

# Junhwan 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
- 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  
Lab. of Genes and Development  
(Prof. Junho Lee) Seoul National University
- Oct. 2020 ~** 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 Conferences

**J.A. Bae**<sup>\*</sup>, S. Mu<sup>\*</sup>, J.S. Kim<sup>\*</sup>, N.L. Turner<sup>\*</sup>, 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<sup>\*</sup>, T. Macrina<sup>\*</sup>, **J.A. Bae**<sup>\*</sup>, R. Yang<sup>\*</sup>, A.M. Wilson<sup>\*</sup>, C. Shneider-Mizell<sup>\*</sup>, K. Lee<sup>\*</sup>, R. Lu<sup>\*</sup>, J. Wu<sup>\*</sup>, A.L. Bodor<sup>\*</sup>, A.A. Bleckert<sup>\*</sup>, D. Brittain<sup>\*</sup>, E. Froudarakis<sup>\*</sup>, S. Dorkenwald<sup>\*</sup>, F. Collman<sup>\*</sup>, N. Kemnitz<sup>\*</sup>, 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. Tolia, R.C. Reid, N.M. da Costa, H.S. Seung (2022). Reconstruction of neocortex: organelles, compartments, cells, circuits, and activity. *Cell*.

H. Yim<sup>\*</sup>, D.T. Choe<sup>\*</sup>, **J.A. Bae**<sup>\*</sup>, 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*.

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<sup>\*</sup>, C.E. McKellar<sup>\*</sup>, T. Macrina<sup>\*</sup>, N. Kemnitz<sup>\*</sup>, K. Lee<sup>\*</sup>, R. Lu<sup>\*</sup>, J. Wu<sup>\*</sup>, 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<sup>\*</sup>, K. Lee<sup>\*</sup>, 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)*.

H.S. Seung, 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*.

## 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

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. (2023). Neuronal wiring diagram of an adult brain. *bioRxiv*.

L. Elabbady, S. Seshamani, S. Mu, G. Mahalingam, C. Schneider-Mizell, A. Bodor, **J.A. Bae**, D. Brittain, J. Buchanan et al. (2022). Quantitative Census of Local Somatic Features in Mouse Visual Cortex. *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

**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

**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 (3<sup>rd</sup> Place).** *GS Caltex-KAIST Outstanding Paper Contest.*

2012

Designing Best Arrangement of Modules in Wave Energy Farm to Maximize Wave Energy Efficiency.