

Aoyu Gong

Contact Information	Route Louis Favre 4, CH-1024 Ecublens, Switzerland Personal Website Google Scholar GitHub LinkedIn	+41 79 657 71 50 aoyu.gong@epfl.ch
Educational Background	Master of Science , Communication Systems École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland • GPA: 5.74/6.00	<i>Sep. 2021 – Present</i>
	Bachelor of Engineering , Communication Engineering Nanjing University of Science and Technology, Nanjing, China • GPA: 3.90/4.00	<i>Sep. 2015 – Jun. 2019</i>
Work Experience	Research Assistant , Laboratory for Visual Intelligence for Transportation École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland • Topic: Rethink traditional operations research problems with deep reinforcement learning	<i>Mar. 2023 – May 2023</i>
Selected Research Experience	The Transformer Network for the Dial-a-Ride Problem [Semester Project Student] supervised by Prof. Alexandre Alahi • Consider the Dial-a-Ride Problem (DARP) which involves designing vehicle routes and schedules for users who specify requests for transportation from pick-up sources to drop-off destinations. • Formulate the DARP as a Markov decision process (MDP), convert the states and actions of this MDP into features and labels, and further create datasets by the realizations of this MDP. • Propose a Transformer-based architecture that uses learned embeddings and cascade encoders. • Train the proposed models using supervised and reinforcement learning, utilize greedy search and beam search for decoding, and propose three new evaluation metrics to validate the design.	<i>Aug. 2022 – Jan. 2023</i>
	Dynamic Optimization of Random Access in Deadline-Constrained Broadcasting [Research Collaborator] collaborating with Prof. Yijin Zhang • Consider random access in deadline-constrained broadcasting with frame-synchronized traffic. • Define a dynamic control scheme that allows each active node to determine its transmission probability based on the local knowledge of the current delivery urgency and contention intensity. • Develop an MDP framework for an idealized environment and a partially observable MDP framework for a realistic environment by which an optimal scheme can only in theory be found. • Investigate the behaviors of the optimal scheme for extreme cases in the MDP framework, leverage intuition gained from these behaviors to propose a heuristic scheme for the realistic environment, and generalize the heuristic scheme to support retransmissions.	<i>Jun. 2020 – Feb. 2021</i>
	Generalized p-Persistent CSMA for Asynchronous Multiple-Packet Reception [Principal Investigator] supported by the National Undergraduate Innovation and Entrepreneurship Training Program under Grant 201710288029 • Consider a multiple-access system with multiple-packet reception capability γ , i.e., a packet can be successfully received as long as it overlaps with $\gamma - 1$ or fewer other packets during its lifetime.	<i>Apr. 2017 – Oct. 2018</i>

- Generalize p -persistent CSMA to consider that a user with carrier sensing capability c adopts the transmission probability p_n if this user has sensed n ongoing transmissions for $n = 0, 1, \dots, c - 1$.
- Formulate such CSMA as a parameterized MDP and utilize the long-run average performance to evaluate the saturation throughput.
- Modify the MDP to establish an upper bound on the maximum throughput and modify the MDP again to propose a heuristic design with near-optimal performance.

Selected Preprints & Publications

* stands for the equal contributions. A full list can be found [here](#).

5. Yijin Zhang*, **Aoyu Gong***, Lei Deng, Yuan-Hsun Lo, Yan Lin, Jun Li, “Achieving maximum urgency-dependent throughput in ALOHA-like random access,” submitted to *IEEE Transactions on Communications* (third round of review).
4. Jingwei Liu, Rui Zhang, **Aoyu Gong**, He Chen, “Optimizing age of information in wireless uplink networks with partial observations,” *IEEE Transactions on Communications*, vol. 71, no. 7, pp. 4105–4118, 2023. [Technical Report]
3. **Aoyu Gong**, Yijin Zhang, Lei Deng, Fang Liu, Jun Li, Feng Shu, “Dynamic optimization of random access in deadline-constrained broadcasting,” *IEEE Transactions on Network Science and Engineering*, vol. 10, no. 4, pp. 2059–2073, 2023. [Technical Report] [Code]
2. **Aoyu Gong***, Tong Zhang*, He Chen, Yijin Zhang. “Age-of-information-based scheduling in multiuser uplinks with stochastic arrivals: A POMDP approach,” in *Proc. IEEE GLOBECOM*, Dec. 2020, pp. 1–6. [PDF] [Code] [Slides]
1. Yijin Zhang, **Aoyu Gong**, Yuan-Hsun Lo, Jun Li, Feng Shu, Wing Shing Wong. “Generalized p -persistent CSMA for asynchronous multiple-packet reception,” *IEEE Transactions on Communications*, vol. 67, no. 10, pp. 6966–6979, 2019. [PDF] [Code] [Slides]

Awards & Honors

- Provincial Best Bachelor Thesis Award** *Sep. 2020*
- Awarded by Jiangsu Provincial Department of Education (across all disciplines)
- Bachelor of Engineering with Honors** *Jun. 2019*
- Awarded by Nanjing University of Science and Technology (**top 5%**)
- NJUST Best Bachelor Thesis Award** *Jun. 2019*
- Awarded by Nanjing University of Science and Technology (across all disciplines)
- National Scholarship** (Three Times) *Nov. 2018 / 2017 / 2016*
- Awarded by Ministry of Education of the People’s Republic of China (**top 1%**)
- NJUST Special-Class Scholarship** (Six Times) *Mar. & Sep. 2018 / 2017 / 2016*
- Awarded by Nanjing University of Science and Technology (**top 1%**)

Interests & Skills

Area of Interest:

- Deep reinforcement learning in operations research
- Random access protocols in wireless networks

Computer Skills:

- Python (> 5k lines of code), MATLAB (> 5k lines of code), C++, VHDL