Yanxiao Liu

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Education

The Chinese University of Hong Kong **2021.8–2025.7 (estimated)**
Ph.D. candidate, Department of Information Engineering
Advisors: Prof. Cheuk Ting Li and Prof. Raymond W. Yeung
GPA: 3.763/4.000

Stanford University **2024.1–2024.6**
Visiting Student Researcher, Department of Electrical Engineering
Advisor: Prof. Ayfer Özgür

The Chinese University of Hong Kong, Shenzhen **2017–2021**
B.Eng. in Electronic Information Engineering and minor in Philosophy
Advisor: Prof. Shenghao Yang

Research

- **One-shot/finite-blocklength network information theory**: I prove one-shot achievability results, second-order results and asymptotic inner/outer bounds on classical network information theory problems. Currently, my primary focus is on lossy compression, channel simulation and interference channels.
- **Machine learning and privacy**: I provide theoretical understanding of machine learning problems through the application of information theory techniques. I am currently employing channel simulation techniques to distributed machine learning, differential privacy and generalization error bounds.
- **Modern wireless communications**: I develop fundamental theory and low-complexity algorithms for large-scale networks in challenging environments. I design practical algorithms that jointly solve the multiflow, scheduling and network coding in large-scale networks. I also provide information-theoretic bounds on multi-hop network settings.

Awards

- CUHK PhD International Mobility for Partnerships and Collaborations Award 2023-24.
- NeurIPS Scholar Award (2024).
- ISIT Travel Award (2024).

Publications

In next page.

Publications

Preprints

[1] **Yanxiao Liu**, Sepehr Heidari Advary, and Cheuk Ting Li. "Nonasymptotic Oblivious Relaying and Variable-Length Noisy Lossy Source Coding". In: *Submitted to ISIT* (2025).

[2] **Yanxiao Liu** and Cheuk Ting Li. "One-Shot Coding over General Noisy Networks". In: *Submitted to IEEE Transactions on Information Theory* (2024).

[3] **Yanxiao Liu**, Chih Wei Ling, and Cheuk Ting Li. "Weighted Polar Codes for Channels with State". In: *to be submitted* (2024).

[4] **Yanxiao Liu**, Shenghao Yang, and Cheuk Ting Li. "Joint Scheduling and Multiflow Maximization in Wireless Networks". In: *to be submitted* (2024).

Journal Articles

[5] Chih Wei Ling*, **Yanxiao Liu* (co-first author)**, and Cheuk Ting Li. "Weighted Parity-Check Codes for Channels with State and Asymmetric Channels". In: *IEEE Transactions on Information Theory* 70.8 (2024), pp. 5573–5588.

[6] Shenghao Yang, Jun Ma, and **Yanxiao Liu**. "Wireless Network Scheduling with Discrete Propagation Delays: Theorems and Algorithms". In: *IEEE Transactions on Information Theory* 70.3 (2024), pp. 1852–1875.

Conference Proceedings

[7] **Yanxiao Liu**, Wei-Ning Chen, Ayfer Özgür, and Cheuk Ting Li. "Universal Exact Compression of Differentially Private Mechanisms". In: *The Thirty-Eighth Annual Conference on Neural Information Processing Systems (**NeurIPS**)*. 2024.

[8] **Yanxiao Liu** and Cheuk Ting Li. "One-Shot Coding over General Noisy Networks". In: *2024 IEEE International Symposium on Information Theory (**ISIT**)*. 2024.

[9] **Yanxiao Liu** and Cheuk Ting Li. "One-Shot Information Hiding". In: *2024 IEEE Information Theory Workshop (**ITW**)*. 2024.

[10] Yijun Fan, **Yanxiao Liu**, Yi Chen, Shenghao Yang, and Raymond W. Yeung. "Reliable Throughput of Generalized Collision Channel Without Synchronization". In: *2023 IEEE International Symposium on Information Theory (**ISIT**)*. 2023.

[11] Yijun Fan, **Yanxiao Liu**, and Shenghao Yang. "Continuity of Link Scheduling Rate Region for Wireless Networks with Propagation Delays". In: *2022 IEEE International Symposium on Information Theory (**ISIT**)*. 2022.

[12] Chih Wei Ling, **Yanxiao Liu**, and Cheuk Ting Li. "Weighted Parity-Check Codes for Channels with State and Asymmetric Channels". In: *2022 IEEE International Symposium on Information Theory (**ISIT**)*. 2022.

[13] Jun Ma, **Yanxiao Liu**, and Shenghao Yang. "Rate Region of Scheduling a Wireless Network with Discrete Propagation Delays". In: *IEEE INFOCOM 2021-IEEE Conference on Computer Communications (**INFOCOM**)*. 2021.

Teaching Assistance

I have served as a teaching assistant for 9 courses, 8 of which were unique, including 2 at the graduate level. My areas of assistance spanned information theory, optimization, probability theory, statistics, discrete mathematics, electronic circuits, and practical computer network laboratories.

Graduate School Courses:

- ENGG5301: Information Theory (Fall 2022-23, Instructor: Prof. Cheuk Ting Li)
  - I was the sole TA supporting this PhD-level course (≈ 60 students). I prepare materials, give weekly tutorials, hold weekly office hours, and grade homework and exams.
- CIE/DDA6010(At CUHKSZ): Optimization Theory and Examples (Fall 2019-20, Instructor: Prof. Stark Draper)
  - I build up, organize and compile lecture notes (155 pages) from scratch, click $\rightarrow$ [Notes].

Undergraduate Courses:

- IERG2060-ESTR2304: Basic Analog and Digital Circuits (Fall 2021-22, Instructor: Dr. Marco Ho)
- IERG2470-ESTR2308: Probability Models and Applications (Spring 2021-22, Instructor: Prof. Raymond W. Yeung)
- IERG2470-ESTR2308: Probability Models and Applications (Spring 2022-23, Instructor: Prof. Cheuk Ting Li)
- IERG3800: Information Infrastructure Design Lab (Fall 2023-24, Instructor: Prof. Yiu Bun Lee)
- IERG3050: Simulation and Statistical Analysis (Fall 2023-24, Instructor: Prof. Cheuk Ting Li)
- ENGG2440: Discrete Mathematics for Engineers (Fall 2024-25, Instructor: Prof. Cheuk Ting Li)
- MIEG2440-ESTR2362: Discrete Structures and Probability (Spring 2024-25, Instructor: Prof. Cheuk Ting Li)

Industrial Experience

Pingan Technology **2020.8–2020.10**
Software Engineer

Postgraduate Courses Studied

GPA: 3.763/4.000

- ENGG5301 Information Theory (Fall 2021-22, Instructor: Prof. Raymond W. Yeung)
- ENGG5781 Matrix Analysis and Computations (Fall 2021-22, Instructor: Prof. Wing-Kin (Ken) Ma)
- ENGG5303 Advanced Wireless Communications (Spring 2021-22, Instructor: Prof. Ying-Jun Angela Zhang)
- IERG5200 Channel Coding and Modulation (Spring 2021-22, Instructor: Prof. Pascal O. Vontobel)
- IERG6300 Theory of Probability (Spring 2021-22, Instructor: Prof. Chandra Nair)
- IERG5290 Network Coding Theory (Fall 2022-23, Instructor: Prof. Raymond W. Yeung)
- IERG6154 Network Information Theory (Spring 2022-23, Instructor: Prof. Chandra Nair)
- IERG6130 Positive Definite Matrices (Sit-in, Spring 2024-25, Instructor: Prof. Amin Gohari)