wang, Ignacio Arganda-Carreras, **Brian Matejek**, Narayanan Kasthuri, Jeff W. Lichtman, and Hanspeter Pfister. AxonEM Dataset: 3D Axon Instance Segmentation of Brain Cortical Regions, in *Springer: International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*.
- 2020 Zudi Lin, Donglai Wei, Won-Dong Jang, Siyan Zhou, Xupeng Chen, Xueying Wang, Richard Schalek, Daniel Berger, **Brian Matejek**, Lee Kametsky, Adi Peleg, Daniel Haehn, Thouis R. Jones, Toufiq Parag, Jeff Lichtman, and Hanspeter Pfister. Two Stream Active Query Suggestion for Active Learning in Connectomics, in *Proceedings of European Conference on Computer Vision (ECCV)*.
- 2019 **Brian Matejek**, Donglai Wei, Xueying Wang, Jinglin Zhao, Kálmán Palágyi, and Hanspeter Pfister. Synapse-Aware Skeleton Generation For Neural Circuits, in *Springer: International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*.
- 2019 **Brian Matejek**, Daniel Haehn, Haidong Zhu, Donglai Wei, Toufiq Parag, and Hanspeter Pfister. Biologically-Constrained Graphs for Global Connectomics Reconstruction, in *Proceedings of IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*.
- 2018 Konstantin Dmitriev, Toufiq Parag, **Brian Matejek**, Arie E Kaufman, and Hanspeter Pfister. Efficient Correction for EM Connectomics with Skeletal Representation, in *British Machine Vision Conference (BMVC)*.

- 2018 Michael Behrisch, Dirk Streeb, Florian Stoffel, Daniel Seebacher, **Brian Matejek**, Stefan Hagen Weber, Sebastian Mittelstaedt, Hanspeter Pfister, and Daniel Keim. Commercial Visual Analytics Systems—Advances in the Big Data Analytics Field, in *IEEE Transactions on Visualization and Computer Graphics (TVCG)*.
- 2017 **Brian Matejek**, Daniel Haehn, Fritz Lekschas, Michael Mitzenmacher, and Hanspeter Pfister. Compresso: Efficient Compression of Segmentation Data for Connectomics, in *Springer: International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*.
- 2017 Daniel Haehn, John Hoffer, **Brian Matejek**, Adi Suissa-Peleg, Ali K Al-Awami, Lee Kamentsky, Felix Gonda, Eagon Meng, William Zhang, Richard Schalek, Alyssa Wilson, Toufiq Parag, Johanna Beyer, Verena Kaynig, Thouis R. Jones, James Tompkin, Markus Hadwiger, Jeff W. Lichtman, and Hanspeter Pfister. Scalable Interactive Visualization for Connectomics, in *MDPI Informatics*.
- 2017 Toufiq Parag, Fabian Tschopp, William Grisaitis, Srinivas C. Turaga, Xuewen Zhang, **Brian Matejek**, Lee Kamentsky, Jeff W. Lichtman, and Hanspeter Pfister. Anisotropic EM Segmentation by 3D Affinity Learning and Agglomeration, in *arXiv preprint arXiv:1707.08935*.
- 2015 David Dohan, **Brian Matejek**, and Thomas Funkhouser. Learning Hierarchical Semantic Segmentations of LIDAR Data, in *IEEE International Conference of 3D Vision*.

Workshops

- 2024 Malyaban Bal, **Brian Matejek**, Susmit Jha, Adam D. Cobb. SpikingVTG: Saliency Feedback Gating Enabled Spiking Video Temporal Grounding, in *Adaptive Foundation Models Workshop at Neural Information Processing Systems (NeurIPS)*.
- 2024 Malyaban Bal, **Brian Matejek**, Susmit Jha, Adam D. Cobb. SpikingVTG: Saliency Feedback Gating Enabled Spiking Video Temporal Grounding, in *Machine Learning and Compression Workshop at Neural Information Processing Systems (NeurIPS)*.
- 2024 Akshata Tiwari, **Brian Matejek**, Daniel Haehn. Non-Invasive Stress Monitoring from Video, in *Women in Machine Learning Workshop at Neural Information Processing Systems (NeurIPS)*.
- 2024 **Brian Matejek**, Ashish Gehani, Nathaniel D. Bastian, Daniel J. Clouse, Bradford J. Kline, Susmit Jha. Safeguarding Network Intrusion Detection Models from Zero-day Attacks and Concept Drift, in *Artificial Intelligence for Cyber Security (AICS) Workshop at AAAI Conference on Artificial Intelligence (AAAI)*.
- 2023 Adam D. Cobb, **Brian Matejek**, Daniel Elenius, Anirban Roy, and Susmit Jha. Direct Amortized Likelihood Ratio Estimation, in *Machine Learning and the Physical Sciences Workshop at Neural Information Processing Systems (NeurIPS)*.

Invited Talks, Oral Exams, and Defenses

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|------|---|-----------------------------|
| 2024 | Safeguarding Network Intrusion Detection Models from Zero-day Attacks and Concept Drift, Artificial Intelligence for Cybersecurity Workshop | <i>AICS at AAAI</i> |
| 2023 | Introduction to Generative AI, Tech Workshop at Micro Conference | <i>THRIVE-WiSE</i> |
| 2023 | High-Assurance Machine Learning for Cybersecurity, Guest Lecture for CS410: Introduction to Software Engineering | <i>UMass Boston</i> |
| 2021 | Biologically-Aware Algorithms for Connectomics, Dissertation Defense | <i>Harvard University</i> |
| 2019 | Efficient Error Correction for Connectomics, Bioimage Computing Workshop | <i>CVPR</i> |
| 2019 | Synapse-Aware Skeleton Generation for Neural Circuits, Connectomics Conference | <i>Max Planck Institute</i> |
| 2018 | Segmentation of Electron Microscopy Images in Connectomics, Qualifying Exam | <i>Harvard University</i> |
| 2016 | Learning Global Features for Neuron Reconstruction in EM Images, Master's Thesis Defense | <i>Princeton University</i> |

Honors & Scholarships

HARVARD UNIVERSITY

- 2017-18 **Smith Family Fellowship**, Graduate Stipend Award
- 2016-17 **Tess Denny Chen Graduate Student Research Fellowship**, Graduate Stipend Award

PRINCETON UNIVERSITY

- 2014 - **Sigma Xi**, Admitted to Scientific Research Society for Undergraduates
- 2012 - **Tau Beta Pi**, Admitted to Engineering Honor Society, Top 12% of Class

Teaching Experience

HARVARD UNIVERSITY

- Fall 2018 Computer Science 109A: Introduction to Data Science

PRINCETON UNIVERSITY

Spr 2016 Computer Science 423: Theory of Algorithms
Fall 2015 Computer Science 402: Artificial Intelligence
Spr 2015 Computer Science 340: Reasoning About Computation
Fall 2014 Computer Science 429: Computer Vision

Mentored Students

2021-24 Akshata Tiwari, Massachusetts Institute of Technology
2021-24 Prateeti Saran, University of Cambridge
2020-21 Simon Warchol, Harvard University
2020-21 Ke Li, Chinese Academy of Sciences
2019-20 Tim Franzmeyer, Eidgenössische Technische Hochschule Zürich (ETH Zurich)
2019 Ian Svetkey, Harvard University
2019 Antoine Alleon, École Polytechnique Fédérale de Lausanne (EPFL)
2019 Romil Sirohi, Harvard University
2019 Bruno Mlodozieniec, University of Cambridge

Professional Services

REVIEWER

2024 Association for the Advancement of Artificial Intelligence (AAAI)
2022 IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)
2021 IEEE Visualization Conference
2021 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)
2021 PLOS Computational Biology
2020 ISCB Conference on Intelligent Systems for Molecular Biology (ISMB)
2020 IEEE European Conference on Computer Vision (ECCV)
2019 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)

Skills

Programming Python, C++, MATLAB, Java, JavaScript, Julia, HTML5, C

Other Tools PyTorch, Cython, Keras, Numpy, Scipy, Pandas, Matplotlib, Django, CSS, Sass, JQuery, Linux, SLURM, LaTeX