Yichen Ruan

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My name is Yichen Ruan, people also call me Ethan. Visit https://ycruan.github.io to learn more about me.

education

2018-2022   **Ph.D. in Electrical and Computer Engineering** - *Carnegie Mellon University*
2016-2017   **M.S. in Systems Engineering** - *UC Berkeley*
2012-2016   **B.S. in Civil Engineering** - *Tsinghua University*
2014-2016   **Secondary Bachelor's Degree in Economics** - *Tsinghua University*

experiences

Software Engineering Intern at Facebook, Seattle - *Summer 2021*

- *Signals Intelligence* team. E2E validation for multi-party computation based private data aggregation using Python.

Software Engineering Intern at Google, Sunnyvale - *Summer 2020*

- *Knowledge Engine* team. Built a chatbot for a Google's internal orchestration service with C++.

Intern Technical PHD at PayPal, San Jose - *Summer 2019*

- *Core data platform* team. Worked on the load balancing of Linux database proxies based on Golang.

projects

Flexible Device Participation in Federated Learning

- Proposed algorithm that extends the existing FedAvg algorithm to incorporate more flexible device participation patterns in federated learning, which includes incompleteness, inactivity, late arrival, and eartly departure.

- Performed extensive theoretical analysis on the proposed algorithm. Quantitatively investigated the impacts of the flexible participation patterns on the convergence behavior and runtime efficiency of the algorithm.

- Conducted experiments with neural networks using Tensorflow to verify our theoretical discoveries.

Optimal Client Recruitment for Federated Learning

- Studied the statistical and system impacts of client recruitment on federated learning. Quantified how client recruitment controls the training accuracy, generalizability, representativeness, completion time, and cost.

- Revealed the underlying trade-offs of these quantities with an optimization framework. Proposed efficient algorithms to solve this NP-Hard optimization problem with correctness proof and complexity analysis.

- Verified our analysis by experiments using neural networks and regression models built with PyTorch.

Economic Value of Vehicular Caching

- Proposed using vehicles as cache carriers and relay nodes to improve the performance of wireless network.

- Develop a unified optimization framework for different network operator objectives; Solve these optimization problems to concretely define the value of vehicular caching, through its viability, demands, and the gain of competition.

publications

- M. Siew, S. Arunasalam, **Y. Ruan**, Z. Zhu, L. Su, S. Ioannidis, E. Yeh, C. Joe-Wong, Fair Training of Multiple Federated Learning Models on Resource Constrained Network Devices, IPSN 2023.

- **Y. Ruan**, C. Joe-Wong, FedSoft: Soft Clustered Federated Learning with Proximal Local Updating, AAAI 2022.

- **Y. Ruan**, X. Zhang, C. Joe-Wong, How Valuable Is Your Data? Optimizing Device Recruitment in Federated Learning, WiOpt 2021.

- **Y. Ruan**, X. Zhang, S.C. Liang, et al., Towards Flexible Device Participation in Federated Learning, AISTATS 2021.

- **Y. Ruan**, C. Joe-Wong, On the Economic Value of Mobile Caching, IEEE INFOCOM 2020.

- Y. Tu, **Y. Ruan**, et al., Network-Aware Optimization of Distributed Learning for Fog Computing, IEEE INFOCOM 2020.