Haiqing Gao

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2001 Longxiang Road, Shenzhen, Guangdong Province, 518172, China

Education

The Chinese University of Hong Kong, Shenzhen
M. Phil. in Computer Information and Engineering Sep. 2020 - Current
GPA: 3.63 / 4.0 (Rank 7 / 61) | Supervised by Prof. Tsung-hui Chang
B.S. in Applied Mathematics (First Honor) Sep. 2016 - May 2020
Accumulated GPA: 3.67 / 4.0 | Major GPA: 3.73 / 4.0 (Rank 5 / 48)
Academic Performance Scholarship: Top 7% in 2016 cohort of the School of Science and Engineering
Master's List: Top 10% of Math majors of Shaw College
Related Courses (All in A range): Optimization Theory and Algorithms, Matrix Analysis, Dynamic Programming, Probability Theory, Stochastic Processes (Prof. Jim Dai), Graph Theory (Prof. Janny Leung)

Research Experience

Hybrid Machine Learning via Gradient-tracking Method *(Paper in progress)* Jun. 2021 - Current
Visiting Master Student, Shenzhen Research Institute of Big Data *Supervisor: Prof. Tsung-hui Chang*
Overview: Hybrid machine learning means that a local sample-feature matrix at each node has neither whole samples nor features. Privacy protocols motivated us to design an efficient distributed algorithm.

- Formulated a nonconvex distributed optimization problem, which includes cases when each node has the whole samples (horizontal machine learning) or the whole features (vertical machine learning)
- Proposed the first multiple-steps gradient-tracking based federated learning algorithm
- Built the convergence theorem to the first-order stationary points with a rate O(1/RQ) where R is the number of communication rounds, and Q is the number of local SGD iterations

Federated Q-learning in Mobile Health (mHealth) Intervention Oct. 2020 - Dec. 2020
Overview: To release the burden of doctors, mobile devices collect health related-data and intervene if necessary. Due to the large noise and long period of obtaining enough training data, an algorithm with a single user's data is prone to fail. Meanwhile, privacy and personalization impede centralized training.

- Designed a mixed model sharing and gradient sharing federated reinforcement learning algorithm
- Constructed a generative model to capture health improvement, over-exercise and abandoning behaviors
- Doubled the speed of convergence while maintaining the same accuracy of learning a single user's data

Fairness in Driver Order Dispatch on the Online Ride-Hailing Platform May 2019 - Oct. 2019
Research Assistant, Shenzhen Research Institute of Big Data *Supervisor: Dr. Yupeng Li*

- Defined the first max-min fairness objective of drivers, which considers routing distances, expected waiting time for the next order and incomes per kilometer
- Modelled the reusability of drivers, cancellation, and perishability of requests into linear constraints
- Invented a Hungarian bottleneck algorithm with multi-armed bandit (MAB) to solve the linear max-min optimization problem

Teaching Experience

Probability and Statistics Jan. 2019 - May 2019
Undergraduate Student Teaching Fellow, the Chinese University of Hong Kong, Shenzhen

- Delivered weekly tutorials to review lectures and provide answers to exercises
- Held office hours to answer questions individually

Skills

Programming Languages/Packages: Python, Java, MATLAB, LaTeX, Pytorch, Numpy, Keras
Languages: Chinese (Native), English (TOFEL 108, Speaking 22)
GRE: V 160 + Q 168 + AW 4