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 Kamentsky, 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	**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, at *Artificial Intelligence for Cyber Security (AICS)* 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, at *Machine Learning and the Physical Sciences* at *Neural Information Processing Systems (NeurIPS)*.

Presentations, Oral Exams, and Defenses

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

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 Mlodozeniec, 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