Yuanyuan Li

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Research Interests

Networking, optimization and machine learning. Especially, cache networks, distributed adaptive algorithms, offline/online submodular optimization, multimodal learning, and experimental design.

Education

- **Northeastern University** — Boston, US
  Ph.D. candidate in Computer Engineering; GPA: 4.0/4.0 — *Sept. 2018 – Dec. 2022 (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

- **Yuanyuan Li**, Tareq Si Salem, Stratis Ioannidis, Giovanni Neglia. Online Caching Networks with Adversarial Guarantees. *ACM International Conference on Measurements and Modeling of Computer Systems (SIGMETRICS), 2022.*
- **Yuanyuan Li**, Stratis Ioannidis. Cache Networks of Counting Queues. *IEEE/ACM Transactions on Networking (TON), 2021.*
- Yuezhou Liu, **Yuanyuan Li**, Qian Ma, Stratis Ioannidis and Edmund Yeh. Fair Caching Networks. *International Symposium on Computer Performance, Modeling, Measurements and Evaluation (PERFORMANCE), 2020.*
- **Yuanyuan Li**, Stratis Ioannidis. Universally Stable Cache Networks. *IEEE International Conference on Computer Communications (INFOCOM), 2020.*
- Kunpeng Li, Yulun Zhang, Kai Li, **Yuanyuan Li**, Yun Fu. Visual Semantic Reasoning for Image-Text Matching, *International Conference on Computer Vision(ICCV), 2019.* (**Oral**).
- **Yuanyuan Li**, Linghe Kong, Fan Wu, Zhenzhe Zheng, Guihai Chen. MAPM: Movement-based Adaptive Prediction Mechanism for Energy Conservation in Body Sensor Networks. *IEEE Global Communications Conference (GLOBECOM), 2016.*
- Linghe Kong, **Yuanyuan Li**, Fan Wu, Xiaofeng Gao, Guihai Chen. Adaptive Wireless Sensor Data Sharing System in Collaborate Robots. *Patent Number: ZL 2015 1 0946882.5.*

Research Experience

- **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.

- **Experimental Design Networks**
  Supervisor: Prof. Stratis Ioannidis, Edmund Yeh, Lili Su, Northeastern Univ. *Feb. 2021 - Aug. 2021*
  - 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 subject to a lower-bounded convex constraint set.
  - 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.
  - Evaluations show that our proposed algorithm outperforms several baselines in both maximizing the objective function and in the final quality of trained target models.

- **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.
  - Evaluate the performance of our proposed algorithm extensively against several competitors, using (both synthetic and trace-driven) experiments involving non-stationary demands.

- **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 $\texttt{M/M/}\infty$ 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, Java.
- **Software and Tools**: Pytorch, Tensorflow, PySpark, Linux, LaTeX, GNU Radio, Office, etc.