Kyle Luther

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Researcher interested in hard computational problems, particularly related to computer vision and computational imaging.

🎓 EDUCATION

Princeton University *2016 - 2022*
PhD in Physics
Advisor: H. Sebastian Seung

University of California Berkeley *2014 - 2016*
Bachelor of Arts in Physics
Highest Distinction in General Scholarship

Folsom Lake Community College *2012 - 2014*
Associate Degree

🏛 RESEARCH

Postdoctoral Researcher in Seung Lab at Princeton *2017-present*
Group led by H. Sebastian Seung

> **Electron tomography at scale** Working on reconstruction algorithms for serial section electron tomography applied to a whole mouse brain. Implemented and will release reconstruction methods built on top of modern autodifferentiation software Jax.

Graduate Researcher in Seung Lab at Princeton *2017-present*
Group led by H. Sebastian Seung

> **Electron tomography** Worked on reconstruction algorithms for serial section electron tomography, with an emphasis on removing the nonlinear distortions present visible in large thin sections.

> **Unsupervised learning** Analyzed brain-inspired models of unsupervised learning (*sparse coding, correlation game*). Devised and implemented novel brain-inspired models of unsupervised learning (*kernel similarity matching, invariant subspace features*).

> **Manifold learning** Devised and implemented a novel manifold learning algorithm posed as a two player game (*embedding game*).

> **Initialization of deep networks** Analyzed the impact of Batch Normalization on deep network initialization and devised a novel initialization scheme inspired by the analysis.

> **3D image segmentation** Performed automated neuron segmentation with convolutional networks in 3D images. Created software for data augmentation of 3D images (*augmentem*).

Undergraduate Researcher in Perlmutter Lab at UC Berkeley *2014-2016*
Group led by Saul Perlmutter

> **Star-finder software** Created software to find recently exploded supernovae in satellite images. The key component of this software relied on a random forest classifier applied to hand-crafted features inside image patches.

Undergraduate Researcher in Fortney Lab at UC Santa Cruz *summer 2014*
Group led by Johnathan Fortney

> **Radiative transfer software** Optimized code used to calculate radiative transfer through exoplanetary atmospheres. Optimization performed by transcribing key components of python code into C.

📖 PUBLICATIONS

Journal & Conference Publications

> **Sensitivity of sparse codes to image distortions**
> *Neural Computation, 2022*
> **K Luther**, HS Seung

Kernel similarity matching with Hebbian neural networks
Neurips, 2022
K Luther, HS Seung

Learning and segmenting dense voxel embeddings for 3D neuron reconstruction
IEEE Transactions on Medical Imaging, 2021
K Lee, R Lu, **K Luther**, HS Seung

Reexamining the principle of mean-variance preservation for neural network initialization
Physical Review Research, 2020
K Luther, HS Seung

Unsupervised learning by a softened correlation game: duality and convergence
53rd Asilomar Conference on Signals, Systems, and Computers, 2019
K Luther, R Yang, HS Seung

Learning metric graphs for neuron segmentation in electron microscopy images
16th IEEE ISBI Conference, 2019
K Luther, HS Seung

The discovery of a gravitationally lensed supernova Ia at redshift 2.22
The Astrophysical Journal, 2018
D Rubin, B Hayden, X Huang, G Aldering, R Amanullah, K Barbary, K Boone, M Brodwin, SE Deustua, S Dixon, P Eisenhardt, AS Fruchter, AH Gonzalez, A Goobar, RR Gupta, I Hook, MJ Jee, AG Kim, M Kowalski, CE Lidman, E Linder, **K Luther**, J Nordin, R Pain, S Perlmutter, Z Raha, M Rigault, P Ruiz-Lapuente, CM Saunders, C Sofiatti, AL Spadafora, SA Stanford, D Stern, N Suzuki, SC Williams

Characterizing transiting exoplanet atmospheres with JWST
The Astrophysical Journal, 2016
TP Green, MR Line, C Montero, JJ Fortney, J Lustig-Yaeger, **K Luther**

Preprints

3D reconstruction of cell nuclei in a full Drosophila brain
bioRxiv, 2021
S Mu, S Yu, NL Turner, CE McKellar, S Dorkenwald, F Collman, S Koolman, M Moore, S Morejohn, B Silverman, K Willie, R Willie, D Bland, A Burke, Z Ashwood, **K Luther**, M Castro, O Ogedengbe, W Silversmith, J Wu, A Halageri, T Macrina, N Kemnitz, M Murthy, HS Seung

Stacked unsupervised learning with a network architecture found by supervised meta-learning
Arxiv, 2022
K Luther, HS Seung

✏ Teaching

Neural Networks: Theory and Applications (COS 485)
Assistant in Instruction, Spring 2018, 2019