

Yuanyuan Li

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Research Interests

Networking, optimization and machine learning. Especially, cache networks, distributed adaptive algorithms, resource allocation, multimodal learning, and experimental design.

Education

- **Northeastern University** Boston, US
Ph.D. candidate in Computer Engineering; GPA: 4.0/4.0 Sept. 2018 – April 2023 (Exp.)
Advisor: Prof. Stratis Ioannidis
- **Shanghai Jiao Tong University** Shanghai, China
M.Sc in Computer Science and Technology; GPA: 2.93/3.3 Sept. 2015 - Feb. 2018
Advisor: Prof. Guihai Chen
- **South China University of Technology** Guangzhou, China
BEng in Information Engineering (Elite Class); GPA: 3.76/4.0 Sept. 2011 - July 2015

Publications

- **Y. Li***, Y. Liu*, L. Su, E. Yeh, S. Ioannidis. Experimental Design Networks: A Paradigm for Serving Heterogeneous Learners under Networking Constraints. *IEEE/ACM Transactions on Networking (TON)*, 2023.
- **Y. Li**, Y. Zhang, S. Ioannidis, J. Crowcroft. Jointly Optimal Routing and Caching with Bounded Link Capacities. *IEEE International Conference on Communications (ICC)*, 2023.
- **Y. Li**, T. Si Salem, G. Neglia, and S. Ioannidis. Online Caching Networks with Adversarial Guarantees. *ACM International Conference on Measurements and Modeling of Computer Systems (SIGMETRICS)*, 2022.
- Y. Liu*, **Y. Li***, L. Su, E. Yeh, S. Ioannidis. Experimental Design Networks: A Paradigm for Serving Heterogeneous Learners under Networking Constraints. *IEEE International Conference on Computer Communications (INFOCOM)*, 2022.
- D. Roy, **Y. Li**, T. Jian, P. Tian, K. Roy Chowdhury and S. Ioannidis. Multi-modality Sensing and Data Fusion for Multi-vehicle Detection. *IEEE Transactions on Multimedia (TOMM)*, 2022.
- **Y. Li**, S. Ioannidis. Cache Networks of Counting Queues. *IEEE/ACM Transactions on Networking (TON)*, 2021.
- Y. Liu, **Y. Li**, Q. Ma, S. Ioannidis and E. Yeh. Fair Caching Networks. *International Symposium on Computer Performance, Modeling, Measurements and Evaluation (PERFORMANCE)*, 2020.
- **Y. Li**, S. Ioannidis. Universally Stable Cache Networks. *IEEE International Conference on Computer Communications (INFOCOM)*, 2020.
- K. Li, Y. Zhang, K. Li, **Y. Li**, Y. Fu. Visual Semantic Reasoning for Image-Text Matching, *International Conference on Computer Vision (ICCV)*, 2019. (Oral).
- **Y. Li**, L. Kong, F. Wu, Z. Zheng, G. Chen. MAPM: Movement-based Adaptive Prediction Mechanism for Energy Conservation in Body Sensor Networks. *IEEE Global Communications Conference (GLOBECOM)*, 2016.

Research Experience

- **Centralized and Distributed Experimental Design Networks**

Supervisor: Prof. Stratis Ioannidis, Edmund Yeh, Lili Su, Northeastern Univ.

Feb. 2021 - Present

- Propose the experimental design network problem, which enables the study of multi-hop data transmission strategies for distributed learning over arbitrary network topologies.
- Prove that, with Poisson data streams and D-optimal design objectives at the learners, our framework leads to the maximization of continuous DR-submodular objective.
- Propose a polynomial-time algorithm based on a variant of the Frank-Wolfe algorithm and a novel gradient estimation. This produces a solution with a $1 - 1/e$ approximation guarantee.
- Explore the distributed implementation via gradient primal-dual technique for FW variant algorithm, while preserving optimality ratio.

- **Interaction in Autonomous Driving**

Machine Learning Intern at Apollo, Baidu USA

Supervisor: Kecheng Xu, Jinghao Miao

Sept. 2021 - Dec. 2021

- Propose and implement the rule-based control point decider and gap decider, when the autonomous vehicle is in the unprotected left turn scenario at the intersection. They increases the efficiency of unprotected left turn.
- Implement a prototype reinforcement learning model (DQN) by Libtorch to determine the control point and gap to pass. Prove the feasibility of RL in unprotected left turn.

- **Multi-domain Sensing and Data Fusion for Multi-vehicle Detection**

Supervisor: Prof. Stratis Ioannidis, Kaushik Chowdhury, Northeastern Univ.

Sept. 2020 - July 2021

- Propose deep learning models for seismic, acoustic, radar and image modalities to detect and identify each vehicle in multi-vehicle scenarios.
- Explore how and when to fuse different modalities, e.g., multi-level fusion.
- Evaluate our fusion model in real-world dataset, ESCAPE. It improves 34% AUC relatively compared to the single image modality, especially the scenario with limited visibility.

- **Distributed Online Cache Algorithm**

Supervisor: Prof. Stratis Ioannidis, Northeastern Univ., Prof. Giovanni Neglia, Inria. Nov. 2019 - Feb. 2021

- Consider a online cache problem from an adversarial point of view.
- Formulate the problem as a submodular maximization under partition matroid constraint. Propose a greedy-based distributed algorithm with $O(\sqrt{T}) (1 - 1/e)$ -regret.
- Take cache update cost into consideration, we utilize coupled caching decisions to maintain $O(\sqrt{T}) (1 - 1/e)$ -regret.

- **Stable Cache Networks**

Supervisor: Prof. Stratis Ioannidis, Northeastern University

Sept. 2018 - Aug. 2019

- Model a cache network as a stable $M/M/1c$ queues network, where identical packets are consolidated. This more realistic, but complicated model leads to a non-Kelly network.
- Propose two approximations for $M/M/1c$ queues network: one via $M/M/\infty$ queues, and one based on $M/M/1c$ queues under the assumption of Poisson arrivals. We verify approximations feasibility and superiority by both experiments and analyses.
- Jointly optimize caching and queue service in cache networks, which is mixed integer NP-hard problem. We construct a $1 - 1/e$ poly-time approximation algorithm significantly outperform competitors experimentally.

Skills

- **Programming:** Python, C/C++, Matlab.
- **Software and Tools:** Pytorch, Tensorflow, PySpark, Linux, LaTeX, etc.