

Eric M. Fischer

Natural Language Processing Engineer
ericmfischer.com

Background

Purpose: I am a first-year Statistics Ph.D. student with a specialization in artificial intelligence, advised by Dr. Song-Chun Zhu at UCLA. My emphasis is in natural language processing and generative modeling. I obtained a Master of Science in Computer Science with a specialization in artificial intelligence and a Bachelor of Arts in Philosophy with an emphasis in philosophy of language, both from UCLA. Before my Masters, I worked as a Full Stack Software Engineer in San Francisco for 3 years.

Research Interests: natural language processing (NLP), generative modeling, computer vision, Markov chain Monte Carlo (MCMC), energy-based models (EBM), reinforcement learning, philosophy of language

Education

University of California, Los Angeles | Ph.D. Statistics 2020 - current

- Specialization: Artificial Intelligence; emphasis: natural language processing and generative modeling

University of California, Los Angeles | M.S. Computer Science, with Thesis | 3.5 GPA 2018 - 2020

- Specialization: Artificial Intelligence; emphasis: generative modeling
- Thesis: *Deep Generative Classifier with Short Run Inference*
- GRE: quantitative reasoning: 168/170, verbal 161/170, analytical writing: 5.5/6

Hack Reactor | San Francisco, CA 2015

- Advanced Software Engineering Immersive Program; full stack software engineering, data structures, and algorithms

University of California, Los Angeles | B.A. Philosophy | 3.9 Major GPA 2009 - 2013

- Emphasis: philosophy of language, first-order logic
- Cum Laude honors; philosophy departmental honors; dean's honor roll; Phi Beta Kappa honors society

Universidad Complutense de Madrid | Madrid, Spain 2011 - 2012

- Philosophy coursework conducted in Spanish with host university students

Publications

Deep Generative Classifier with Short Run Inference | MS Thesis | <https://escholarship.org/uc/item/8kx4z8qw>

- Deep generative classifier exploits Short Run MCMC inference with Langevin dynamics and backpropagation through time, exhibiting (1) comparable accuracy to a traditional ConvNet classifier and (2) robustness to adversarial attacks, due to the stochasticity of the Langevin equation and the top-down architecture of the generator network

Learning Multi-Layer Latent Variable Model with Short Run Inference Dynamics | under review

- Ran experiments for a project in which a Short Run MCMC residual network outperforms a variational autoencoder (VAE) and generative adversarial network (GAN) for image synthesis, interpolation, and reconstruction

Research

Exact and Cluster Sampling of Ising Model | github.com/EricMFischer/exact-and-cluster-sampling-markov-chains

- Convergence analysis of exact sampling with the Gibbs sampler and coupled Markov chains vs. cluster sampling with the Swendsen-Wang algorithm

First-Order Optimization Methods for CNN | github.com/EricMFischer/first-order-nn-optimization

- Python implementations and convergence analysis of first-order methods SGD, SGD with momentum, SGD with Nesterov momentum, RMSprop, and Adam

Variational Lower Bound Formulation and App. of VAE | github.com/EricMFischer/variational-autoencoder

- Formulation of the evidence lower bound (ELBO) for the VAE and an application to the MNIST dataset

T-Snake Model for Generative Inpainting | github.com/CS269-Capstone/t-snake-mask-generation

- Employed a topology adaptive snake (T-snake) deformable model to improve generative inpainting mask preprocessing

Technical Skills

Statistics, Linear Algebra, Calculus: Bayesian statistics, Monte Carlo methods, linear algebra, matrix algebra, optimization, applied probability, multivariable calculus

Machine Learning: CNN, RNN, LSTM, GRU, SVM, neural network optimization, transformers, decoders

Software Engineering: Operating Systems (Linux, macOS, Ubuntu), Languages (Python, C, C++, R, JavaScript, PHP), Frameworks (Pytorch, Tensorflow, React, Angular), DevOps (Git, AWS, Cloudflare)

Coursework

UCLA Graduate Coursework

STATS 200A - *Applied Probability* (audited)

STATS 201C - *Advanced Modeling and Inference*

STATS 202B - *Matrix Algebra and Optimization*

STATS 202C - *Monte Carlo Methods for Optimization*

STAT M231A - *Pattern Recognition and Machine Learning*

STATS M232A - *Statistical Modeling and Learning in Vision and Cognition* (audited)

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 Coursework

CS 224n: Natural Language Processing with Deep Learning, Stanford University on web.stanford.edu

CS 231n: Convolutional Neural Networks for Visual Recognition, Stanford University on cs231n.stanford.edu

Self-Driving Car Engineer Nanodegree - I) *Computer Vision*, II) *Deep Learning*, III) *Sensor Fusion*, IV) *Localization*, V) *Planning*, VI) *Control*, VII) *System Integration*, Nvidia et al. on Udacity

Digital Signal Processing, École Polytechnique Fédérale de Lausanne

Mathematics for Machine Learning - I) *Linear Algebra*, II) *Multivariate Calculus*, III) *PCA*, ICL on Coursera

Algorithms Specialization - I) *Divide and Conquer, Sorting and Searching, and Randomized Algorithms*, II) *Graph Search, Shortest Paths, and Data Structures*, III) *Greedy Algorithms, Minimum Spanning Trees, and Dynamic Programming*, IV) *Shortest Paths Revisited, NP-Complete Problems*, Stanford University on Coursera

Free Reading

Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville

Causality: Models, Reasoning, and Inference, Judea Pearl

Experience

Center for Vision, Cognition, Learning, and Autonomy | Graduate Researcher | UCLA **2018 - current**

- Contribute to several NLP and generative modeling research projects with PhD students and other engineers

NatureBox | Full Stack Software Engineer | Redwood City, CA **2016 - 2018**

- Main architect of new Flux/React web application after company added direct-to-consumer business
- Led the following projects: Stripe payment processor migration, Login and Pay with Amazon, API v2

Cinemagram | Software Engineer | San Francisco, CA **2015 - 2016**

- Worked with JavaScript, Ruby, SQL, and Redis to construct internal data tools

Veritas Prep | SAT, ACT, and GRE Instructor | Malibu, CA **2011 - 2016**

- Instructed students privately and in classes for the SAT, ACT, and GRE; first instructor to teach live online course

Socratic Prep | SAT, ACT, and GRE Instructor **2009 - 2018**

- Have tutored hundreds of students privately and in classes for the SAT, ACT, GRE, and other subjects

Honors, Scholarships, and Interests

- Significant contributor to two textbooks summarizing over 20 years of artificial intelligence research at UCLA: *Statistical Models for Marr's Paradigm* and *Stochastic Grammars for Scene Parsing*
- Cum Laude Honors, philosophy departmental honors, dean's honor roll, Phi Beta Kappa honors society
- 2nd place in LA County science fair for research project *Mechanical Exfoliation and Characterization of Graphene via Raman Spectroscopy*, conducted at UCLA in 2009
- Awarded Bristol-Myers Squibb \$20,000 college scholarship based on academic merit
- Previously a registered investment adviser in California; passed Series 65 exam (Uniform Investment Adviser Law Examination) in 2014 while working as Wealth Advisor Associate
- Currently hold a California Real Estate License
- Member of Society of Latino Engineers and Scientists and UCLA
- Other interests: philosophy of language, learning languages (fluent in Spanish and Portuguese), fishing, basketball, backpacking, gardening, cooking, spearfishing, piano, built my own PC for machine learning