

Kyle Luther

PhD candidate in Physics
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🔗 Google Scholar

🎓 EDUCATION

Princeton University 2016 - present
PhD candidate 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

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**



TEACHING

Neural Networks: Theory and Applications (COS 485)

Assistant in Instruction, Spring 2018, 2019