Yuanyuan Li

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Research Interests

Networking, optimization and machine learning. Especially, cache/edge 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 – Aug. 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 (GOOGLE SCHOLAR LINK)

- D. Malak, **Y. Li**, S. Ioannidis, E. Yeh and M. Mdard. Joint Optimization of Storage and Transmission via Coding Traffic Flows for Content Distribution. *International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt), 2023.* (**Best Paper Award**)

- **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 (TMM), 2022.*

- **Y. Li**, S. Ioannidis. Cache Networks of Counting Queues. *IEEE/ACM Transactions on Networking (ToN), 2021.*

- **Y. Li**, S. Ioannidis. Universally Stable Cache Networks. *IEEE International Conference on Computer Communications (INFOCOM), 2020.*

- 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.*

- K. Li, Y. Zhang, K. Li, **Y. Li**, Y. Fu. Visual Semantic Reasoning for Image-Text Matching. *IEEE 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

- **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, while preserving optimality ratio.

- **Multi-modality Sensing and Data Fusion**

  Supervisor: Prof. Stratis Ioannidis, Kaushik Chowdhury, Northeastern Univ.   *Sept. 2020 - Present*

  - 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.

- **Multimodal Planning in Autonomous Driving**   ML 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 increase the efficiency, as perception/prediction-based methods are inaccurate.
  - Implement a prototype reinforcement learning model (DQN) by C++ Libtorch to determine the control point and gap to pass. Prove the feasibility of RL in unprotected left turn.

- **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/∞ 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, Git, Tensorflow, PySpark, Linux, LaTeX, etc.