Juhyun 'Simon' Park

https://parksimon0808.github.io/ juhyunp at princeton.edu

Education

Princeton University *Princeton, NJ, USA*
A.B. in Mathematics, Department GPA 3.97/4.0 *Sep 2017 - May 2013*
Certificates: Applications of Computing, Statistics and ML
(Leave of Absence for Military Service) *(2019 - 2021)*

Interests

Machine Learning Theory, Deep Learning Theory, Optimization, Natural Language Processing

Research Experience

Machine Learning Theory

1. Effect of L2 Regularization on ReLU Networks — Current
Advisor: Boris Hanin
- Analyzing how L2 regularization on infinite-width, 1-layer networks restricts the function space for 2-dimensional data
- Providing more insight into what it means to minimize total deviation norm of the gradient of a function on high dimensional input

2. Robustness of Shapley Values for Data Valuation — Spring 2021
Advisor: Sanjeev Arora
- Analyzed the robustness of Shapley values across different training settings
- Proposed a novel approach of approximating Shapley values by evaluating on simpler models with similarly expressive power

Natural Language Processing

1. Effectiveness of In-Context Learning — Current
Advisor: Danqi Chen
- Analyzing empirically what aspects of in-context learning contribute to open-domain QA and summarization tasks
- Shuffling gold answers, extracting random sentences from contexts, selecting random English words with the same semantic meaning, etc.

2. Joint Multi-task Language Model — Spring 2021
Advisor: Karthik Narasimhan
- Proposed a variation of a joint multi-task language model for Vietnamese that outperforms the baseline model

Theoretical Computer Science

1. General Matroid Secretary Problem — Spring 2021
Advisor: Matt Weinberg
- Proposed multiple algorithms for the Matroid Secretary Problem generalized from the ordinary Secretary Problem
- Proved their properties using the greedy algorithm and forbidden set frameworks

2. Free-Order Matroid Secretary Problem — Fall 2021
Advisor: Matt Weinberg
- Proposed a variation to an algorithm with a competitive ratio of 4
- For uniform matroids, proved that the variation has a constant competitive ratio; conjectured that the ratio converges to e if the size of the matroid tends to infinity
- For general matroids, empirically observed that the algorithm is likely to have a competitive ratio close to e

3. Applications of Polynomial Methods — Fall 2021
Advisor: Alan Chang
- Studied how polynomial methods can be applied to Joints and Nikodym Problems

Transportation Research and Urban Engineering Lab KAIST
Advisor: Yoonjin Yoon (Department of Civil and Environmental Engineering)

1. Resiliency of East Asian Air Network to Adversarial Attacks Summer 2019
   - Through simulations, presented that the East Asian air network is more robust to adversarial attacks than the global network

2. Prediction of Seoul Metro Ridership Summer 2019
   - Designed a LSTM model to predict the hourly ridership of Seoul metro

Publication

Arora, S., **Park, S.**, Jacob, D., and Chen, D., "Introduction to Machine Learning: Lecture Notes for COS324 at Princeton University," 2022. [link]

Park, S., "Extension of Simple Algorithms to the Matroid Secretary Problem," 2022. [link]

Awards

Shapiro Award for Academic Excellence *Sep 2019*
Princeton University, Top 3% of Class

Hanseong Sonjaehan Scholarship Foundation *Aug 2015*
Top 150 in Republic of Korea

Teaching Experience

Introduction to Machine Learning Undergraduate TA *Current*
LaTeX Trainer Lab TA *Current*
Introduction to Programming Systems Lab TA *Spring 2021, Current*
Algorithms and Data Structures Lab TA *Spring 2021, Current*
Algorithms and Data Structures Grader *Spring 2019, Fall 2021*
Computer Science: An Interdisciplinary Approach Grader *Fall 2018*

Skills

Programming Languages: Fluent in Java, Python, C / Familiar with R, SQL
Natural Languages: Native in Korean / Fluent in English, Mandarin Chinese

Relevant Coursework

Computer Science (graduate courses in **bold**, courses for next semester in *italics*)

- **Mathematical Understanding of Deep Learning**, **Understanding Large Language Models**, **Advanced Algorithm Design**, ***Optimization for Machine Learning***, Introduction to Machine Learning, Natural Language Processing, *Neural Networks: Theory and Applications*

Mathematics

- Real/Complex Analysis, Algebra, Probability, Statistics, Stochastic Systems, Theory of Computation, Game Theory, *Analysis of Big Data*

Extracurricular Activities

Korean Augmentation to the US Army *Nov 2019 - Jun 2021*
Translated for high-ranking officers
Korean Students Association at Princeton *Feb 2019 - May 2019*
Events Director
Harvard-MIT Math Tournament *Feb 2019*
Grader
Princeton University Math Competition *Nov 2018*
Tech Team, Problem Reviewer