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Eric Fischer

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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 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). 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, Representation Learning, Generative Models, Unsupervised Learning, Energy-Based Models, Computer Vision

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)

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
- 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 | 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
- 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
- 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
- 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
- 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**
- Research on energy-based generative models applied to natural language processing 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

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 2nd 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*
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, June - Sep 2015
CS 224n - Natural Language Processing with Deep Learning, Stanford University on web.stanford.edu/class/cs224n/
CS 230 - Deep Learning, Stanford University on cs230.stanford.edu
CS 231n - Deep Learning for Computer Vision, Stanford University on 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) and *Stochastic Grammars for Scene Parsing* (ericmfischer.com/publication/book-2/book-2.pdf)