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Eric M. Fischer

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Background

Purpose: I am a first-year Ph.D. student specializing in artificial intelligence in the Department of Statistics at the University of California, Los Angeles. I carry out generative learning research on language models at the Center for Vision, Cognition, Learning, and Autonomy (VCLA) and am advised by Dr. Song-Chun Zhu.

I earned a Masters from the Department of Computer Science at UCLA and submitted a thesis *Deep Generative Classifier with Short Run Inference*, for which I built a deep generative classifier that utilizes short-run MCMC inference, Langevin dynamics, and backpropagation through time to achieve similar classification accuracy to an analogous convolutional neural network, but with the added benefits that it may generate data, may learn unsupervised from 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.

Before my Masters, I worked as a Full Stack Software Engineer in the San Francisco bay area for over 2 years, most recently at NatureBox in Redwood City. I earned a Bachelors from the Department of Philosophy at UCLA, focusing my studies on first-order logic and language.

Research Interests: generative learning, energy-based models, representation learning, unsupervised learning, natural language processing, computer vision

Education

University of California, Los Angeles | Ph.D. Statistics **Sep 2020 - current**
- Specialization: artificial intelligence
- Advisor: Dr. Song-Chun Zhu

University of California, Los Angeles | M.S. Computer Science **Sep 2018 - June 2020**
- Specialization: artificial intelligence
- Advisor: Dr. Song-Chun Zhu
- 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**
- Emphasis in first-order logic and language
- Cum laude honors, UCLA College Honors, Philosophy Departmental Honors, Phi Beta Kappa member

Experience

Center for Vision, Cognition, Learning, and Autonomy | Graduate Researcher | Los Angeles, CA **Dec 2018 - current**
- Perform generative learning research on language models with other lab members (vcla.stat.ucla.edu/people.html)

University of California, Los Angeles | Teaching Assistant | Los Angeles, CA **Mar 2020 - current**
- Teaching assistant for courses: STATS 10 - *Introduction to Statistical Reasoning*, STATS 102 - *Introduction to Monte Carlo Methods*
- Grader for courses: STATS 21 - *Python and Other Technologies for Data Science*

NatureBox | Full Stack Software Engineer | Redwood City, CA **Mar 2016 - Dec 2017**
- Core contributor to new Flux/React web application 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 interfaces and tools

ClearPath Capital Partners | Wealth Advisor Associate | San Francisco, CA **Sep 2013 - June 2014**
- Passed Series 65 (Uniform Investment Adviser Law Exam) to acquire securities license as an investment advisor

Publications

Deep Generative Classifier with Short Run Inference | M.S. Thesis | escholarship.org/uc/item/8kx4z8qw

- Deep generative classifier utilizes short-run Markov chain Monte Carlo inference, Langevin dynamics, and backpropagation through time to achieve similar classification accuracy to an analogous convolutional neural network, but with the added benefits that it may generate data, may learn unsupervised from 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 | ECCV | contributor (not author) | arxiv.org/pdf/1912.01909.pdf

- Ran experiments for a short-run MCMC residual network that 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 with the Gibbs sampler and coupled Markov chains to cluster sampling with 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

Graduate Coursework

University of California, Los Angeles

STATS 200A - *Applied Probability*
STATS 201C - *Advanced Modeling and Inference*
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 236C - *Optimization for Large-Scale Systems*
EC ENGR 239AS - *Neural Networks and Deep Learning*

Independent

Hack Reactor, advanced software engineering immersive program in 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 - Convolutional Neural Networks for Visual Recognition, Stanford University on cs231n.stanford.edu
Wrote two chapters and edited several others of two textbooks authored by my Ph.D. advisor 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)