

Gary Cheng

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www.garycheng.me

Interests

My research interests are broadly in learning theory, optimization, and differential privacy. I am currently working on projects in adaptive optimization, differentially private optimization, and federated learning.

Education

Ph.D. Electrical Engineering, Stanford University

September 2019 - Present

GPA 4.0

Advised by Professor John Duchi, researching topics in optimization and statistics for machine learning. Supported by the 3-year *Professor Michael J. Flynn Stanford Graduate Fellowship*.

B.A. Computer Science, University of California, Berkeley

Highest Distinction (Summa Cum Laude)

GPA 4.0

August 2015 - May 2019

Advised by Professors Laurent El Ghaoui, Jean Walrand, and Kannan Ramchandran.

Coursework in machine learning, optimization, statistics, probability, algorithms, signal processing, analysis, abstract algebra, linear algebra, etc.

Experience

Stanford Machine Learning Group, *Research Assistant*

June 2020 - Present

Advised by Professor John Duchi, studying problems broadly in optimization and statistics. Currently thinking about settings where it is possible to improve the dimension-dependent convergence rate in differentially private stochastic convex optimization. I'm also working on other projects on adaptive optimization and federated learning.

Google, *Research Intern*

June 2021 - September 2021

Worked with Keith Rush, Zachary Garrett, and Zachary Charles on the Federated Learning Research team to design methods of training larger models in federated learning. Designed experiments demonstrating how the Federated Dropout algorithm and numerous variations/generalizations (many variations were my own design) were unable to beat simple baselines. Proposed the Federated Ensembling algorithm which does outperform baselines. Currently preparing a paper on my findings. Codebase can be found at https://github.com/google-research/federated/tree/master/shrink_unshrink

Stanford Information Systems Lab, *Research Assistant*

January 2020 - October 2021

Working with Professor David Tse, studying problems related to adaptive sampling and multi-armed bandits. Researching the problem of estimating smooth function outputs given uncertainty in the inputs.

UC Berkeley BAIR Lab, *Research Assistant*

January 2018 - May 2019

Developed an early stopping Frank-Wolfe algorithm for the purpose of dataset summarization. Proved algorithm has a linear convergence rate. Designed, coded, and simulated all numerical experiments in Python. Project advised by Professors Laurent El Ghaoui and Kannan Ramchandran. First author paper on arXiv and presented poster at BayLearn 2018.

UC Berkeley BLISS Lab, *Research Assistant*

August 2016 - May 2019

Developed a novel dynamic appointment scheme and used stochastic gradient descent to find optimal appointment schedules with applications in hospital scheduling. Designed, coded, and simulated all numerical experiments in Python. Advised by Professor Jean Walrand. Outstanding Presentation Award at GCURS 2017 and first author paper presented at American Control Conference 2019.

Amazon.com, *Software Engineer Intern*

May 2017 - August 2017

Full stack developer on the Forecasting team in Supply Chain Optimization. Implemented graph algorithms to give insight into the longest running components of forecasting calculations. Created new Java APIs and integrated them into a Ruby on Rails front-end.

Publications

Gary Cheng*, Karan Chadha*, and John Duchi. “Fine-tuning in Federated Learning: A simple but tough-to-beat baseline” *preprint in submission*. <https://arxiv.org/abs/2108.07313>

Tavor Baharav, **Gary Cheng**, Mert Pilanci, David Tse. “Approximate Function Evaluation via Multi-Armed Bandits” Poster at *AISTATS 2022*.

Gary Cheng*, Karan Chadha*, and John Duchi. “Accelerated, Optimal, and Parallel: Some Results on Model-Based Stochastic Optimization” *arXiv preprint*.
<https://arxiv.org/abs/2101.02696>

Gary Cheng*, Hilal Asi*, Karan Chadha*, and John Duchi. “Minibatch Stochastic Approximate Proximal Point Methods” **Spotlight Presentation** at *NeurIPS 2020*.
<https://papers.nips.cc/paper/2020/hash/fa2246fa0fdf0d3e270c86767b77ba1b-Abstract.html>

Gary Cheng, Armin Askari, Kannan Ramchandran, and Laurent El Ghaoui. “Greedy Frank-Wolfe Algorithm for Exemplar Selection.” Poster at *BayLearn 2018*.
<https://arxiv.org/abs/1811.02702>

Gary Cheng, Kabir Chandrasekher, and Jean Walrand. “Static and Dynamic Appointment Scheduling with Stochastic Gradient Descent.” In *American Control Conference 2019*.
<https://ieeexplore.ieee.org/document/8814666>

* denotes equal contribution

Teaching

Teaching Assistant, University of California, Berkeley

EE 126, Probability and Random Processes. Spring 2018 & Spring 2019.

CS 170, Algorithms. Fall 2017.

CS 61B, Data Structures and Algorithms. Spring 2017.

Awards

Prof. Michael J. Flynn Stanford Graduate Research Fellowship. Spring 2019, Awarded by Stanford.

NSF Graduate Research Fellowship Honorable Mention. Spring 2019, Awarded by NSF.

UC Berkeley Campus Outstanding GSI Award. Spring 2019, Awarded by UC Berkeley.

GCURS 2017 Outstanding Presentation Award. Fall 2017, Awarded by Rice University.

Cal Alumni Association Leadership Award. Fall 2015, Awarded by UC Berkeley.

Skills

Proficient in: Python, NumPy, Weights & Biases

Familiar with: PyTorch, TensorFlow, TensorFlow Federated, Java

Hobbies

Basketball, Tennis, Volleyball, Watching (most) sports