

# Eric Fischer

[ericmfischer.com](https://ericmfischer.com)

## Background

**Purpose:** I'm a Ph.D. student with a specialization in natural language processing from the Department of Statistics at the University of California, Los Angeles. I perform research on energy-based generative models applied to language problems at the Center for Vision, Cognition, Learning, and Autonomy at UCLA. My advisors are Dr. Ying Nian Wu and Dr. Song-Chun Zhu.

I earned a Master of Science from the Department of Computer Science at UCLA, submitting a thesis *Deep Generative Classifier with Short Run Inference* ([escholarship.org/uc/item/8kx4z8qw](https://escholarship.org/uc/item/8kx4z8qw)). A deep generative classifier uses Short Run Markov Chain Monte Carlo inference, Langevin dynamics, and backpropagation through time to achieve similar classification accuracy as an analogous discriminative classifier, i.e., a convolutional neural network, while it has the advantages that it can generate data, it can learn unsupervised with additional *unlabeled* data, and it exhibits robustness to adversarial attacks due to the stochasticity of the Langevin equation and the top-down architecture of the underlying generator network.

**Research Interests:** Natural Language Processing, Computer Vision, Representation Learning, Generative Models, Unsupervised Learning, Energy-Based Models

## Education

**University of California, Los Angeles** | Ph.D. Statistics Sep 2020 - current  
• Specialization: natural language processing

**University of California, Los Angeles** | M.S. Computer Science Sep 2018 - June 2020  
• Specialization: artificial intelligence  
• Thesis: *Deep Generative Classifier with Short Run Inference* ([escholarship.org/uc/item/8kx4z8qw](https://escholarship.org/uc/item/8kx4z8qw))

**University of California, Los Angeles** | B.A. Philosophy Sep 2009 - June 2013  
• Philosophy Departmental Honors, UCLA College Honors, Cum Laude Honors  
• Emphasis in philosophy of language and propositional and first-order logic

## Publications

**Deep Generative Classifier with Short Run Inference** | M.S. Thesis | [escholarship.org/uc/item/8kx4z8qw](https://escholarship.org/uc/item/8kx4z8qw)  
• Deep generative classifier uses Short Run Markov Chain Monte Carlo inference, Langevin dynamics, and backpropagation through time to achieve similar classification accuracy as an analogous discriminative classifier, i.e., a convolutional neural network, while it has the advantages that it can generate data, it can learn unsupervised with additional *unlabeled* data, and it exhibits robustness to adversarial attacks due to the stochasticity of the Langevin equation and the top-down architecture of the underlying generator network

**Learning Multi-Layer Latent Variable Model via Variational Optimization of Short Run MCMC for Approximate Inference** | [arxiv.org/pdf/1912.01909.pdf](https://arxiv.org/pdf/1912.01909.pdf) | ECCV | contributor (not author)  
• Short Run MCMC residual network outperforms a variational autoencoder in terms of image reconstruction error and image synthesis quality, while not requiring the design of a separate inference network

## Research

**Exact and Cluster Sampling of Ising Model** | [github.com/EricMFischer/exact-and-cluster-sampling-markov-chains](https://github.com/EricMFischer/exact-and-cluster-sampling-markov-chains)  
• A convergence analysis comparing exact sampling, using the Gibbs sampler and coupled Markov chains, to cluster sampling, using the Swendsen-Wang algorithm

**First-Order Optimization Methods for CNN** | [github.com/EricMFischer/first-order-nn-optimization](https://github.com/EricMFischer/first-order-nn-optimization)  
• Custom Python implementations and convergence analyses of first-order optimization methods Stochastic Gradient Descent (SGD), SGD with momentum, SGD with Nesterov momentum, RMSprop, and Adam

**T-Snake Model for Generative Inpainting** | [github.com/CS269-Capstone/t-snake-mask-generation](https://github.com/CS269-Capstone/t-snake-mask-generation)  
• Employs a topology adaptive snake deformable model to probabilistically generate missing image data

## Variational Lower Bound Formulation and Application of VAE | [github.com/EricMFischer/variational-autoencoder](https://github.com/EricMFischer/variational-autoencoder)

- Statistical formulation and analysis of evidence lower bound for the variational autoencoder, using the MNIST dataset

## Experience

**Center for Vision, Cognition, Learning, and Autonomy** | Graduate Researcher | Los Angeles, CA **Dec 2018 - current**

- Perform research on energy-based generative models applied to language problems

**University of California, Los Angeles** | Teaching Assistant | Los Angeles, CA **Mar 2020 - current**

- Have served as a Teaching Assistant and Grader for many undergraduate and graduate statistics courses at UCLA

**eXp Realty | South Bay Association of Realtors** | Realtor | Los Angeles, CA **Nov 2021 - current**

- Realtor for eXp Realty, the fastest-growing real estate brokerage in the world
- Department of Real Estate license ID: 02042145
- Email: [eric.fischer@exprealty.com](mailto:eric.fischer@exprealty.com)

**NatureBox** | Full Stack Software Engineer | Redwood City, CA **Mar 2016 - Dec 2017**

- Core contributor to new Flux/React web application created after company added direct-to-consumer business
- Led various projects including a payment processor migration, addition of Amazon payments, and a 2<sup>nd</sup> version of API

**Cinemagram** | Software Engineer | San Francisco, CA **Sep 2015 - Dec 2015**

- Worked with Python, Ruby, and SQL code to construct internal data management interfaces and tools

**ClearPath Capital Partners** | Wealth Advisor Associate | San Francisco, CA **Sep 2013 - June 2014**

- Earned Series 65 (Uniform Investment Adviser Law Exam) license to act as an investment advisor in California

## Graduate Coursework

### University of California, Los Angeles

**STATS 200A** - *Applied Probability*

**STATS 200B** - *Theoretical Statistics* (winter 2023)

**STATS 200C** - *High Dimensional Statistics* (spring 2023)

**STATS 201A** - *Research Design, Sampling, and Analysis* (in progress)

**STATS 201B** - *Statistical Modeling and Learning* (winter 2023)

**STATS 201C** - *Advanced Modeling and Inference*

**STATS 202A** - *Statistics Programming* (in progress)

**STATS 202B** - *Matrix Algebra and Optimization*

**STATS 202C** - *Monte Carlo Methods for Optimization*

**COM SCI M276A / STATS M231A** - *Pattern Recognition and Machine Learning*

**COM SCI M266A / STATS M232A** - *Statistical Modeling and Learning in Vision and Cognition* (audited)

**COM SCI M266B / STATS M232B** - *Statistical Computing and Inference in Vision and Cognition*

**COM SCI 247** - *Advanced Data Mining*

**COM SCI 251A** - *Advanced Computer Architecture*

**COM SCI 269** - *Seminar in Artificial Intelligence: Deformable Models*

**EC ENGR M235** - *Modern Environmental Statistics* (spring 2023)

**EC ENGR 236C** - *Optimization for Large-Scale Systems*

**EC ENGR 239AS** - *Neural Networks and Deep Learning*

**EC ENGR C243A** - *Neural Signal Processing* (audited, spring 2023)

### Independent

**Hack Reactor**, Advanced Software Engineering Immersive Program, San Francisco, CA, [hackreactor.com](https://hackreactor.com), June - Sep 2015

**CS 224n** - *Natural Language Processing with Deep Learning*, Stanford University on [web.stanford.edu/class/cs224n/](https://web.stanford.edu/class/cs224n/)

**CS 230** - *Deep Learning*, Stanford University on [cs230.stanford.edu](https://cs230.stanford.edu)

**CS 231n** - *Deep Learning for Computer Vision*, Stanford University on [cs231n.stanford.edu](https://cs231n.stanford.edu)

Wrote two chapters and edited several others of two textbooks authored by my Ph.D. advisors Dr. Song-Chun Zhu and Dr. Ying Nian Wu, which summarize over 20 years of artificial intelligence research at UCLA: *Statistical Models for Marr's Paradigm* ([ericmfischer.com/publication/book-1/book-1.pdf](https://ericmfischer.com/publication/book-1/book-1.pdf)) and *Stochastic Grammars for Scene Parsing* ([ericmfischer.com/publication/book-2/book-2.pdf](https://ericmfischer.com/publication/book-2/book-2.pdf))