# Kyle Luther

kluther@princeton.edu kyleluther.github.io Google Scholar

## 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

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

**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

**Preprints**

**Sensitivity of sparse codes to image distortions**
*arXiv (accepted and to appear in Neural Computation), 2022*
**K Luther**, HS Seung

**Kernel similarity matching with Hebbian neural networks**
*arXiv, 2022*
**K Luther**, H. Sebastian Seung

**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

**Journal & Conference Publications**

**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**
*$53^{rd}$ 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**

## Teaching

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