

# 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

- 2022 Tianyi Chen, **Brian Matejek**, Michael Mitzenmacher, 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**<sup>†</sup>, Tim Franzmeyer<sup>†</sup>, 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 Kamensky, 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 Kametsky, 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 Kametsky, 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*.

## Presentations, Oral Exams, and Defenses

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| 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

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### 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

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### 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

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- 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 Mlodozienec, University of Cambridge

## Professional Services

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### REVIEWER

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

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

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