Charlie Hou

Links

Website: https://houcharlie.github.io/
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Education

Princeton University**,** Princeton, NJ   *Sept 2015-June 2019*
Bachelor of Science in Engineering, Operations Research and Financial Engineering
Certificates: Applied Math
Overall GPA: 3.81/4.0 (School's top quintile)
Activities/Awards/Honors:

- Tutor for multivariable calculus, linear algebra, introductory physics at the learning center
- Won Tiger Chef Challenge (school-wide cooking competition)
- Club Tennis first team member

Relevant Coursework*:*

- Programming: Functional Programming, Algorithms and Data Structures, Introduction to Programming Systems
- Mathematics/Probability: High Dimensional Probability (grad class), Real Analysis and Measure Theory, Probability and Stochastic Systems
- Statistics/ML: Applied Machine Learning, Mathematical Statistics (grad class), Statistical Learning Theory (grad class), Large Scale Optimization for Data Science (grad class), Deep Learning Theory (grad class),

Experience

Goldman Sachs, New York City, New York, *Strat Intern*   *May 2018-Aug 2018*

- Improved mathematical rigor of simulations on stress-testing model by de-meaning random variables that were biased through correlation, implemented changes in code using Slang (GS programming language). These changes impacted projections made by $250 million
- Designed and implemented a model monitoring system in Slang and SQL that gives periodic summaries and alerts the firm to unexpected behaviors on an ongoing basis based on current data
- Quantitatively validated appropriateness of machine learning loan model: showed that training data was linearly separable by projecting high dimensional data down to normal direction implied by the logistic regression model using R

BNY Mellon, Jersey City, New Jersey, *Software Engineering Intern*   *Jun 2017-Aug 2017*

- Analyzed statistical relationships between work variables and code output using SQL and Python
- Implemented an augmented reality tool to view data in multiple dimensions, presented to senior leadership

Research Projects

Convergence analysis of one-block ResNets (Advised by Prof. Yuxin Chen)

- Implemented a modified ResNet in Pytorch, ran simulations and found that this modified architecture has good landscape properties: empirically, all reachable local minima are global minima.
- Showed that in the one-dimensional case that a large portion of critical points are also global minima

Multi-shot learning in graphs (Advised by Prof. Miklos Racz)

- Designed a new algorithm to recover node orderings from multiple graphs. The algorithm quickly approaches perfect accuracy as the number of graphs grows.
- Using concentration of measure to show the rates at which the algorithm converges to the truth.

Interpolated peeling: New learning algorithms for vertex order recovery (Advised by Prof. Miklos Racz)
- Created new algorithm, Interpolated Peeling, that gives more precise control over performance in order recovery, made progress in describing it precisely in theoretical terms. Implemented in R and Python
- Re-implemented a library method for preferential attachment process in Python to adhere to currently studied versions of preferential attachment.   Used method to run simulations of large graphs efficiently

"Acceleration" due to depth (Advised by Prof. Yuxin Chen, joint work with Gene Li and Hrishikesh Khandeparkar)
- Found that increasing depth in neural networks reduces regularization loss, but does not decrease "true loss" very much
- Conjecture that the reason is that regularization makes objective function look more like Lp loss, which Arora et al. showed has good optimization properties when depth is introduced in the linear case

Personal Projects
Wall Street Bets (joint work with Frank Li, Gene Li, Daniel Gao)
- Used a multinomial naïve bayes model on Reddit posts, using Python and scikit-learn to trade stocks
- Achieved greater than 50% accuracy on direction of prices during testing

Technical Skills
Proficient: Python, R, SQL, Java
Familiar/Experience with: C, C++, MATLAB, Javascript, Ocaml, Hadoop, MapReduce, C#
Software packages: Tensorflow, Pytorch, scikit-learn, PANDAS, scipy, jupyter, glmnet, igraph