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Eric M. Fischer

Computer Vision Engineer
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Background

Purpose: I am currently writing a Masters thesis for an MS in Computer Science, advised by Professor Song-Chun Zhu at the Center for Vision, Cognition, Learning, and Autonomy at UCLA. Before my Masters, I worked as a Full Stack Software Engineer in the SF Bay Area for 3 years, mostly recently at NatureBox. My research interests are in generative modeling in computer vision and natural language processing. I have contributed to several research projects that apply MCMC sampling and generative, inference, and energy based models to various vision and language tasks.
Research Interests: Generative Modeling, Computer Vision, Natural Language Processing, Markov Chain Monte Carlo, Energy-Based Models, Autonomous Driving

Publications

Short-Run MCMC Residual Network toward Energy Based Model | CVPR | under review | 2019
- Non-convergent, non-mixing, and non-persistent short-run MCMC residual network outperforms a variational autoencoder and generative adversarial network for the tasks of image synthesis, interpolation, and reconstruction
- Unlike a traditional energy based model or MCMC, the learned short-run MCMC is capable of reconstructing and interpolating between images, like generator or flow models can

Generative Recurrent Language Models with MCMC Inference | under review soon | 2019
- Utilizes an image parsing to text description (I2T) framework that generates text descriptions in natural language, based on an understanding of image and video content
- l2T framework consists of four components: image parsing engine, and-or-graph for visual knowledge representation, semantic web, and text generation engine

Masters Thesis in Generative Modeling in Vision and Language | in progress | 2019
- Thesis for Computer Science Masters program in progress under my advisor Dr. Song-Chun Zhu at UCLA

Research

T-Snake Model for Generative Inpainting | github.com/CS269-Capstone/t-snake-mask-generation
- Used a topology adaptive snake (T-snake) deformable model to improve the quality of object masks before passing them to generative adversarial network for generative image inpainting

Exact and Cluster Sampling of Ising Model | github.com/EricMFischer/exact-and-cluster-sampling-markov-chains
- Implementation and convergence analysis of exact sampling with the Gibbs sampler and coupled Markov chains versus cluster sampling with the Swendsen-Wang algorithm

Advanced Lane Finding for Self-Driving Cars | github.com/EricMFischer/self-driving-car-nano-degree
- Built lane-finding algorithm with distortion correction, image rectification, color transforms, and gradient thresholding

Vehicle Detection for Self-Driving Cars | github.com/EricMFischer/self-driving-car-nano-degree
- Created vehicle detection and tracking pipeline with OpenCV, histogram of oriented gradients, and SVM and compared it a similar pipeline built with a deep neural network

First-Order Optimization Methods for CNN | github.com/EricMFischer/first-order-nn-optimization
- Python implementations and convergence analysis of SGD, SGD with momentum, SGD with Nesterov momentum, RMSprop, and Adam optimizers for a CNN

Variational Lower Bound Formulation and App. of VAE | github.com/EricMFischer/variational-autoencoder
- Formulation of the evidence lower bound (ELBO) for the variational autoencoder and an application to synthesizing binary images from the MNIST dataset

EEG Classification with CNNs | github.com/ee239as-project/EEG-classification-with-CNN
- With heavy data augmentation to 4 second electroencephalogram samples and various iterations of CNN models, ultimately predicted at 72% test accuracy the motor tasks asked of subjects

Technical Skills

Statistics, Linear Algebra, Calculus: Advanced Modeling and Inference, Bayesian Statistics, Probabilistic Graphical Models, Monte Carlo Methods, Linear Algebra, Matrix Algebra, Optimization, Applied Probability, Multivariable Calculus
Machine Learning: CNN, RNN, LSTM, GRU, SVM, Residual Networks, Generative Learning, Reinforcement Learning, neural network optimization, machine learning algorithms, advanced data mining, deformable models
Software Engineering: Operating Systems (Linux, macOS, Ubuntu), Languages (Python, C, C++, JavaScript, R, Matlab, PHP, Ruby), Frameworks (Pytorch, Tensorflow, Keras, React, Angular), DevOps (Git, AWS, Cloudflare), Web Tools (Heap, Optimizely), Other (data cleansing, shell scripts, TDD)

Education

University of California, Los Angeles | MS Computer Science with Thesis | 3.5 GPA **2018 - 2020**
- Specialization: Artificial Intelligence; submitting Masters research thesis
- Machine learning coursework spans statistics, computer science, and electrical and computer engineering
- GRE Score: Quantitative Reasoning: 168/170, Verbal 161/170, Analytical Writing: 5.5/6

Hack Reactor | Advanced Software Engineering Immersive Program | San Francisco, CA **2015**
- Full stack software engineering curriculum with emphasis on data structures and algorithms

University of California, Los Angeles | BA Analytic Philosophy | 3.7 GPA | 3.9 Major GPA **2009 - 2013**
- Emphasis: first-order logic and philosophy of language
- 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 in Spanish with host university students

Coursework

UCLA Graduate Coursework
STATS 200A - *Applied Probability* (audited due to class size)
STATS 200B - *Theoretical Statistics* (**2020 winter** quarter)
STATS 200C - *High-Dimensional Statistics* (**2020 spring** quarter)
STATS 201B - *Statistical Modeling and Learning* (**2020 winter** quarter)
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 231B - *Methods of Machine Learning* (**2020 winter** quarter)
STATS 231C - *Theories of Machine Learning* (**2020 spring** quarter)
STATS M232A - *Statistical Modeling and Learning in Vision and Cognition* (previously audited, **2020 winter** quarter)
STATS M232B - *Statistical Computing and Inference in Vision and Cognition* (**2020 spring** quarter)
STATS 232C - *Cognitive Artificial Intelligence* (**2020 spring** quarter)
COM SCI 247 - *Advanced Data Mining*
COM SCI 249 - *Current Topics in Data Structures: Natural Language Processing* (audited)
COM SCI 251A - *Advanced Computer Architecture*
COM SCI 260 - *Machine Learning Algorithms* (audited)
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
Deep Learning Specialization - *I) Neural Networks and Deep Learning, II) Improving Deep Neural Networks: Hyperparameter Tuning, Regularization, and Optimization, III) Structuring Machine Learning Projects, IV) Convolutional Neural Networks, V) Sequence Models*, Stanford University on Coursera
Digital Signal Processing, École Polytechnique Fédérale de Lausanne
Probabilistic Graphical Models - *I) Representation, II) Inference, and III) Learning*, Stanford University on Coursera
Mathematics for Machine Learning - *I) Linear Algebra, II) Multivariate Calculus, III) PCA*, ICL on Coursera
Linear Algebra, Gilbert Strang at MIT Open Courseware, University of Texas Austin on edX
The Science of Uncertainty - Probability, MIT on edX

Statistics with R Specialization - *I) Probability and Data, II) Inferential Statistics, III) Linear Regression and Modeling, IV) Bayesian Statistics, V) Statistics with R Capstone*, Duke University on Coursera
Multivariable Calculus, Ohio State University 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
Pattern Recognition and Machine Learning, Christopher M. Bishop

Experience

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

- Contribute to several research projects that apply MCMC sampling and generative, inference, and energy based models to various image and language tasks; NLP text generation project currently in progress
- Collaborate with other engineers to develop code and experiments that advance the entire research group

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

- Main contributor for new React web app after Naturebox added direct-to-consumer business
  - Used Flux/React architecture with Flow and ImmutableJS additions; constructed new backend API
- Led projects such as Litle to Stripe payment processor migration, Login and Pay with Amazon, Referrals, API v2
  - Worked on frontend, backend, and with DB, performed most devops, security tasks, led engineering meetings

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

- Worked with JavaScript, Ruby, SQL, and Redis to construct data management interfaces
- Wrote and ran Snapchat client in PHP for growth campaigns, acquiring 150K users in 6 months

Flinja | Frontend Software Engineer | Los Angeles, CA **2012 - 2014**

- As a main frontend contributor on a small team for startup Flinja, website won DEMO's (VentureBeat/IDG) Fall 2012 DemoGod Award for best social platform

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

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

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

- Vast majority of income before professional software engineering came from tutoring for my company Socratic Prep
- Have tutored hundreds of students privately and in classes for the SAT, ACT, and GRE exams and other subjects

Scholarships, Honors, Memberships, Volunteering

- UCLA Cum Laude Honors, UCLA Philosophy Departmental Honors, UCLA Dean's Honor Roll
- Awarded Bristol-Myers Squibb $20,000 college scholarship based on academic merit
- 2nd place in Los Angeles County and the California Science Fair for "Mechanical Exfoliation and Characterization of Graphene via Raman Spectroscopy", conducted at UCLA with graduate student Carlos Manuel Torres Jr. in 2009
- Won NatureBox company Hackathon for a 3D CAD model of a shoe insole intended for jumping
  - Printed shoe insole with Maker's Tool Works 3D MiniMax printer self-assembled from scratch
- Won SAT and ACT Instructor of the Year at Veritas Prep and was featured on website homepage for being first instructor to teach a live online course, recorded from their headquarters in Malibu, CA
- Became a Registered Investment Adviser in California by passing Series 65 - Uniform Investment Adviser Law Examination in 2014 while working as Wealth Advisor at ClearPath Capital Partners in San Francisco for a brief time
- As a main frontend contributor on a small team for startup Flinja, website won DEMO's (VentureBeat/IDG) Fall 2012 DemoGod Award for best social platform
- UCLA Engineering Graduate Student Association member
- UCLA Society of Latino Engineers and Scientists (SOLES) member, UCLA Latino Alumni Association member
- Phi Beta Kappa honor society member
- Have participated in several Kaggle machine learning and data science competitions
- UCLA Beta Theta Pi Treasurer and alumni; volunteered at homeless shelters for four years as Beta Theta Pi member

Additional Information

Other technical interests: Built own PC with four GPUs for machine learning; quantitative research and trading
Personal: Fluent in English, Spanish, and Portuguese; love cooking, gardening, fishing, backpacking, and basketball