# Xinran ZHAO

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#### **EDUCATION**

## City University of Hong Kong

- Ph.D. Candidate in Electrical Engineering
- Supervisor: Prof. Lin DAI
- GPA: 4.15/4.30

## Huazhong University of Science and Technology

Bachelor in Electronic and Information Engineering

- GPA: 3.86/4.0 (89/100)
- Thesis: "Random access toward massive machine-to-machine communications: Performance analysis and protocol design" (Outstanding Undergraduate Thesis Award)

## **RESEARCH INTERESTS**

- Distributed multiple access: Modeling, performance analysis and optimal design.
- · Next-generation wireless communication networks: Massive Internet of Things, low-latency communications, and distributed learning-based access design.

#### **PUBLICATIONS**

- J=JOURNAL, C=CONFERENCE, S=IN SUBMISSION
- [S1] Xinran Zhao and Lin Dai, "Throughput-optimal random access: A queueing-theoretical analysis for learning-based access design," under review. (Preprint: https://arxiv.org/abs/2504.03178)
- [J2] Xinran Zhao and Lin Dai, "To sense or not to sense: A delay perspective," IEEE Transactions on Communications, vol. 73, no. 6, pp. 3863-3879, June 2025.
- Xinran Zhao and Lin Dai, "Connection-based Aloha: Modeling, optimization, and effects of connection [**J**1] establishment," IEEE Transactions on Wireless Communications, vol. 23, no. 2, pp. 1008–1023, Feb. 2024.
- [C1] Xinran Zhao and Lin Dai, "To sense or not to sense: A delay perspective," IEEE International Conference on Communications, Denver, CO, USA, 2024, pp. 2318-2323.

## **ACADEMIC EXPERIENCE**

## • Learning-Based Random Access: Design and Optimization [S1]

- Two learning-based random access schemes were proposed for throughput optimization based on a Multi-Armed-Bandit (MAB) framework.
- The proposed schemes were shown to both achieve the maximum throughput of 1, though with different throughput-fairness tradeoffs.
- · A unified queueing-theoretical framework was established, based on which the optimal throughput-fairness tradeoff and the corresponding parameter setting are obtained for the proposed schemes.

## • Random Access: Unified Modeling, Optimization and Comparison [J2]

- A unified analytical framework for random access was established, which incorporates various access design features including sensing-free or sensing-based, connection-free or connection-based, and backoff.
- The unified framework enables not only the delay characterization and optimization for a given random access scheme, but also a comprehensive comparison of optimal delay performance across different schemes.
- Useful criteria, such as the upper-bound of sensing time for benenficial sensing, were obtained and further applied to random access schemes in 5G networks.
- Connection-Based Aloha: Modeling and Performance Optimization [J1]
- A scalable model was developed for connection-based Aloha.
- Both the throughput performance and queueing delay performance were characterized, optimized, and compared with those for connection-free Aloha.
- Conditions for beneficial connection establishment were discussed and further applied to random access schemes in 5G networks.

Aug. 2020 - Present Hong Kong SAR

Sep. 2016 - Jun. 2020 Wuhan, China

Jul. 2024 - Present

Aug. 2020 - Sep. 2022

Oct. 2022 - Jun. 2024

## **TEACHING EXPERIENCE**

#### • Tutor for Final Year Projects

- Optimal Backoff Tuning for Massive Access of Machine-type Devices in 5G Networks Fall 2024
- Massive Access for Beyond-5G Communications Networks: Connection-based or Connection-free?

Fall 2021, Fall 2022, Spring 2024

 $\circ$  Energy-Efficient Massive Access for Machine-to-Machine Communications

## Teaching Assistant

- Data Engineering and Learning Systems
- Mobile Communication and Networks
- Principles of Communications

## **PROJECT EXPERIENCE**

## • Intelligent Control System of Tobacco Baking Room

- *Team leader of a collaboration project between Dian Group (student tech team in HUST) and China Tobacco* Wuhan, China
  **Back-End Development**: Developed server-side APIs. Implemented functions include data reception from IoT terminals, status monitoring of baking rooms, historical data statistics, remote control, etc.
- **System Debugging and Deployment**: Conducted joint debugging between the server and IoT embedded terminals based upon the LoRaWAN architecture. The system was deployed and used in practical tobaccobaking scenarios.
- Skills: Python Django, MySQL, Redis and LoRaWAN.

## • Online Exam System

- Member of a project at Dian Group
- **Back-End Development**: Developed server-side APIs. Implemented functions include question bank management, examinee information management, online examination, grading, etc.
- Skills: Python Flask and MySQL.

## AWARDS

- Research Tuition Scholarship
- EE Graduate Research Seminar Award 3nd Prize
- Outstanding Undergraduate Thesis Award

City University of Hong Kong, Sep. 2023 Dept. of EE, City University of Hong Kong, May 2022 Huazhong University of Science and Technology, Jun. 2020

## SKILLS

• Mathematical Tools: Probability theory, queueing theory, stochastic process, reinforcement learning.

• **Programming Languages:** MATLAB, C/C++, Python.

## Additional Information

• Languages: Mandarin (native) and English (IELTS 7.0, expired)

Mar. 2019 - Jan. 2020

Fall 2021, Spring 2023

*Sep.* 2018 - Jan. 2020 Wuhan, China

Spring 2024 Spring 2022, Fall 2022, Fall 2023

Fall 2020

Mar 2010 In 200