J. Alexander Bae

Ph.D. in Electrical and Computer Engineering and Neuroscience

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Education

Sep. 2015 ~ Jan. 2022	Ph.D. in Electrical and Computer Engineering and Neuroscience, Princeton University (*Gordon Y.S. Wu Fellow*)
Sep. 2015 ~ Sep. 2017	M.A. in Electrical and Computer Engineering, Princeton University (*Gordon Y.S. Wu Fellow*)
Feb. 2011 ~ Feb. 2015	B.S. in Electrical Engineering, Korea Advanced Institute of Science and Technology (KAIST) (*Summa Cum Laude*)

Experience

Nov. 2021 ~	Postdoctoral researcher (*SNU Science Fellow*) Research Institute of Basic Sciences (Prof. Junho Lee)	Seoul National University
Jul. 2023 ~	Software engineer (part-time)	Zetta AI
Apr. 2016 ~ Oct. 2021	Graduate student researcher Seung Lab (Prof. Sebastian Seung)	Princeton University
Mar. 2015 ~ Jun. 2015	Research assistant Communication Circuits and Systems Lab (Prof. SeongHwan Cho)	KAIST
Feb. 2014 ~ Feb. 2015	Undergraduate researcher Communication Circuits and Systems Lab (Prof. SeongHwan Cho)	KAIST
Jun. 2014 ~ Aug. 2014	Research intern Bouma Group (Prof. Brett Bouma), Wellman Center for Photomedicine	Massachusetts General Hospital

Publications

* Co-first authors

Journals and Conference Proceedings

J.A. Bae[*], S. Mu[*], J.S. Kim[*], N.L. Turner[*], I. Tartavull, N. Kemnitz, C.S. Jordan, A.D. Norton, W.M. Silversmith, R. Prentki, M. Sorek, C. David, D.L. Jones, D. Bland, A.L.R. Sterling, J. Park, K.L. Briggman, H.S. Seung, the Eyewirers (2018). Digital Museum of Retinal Ganglion Cells with Dense Anatomy and Physiology. *Cell*.

N.L. Turner[*], T. Macrina[*], **J.A. Bae**[*], R. Yang[*], A.M. Wilson[*], C. Shneider-Mizell[*], K. Lee[*], R. Lu[*], J. Wu[*], A.L. Bodor[*], A.A. Bleckert[*], D. Brittain[*], E. Froudarakis[*], S. Dorkenwald[*], F. Collman[*], N. Kemnitz[*], D. Ih, W.M. Silversmith, J. Zung, A. Zlateski, I. Tartavull, S. Yu, S. Popovych, S. Mu, W. Wong, C.S. Jordan, M. Castro, J. Buchanan, D.J. Bumbarger, M. Takeno, R. Torres, G. Mahalingam, L. Elabbady, Y. Li, E. Cobos, P. Zhou, S. Suckow, L. Becker, L. Paninski, F. Polleux, J. Reimer, A.S. Tolias, R.C. Reid, N.M. da Costa, H.S. Seung (2022). Reconstruction of neocortex: organelles, compartments, cells, circuits, and activity. *Cell*.

H. Yim[*], D.T. Choe[*], **J.A. Bae**[*], H. Kang, K.C.Q. Nguyen, M. Choi, S. Ahn, S. Bahn, H. Yang, D.H. Hall, J.S. Kim, J. Lee (2024). Comparative connectomics of dauer reveals developmental plasticity. *Nature Communications*.

J.A. Bae[*], M. Choi[*], S. Ahn, G. Ko, D.T. Choe, H. Yim, K.C. Nguyen, J.S. Kim, D.H. Hall, J. Lee (*under review*). Structural diversity of mitochondria in the neuromuscular system across development revealed by 3D electron microscopy.

S. Dorkenwald, A. Matsliah, A.R. Sterling, P. Schlegel, S. Yu, C.E. McKellar, A. Lin, M. Costa, K. Eichler, Y. Yin, …, **J.A. Bae** et al. (2024). Neuronal wiring diagram of an adult brain. *Nature*.

L. Elabbady, S. Seshamani, S. Mu, G. Mahalingam, C. Schneider-Mizell, A.L. Bodor, **J.A. Bae**, D. Brittain, J. Buchanan et al. (*Accepted*). Quantitative Census of Local Somatic Features in Mouse Visual Cortex. *Nature.*

C. Schneider-Mizell, A.L. Bodor, D. Brittain, J. Buchanan, D.J. Bumbarger, L. Elabbady, C. Gamlin, D. Kapner, S. Kinn, G. Mahalingam, …, **J.A. Bae** et al. (*Accepted*). Cell-type-specific inhibitory circuitry from a connectomic census of mouse visual cortex. *Nature*.

S. Dorkenwald, C. Schneider-Mizell, D. Brittain, A. Halageri, C. Jordan, N. Kemnitz, M.A. Castro, W. Silversmith, J. Maitin-Shephard, J. Troidl, …, **J.A. Bae** et al. (*Accepted*). CAVE: Connectome Annotation Versioning Engine. *Nature Methods*.

S. Popovych, T. Macrina, N. Kemnitz, M. Castro, B. Nehoran, Z. Jia, **J.A. Bae**, E. Mitchell, S. Mu, E. Trautman, S. Saalfeld, K. Li (2024). Petascale pipeline for precise alignment of images from serial section electron microscopy. *Nature Communications*.

W. Silversmith, A. Zlateski, **J.A. Bae**, I. Tartavull, N. Kemnitz, J. Wu, H.S. Seung (2023). Igneous: Distributed dense 3D segmentation meshing, neuron skeletonization, and hierarchical downsampling. *Front. Neural Circuits*.

J. Wu, N. Turner, **J.A. Bae**, A. Vishwanathan, H.S. Seung (2022). RealNeuralNetworks.jl: An Integrated Julia Package for Skeletonization, Morphological Analysis, and Synaptic Connectivity Analysis of Terabyte-Scale 3D Neural Segmentations. *Frontiers in Neuroinformatics*.

S. Dorkenwald[*], C.E. McKellar[*], T. Macrina[*], N. Kemnitz[*], K. Lee[*], R. Lu[*], J. Wu[*], S. Popovych, E. Mitchell, B. Nehoran, Z. Jia, **J.A. Bae**, S. Mu, D. Ih, M. Castro, O. Ogedengbe, A. Halageri, K. Kuehner, A.R. Sterling, Z. Ashwood, J. Zung, D. Brittain, F. Collman, C. Schneider-Mizell, C. Jordan, W. Silversmith, C. Baker, D. Deutsch, L. Encarnacion-Rivera, S. Kumar, A. Burke, D. Bland, J. Gager, J. Hebditch, S. Koolman, M. Moore, S. Morejohn, B. Silverman, K. Willie, R. Willie, S. Yu, M. Murthy, H.S. Seung (2021). FlyWire: Online community for whole-brain connectomics. *Nature Methods*.

D. Wei[*], K. Lee[*], H. Li, R. Lu, **J.A. Bae**, Z. Liu, L. Zhang, M. dos Santos, Z. Lin, T. Uram, X. Wang, I. Arganda-Carreras, B. Matejek, N. Kasthuri, J. Lichtman, H. Pfister (2021). AxonEM Dataset: 3D Axon Instance Segmentation of Brain Cortical Regions. *Medical Image Computing and Computer Assisted Intervention - MICCAI 2021*.

S. Popovych, **J.A. Bae**, H.S. Seung (2020). Caesar: Segment-Wise Alignment Method for Solving Discontinuous Deformations. In *Proceedings of the IEEE 17th International Symposium on Biomedical Imaging (ISBI)*.

Presentations

Comparative study on mitochondrial structure in the neuromuscular system across development. *Neuroscience 2023 (SfN)*. 2023.

The mind of a dauer: Deviations in mitochondrial morphology in neuromuscular system revealed by deep learning-based EM reconstruction. *C. elegans Topic Meeting: Neuronal Development, Synaptic Function, and Behavior (CeNeuro)*. 2022.

Connectivity maps of cortical cells in petascale neural circuit reconstruction. *Research in Encoding and Decoding of Neural Ensembles* (*AREADNE)*. 2022.

Reconstruction of neocortex: Circuits and activity. *Connectomics Conference*. 2022.

Digital Museum of Retinal Ganglion Cells with Dense Anatomy and Physiology. *Society for Neuroscience (SfN)*. 2018.

Removing Motion Artifact of Bio-Impedance Heart Rate Measurement System Using Independent Component Analysis (ICA). *International Conference on Electronics, Information, and Communication (ICEIC 2015)*. 2015.

Preprints

J.A. Bae[*], M. Choi[*], S. Ahn, G. Ko, D.T. Choe, H. Yim, K.C. Nguyen, H. Kang, S. Bahn, D.H. Hall, J.S. Kim, J. Lee. Structural diversity of mitochondria in the neuromuscular system across development. *bioRxiv.*

MICrONS Consortium (2021). Functional connectomics spanning multiple areas of mouse visual cortex. *bioRxiv*.

T. Macrina[*], K. Lee[*], R. Lu[*], N.L. Turner[*], J. Wu[*], S. Popovych[*], W. Silversmith[*], N. Kemnitz[*], **J.A. Bae**, M.A. Castro et al. (2021). Petascale neural circuit reconstruction: automated methods. *bioRxiv*.

Honors and Awards

Honors

SNU Science Fellowship. *Seoul National University*.
Mar. 2022 ~ Feb. 2025

Gordon Y.S. Wu Fellowship. *Princeton University*.
Sep. 2015 ~ Aug. 2020

Andrew Kim Memorial Foundation Engineering Award. *Andrew Kim Foundation*.
Mar. 2018

KFAS Undergraduate Student Scholarship. *Korea Foundation for Advanced Studies (KFAS)*.
Mar. 2012 ~ Feb. 2015

Jongha Scholarship. *Jongha Scholarship Foundation*.
Aug. 2013

National Science and Technology Scholarship. *Korea Student Aid Foundation (KOSAF)*.
Feb. 2011 ~ Feb. 2015

Scholarship for Academic Excellence. *KAIST*.
Mar. 2014 ~ Jun. 2014

Awards

Young Investigator Award. *ICKSMCB 2024*.
Oct. 2024
Structural diversity of mitochondria in the neuromuscular system across development.

Best Presentation Award. *Ygnite 2019*.
Jan. 2019
Toward Large-scale Dense 3D Neuron Reconstruction using Artificial Intelligence.

Gold Paper Award. *IEEE Seoul Section Student Paper Contest.*
2014
How to Cope with Motion Artifact in Heart Rate Signal from Bio-Impedance Measurement System.

Honorable Mention (3rd Place). *GS Caltex-KAIST Outstanding Paper Contest.*
2012
Designing Best Arrangement of Modules in Wave Energy Farm to Maximize Wave Energy Efficiency.

Top Trainee. Republic of Korea Army.
2023

Teaching Experiences

Teaching Assistant (Machine Learning and Pattern Recognition). Princeton University.
Sep. 2016 ~ Jan. 2017

Freshman Tutor (Introduction to Programming (Python)). KAIST.
Mar. 2013 ~ Dec. 2014

Other Experiences

Graduate Engineering Council (President). Princeton University. Sep. 2018 ~ Sep. 2020

Korean Graduate Student Association (President). Princeton University. Jun. 2017 ~ May. 2018

Department Graduate Student Committee. Princeton University. Sep. 2016 ~ May. 2019

Volunteer. COVID Translate Project. Mar. 2020 ~ Jun. 2020

Volunteer. Raphael Clinic (Clinic for foreign immigrants). Jan. 2013 ~ Aug. 2015

Volunteer. The Special Olympics Winter Games 2013. Jan. 2013 ~ Feb. 2013