Kyle Luther

✉ kluther@princeton.edu   🏠 kyleluther.github.io   G Google Scholar

I'm a researcher working at the intersection of artificial intelligence, computer vision and computational imaging.

🎓 EDUCATION

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

University of California Berkeley   *2014 - 2016*
Bachelor of Arts in Physics *GPA: 4.0/4.0*
Highest Distinction in General Scholarship

Folsom Lake Community College   *2012 - 2014*
Associate Degree *GPA: 4.0/4.0*

🖥 PROGRAMMING SKILLS

5+ years experience Python, PyTorch, Numpy/SciPy, Scikit-learn, Scikit-image, Matplotlib
1+ years experience Jax, Jupyter
Used in research C/C++, CUDA, OpenCV, Pillow

🏛 RESEARCH

Postdoctoral Researcher in Sebastian Seung's Lab at Princeton   *2022-present*
Group led by H. Sebastian Seung

> **Electron tomography at scale** Working on serial section electron tomography applied to large scale brain imaging. We use convolutional networks to reduce the number of images required to perform 3D tomographic reconstructions, and thus improve the imaging throughput.

Graduate Researcher in Sebastian Seung's Lab at Princeton   *2017-2022*
Group led by H. Sebastian Seung

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

> **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.

Undergraduate Researcher in Saul Perlmutter's 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 Jonathan Fortney's 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