Deqing Fu

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EDUCATION

University of Chicago — Chicago, IL
M.S. in Statistics; GPA: 3.86/4.00 — Sep 2020 – Jun 2022
Honors: Susanne H. Rudolph Scholarship

The University of Chicago — Chicago, IL
B.S. in Mathematics (with Honors); B.S. in Computer Science (with Honors); B.A. in Statistics — Sep 2016 – Jun 2020
GPA: Cumulative: 3.69/4.00; Mathematics: 3.88/4.00; Computer Science: 3.80/4.00; Statistics: 3.94/4.00
Honors: Liew Family College Research Fellows Fund; Dean's List 2016-2020

PUBLICATIONS AND PRESENTATIONS

- Cooper Nederhood, Nicholas Kolkin, **Deqing Fu**, Jason Salavon. *Harnessing the Conditioning Sensorium for Improved Image Translation.* International Conference on Computer Vision (ICCV), 2021
- Sri Hari Krishna Narayanan, Paul Hovland, Kshitij Kulshreshtha, Devashri Nagarkar, Kaitlyn MacIntyre, Riley Wagner, **Deqing Fu**. *Comparison of Two Gradient Computation Methods in Python*. Neural Information Processing Systems (NIPS) Autodiff Workshop, 2017

RESEARCH EXPERIENCE

Research Assistant — Dec 2020 – Present
The University of Chicago, The Department of Statistics — Chicago, IL
Supervisor: Prof. Lek-Heng Lim & Dr. Bradley Nelson
- Initiated the idea of using **Topological Loss** to accelerate the training process by controlling the topology of layers in Convolutional Neural Network architectures. Experimented this idea on solving **Depth Estimation** problems using ResNet-50 backboned U-Net with different levels of topological control
- Proposed to use Convolution Auto-Encoders to extract embedding of images from frames in videos, and to apply the technique of **Persistent Homology** and **Lorentz Transforms** on this embedding manifold to analyze the topology of deep neural networks on time-dependent data, such as videos
- Extending these mathematical intuitions on deep learning to a larger project of **Time-Aware Machine Intelligence**

Research Assistant — Sep 2020 – Mar 2021
The University of Chicago, Jason Salavon Studio — Chicago, IL
Supervisor: Prof. Jason Salavon
- Collected and pre-processed two new datasets, a modified in-the-wild dataset (FFHQ-Wild) of 70,000 images, and a proprietary television series dataset (ClassicTV) of 40,000 images
- Initiated the idea of using multiple conditionings, including segmentations, face landmarks, and depths, etc., for our **Generative Adversarial Networks**-based **Image Style Translation** framework. Trained the new framework on CelebA-HQ and the new datasets, FFHQ-Wild and ClassicTV
- Benchmarked our model against other state-of-the-art methods. The new method achieved significant better Fréchet Inception Distance (FID) scores with an average improvement of 39.3%
- Collaborated with team to write a paper, *Harnessing the Conditioning Sensorium for Improved Image Translation*, which was later accepted to International Conference on Computer Vision (ICCV) 2021

Research Assistant — Jan 2019 – Present
The University of Chicago, The Department of Computer Science — Chicago, IL
Supervisor: Prof. Michael Maire
- Researching on **Amodal Image Segmentation** to infer segmentations of both visible and occluded parts of objects.
- Proposed and experimented a multi-level sheet model as an approach to make object connectivity and occlusion relationships explicit. Extended the **Spectral Clustering** method and applied as a post-processing technique to a learned multi-level affinity matrix. Trained multiple baseline models on the COCO-Amodal Dataset
- Experimented a novel **Self-supervised Learning** framework which uses generative adversarial networks (GANs) as inpainters to improve the performance of **Contrastive Learning** models on segmentation tasks

Summer Research Assistant — Jun 2017 – Aug 2017
Argonne National Laboratory, Mathematics and Computer Science Division — Lemont, IL
Supervisor: Dr. Paul Hovland & Dr. Sri Hari Krishna Narayanan
- Benchmarked the efficiency of ADOL-C, an **Automatic Differentiation** algorithm, and implemented a toy LSTM model with ADOL-C in Python. Presented research results to Argonne scientists at Summer Argonne Students' Symposium.
- Submitted a report paper, Comparison of two gradient computation methods in Python, with advisors Dr. Paul Hovland and Dr. Sri Hari Krishna Narayanan, which was accepted as a poster at NIPS 2017 Autodiff Workshop

PROFESSIONAL EXPERIENCE

Software Engineer Intern   Jun 2021 – Sep 2021
Google Lens Team, Google   *Mountain View, CA*

- Developed a semantically-aware machine learning algorithm to analyze similar images. Evaluated the performance of different clustering methods, including K-Means, Mean Shift, and Affinity Clustering, on Google Lens datasets
- Proposed and implemented a multi-stage clustering-and-deduping algorithm to group similar images together. The algorithm combines an offline **Affinity Clustering**-based clustering algorithm and an online merging algorithm to achieve the better quality and latency. This new machine-learning-based algorithm improved user satisfaction rate by 1.02%, compared to the existing wavelet-based algorithm
- Initiated the idea of using models for recommendation systems, such as the **Deep and Wide** model, to optimize users' click-through-rate on Lens' image search results

Software Engineer Intern   Jun 2018 – Aug 2018
Industrial Toys Studio, Electronic Arts   *Pasadena, CA*

- Implemented game logic for the prototype of a new mobile title for the well-known Battlefield game series using the Unreal Engine 4. Developed tools for engineering and art teams, debugged, and optimized existing functionalities of the game prototype

RELEVANT COURSEWORK

Mathematics:
Abstract Algebra (Honors), Discrete Math (Honors), Combinatorics (Honors), Algorithms (Honors), Real Analysis (Accelerated), Complex Analysis, Ordinary Differential Equations

Statistics and Applied Math:
Distribution Theory (PhD level), Measure-Theoretic Probability (PhD level), Matrix Computation (PhD level), Optimization, Convex Optimization (PhD level), Nonlinear Optimization (PhD level), Robust and Semiparametric Statistics (PhD level), Monte Carlo Simulation (PhD level), Markov Chains and Brownian Motions, Time Series Analysis, Applied Linear Statistical Models, Generalized Linear Models, Numerical PDEs (PhD level), Harmonic Analysis (PhD level), Spectral Methods (PhD level)

Machine Learning and Deep Learning:
Machine Learning, Speech Technologies, Computer Vision, Computational Linguistics, Probabilistic Graphical Models (PhD level), Fundamentals of Deep Learning (PhD level), Topics in Deep Learning: Discriminative Models (PhD level), Causal Inference for Machine Learning (PhD level)

TEACHING EXPERIENCE

Teaching Assistant:	BUSN 41301 Statistical Insight into Marketing, Consulting, and Entrepreneurship	Fall 2021
	MATH 15300 Calculus - III	Winter 2018
	MATH 15200 Calculus - II	Fall 2017
Grader:	CMSC 31230 Fundamentals of Deep Learning	Fall 2021
	STAT 24620 Multivariate Statistics and Data Analysis	Spring 2020
	MATH 20100 Mathematical Methods for Physical Science	Winter 2019
	MATH 19520 Mathematical Methods for Social Science	Fall 2018
	MATH 20300 Analysis in Rn - I	Spring 2018

SKILLS

Programming Languages: Python, C/C++, MATLAB, R
Deep Learning: TensorFlow, Keras, PyTorch, Computer Vision
Languages: Chinese (Mandarin) - Native; English - Proficient