Lyutianyang Zhang

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Education

- **University of Washington** — Seattle, WA
  Ph.D. in Electrical Engineering, GPA 3.82/4.0, Supervisor: Sumit Roy, Fellow, IEEE — *Sept. 2019 – Jun. 2023*
- **University of Washington** — Seattle, WA
  M.S. in Electrical and Computer Engineering, GPA 3.82/4.0 — *Sep. 2017 – August 2019*
- **University of Washington** — Seattle, WA
  M.S. in Applied Mathematics, GPA 3.82/4.0 — *Sep. 2019 – June 2022*
- **The Australian National University** — Canberra, Australia
  B.S. in Electrical Engineering, Cumulative GPA 3.85/4.0, Major 4.0/4.0 — *Jul. 2015 – Jun. 2017*
- **Beijing Institute of Technology** — Beijing, China
  B.S. Electronic Science and Technology, Cumulative GPA 3.75/4.0, Major 3.9/4.0 — *Sep. 2013 – Jun. 2015*

Research Interest

My research interests focus on deep learning based channel access and Multi-link Operation in WiFi 7, PHY-MAC layer resource allocation based on optimization theory in mobile edge computing and 5G NR.

Relevant Courses, Skills, Award

- Probability and Random Process, Wireless Communication, Communication Theory, Digital Signal Processing, Computer Networking, Dynamic Systems, Optimization Theory, Artificial Intelligence for Engineering, and Machine/Deep Learning
- Programming Languages: Python, MATLAB, C++
- Teaching Assistance at University of Washington: Probability and Random Process, Computer networking
- Research Assistance at University of Washington Fundamental Laboratory
- Meritorious Award in Mathematical Contest in Modeling (2015,2017)
- Beijing Undergraduate Student Entrepreneurship Silver award

Professional Experiences

- **Assistant Professor - Full Time** — Chongqing, China
  Chongqing University — *2025/2-current*
  - AI-powered Cross-Layer Wi-Fi 8 Optimization: Channel sounding and access optimization. Link-level simulator design for Wi-Fi and cellular system.
- **WiFi Standard Senior Engineer - Full Time** — Shenzhen, Guangdong
  Huawei Technology, Inc. — *2024/9-current*
  - Propose new Wi-Fi technology to advance the open IEEE Wi-Fi 802.11bn PHY and MAC standardization globally. Discuss with tech companies globally in WiFi 8 TGBN teleconference for IEEE Wi-Fi proposal and achieve consensus in future WiFi 8 spec. IEEE WiFi 8 Standarization working group voter and contributor. Currently holding 4 WiFi 8 patents and one IEEE WiFi 8 proposal pending for submission.
- **WiFi Performance Software Engineer - Full Time** — Cupertino, CA
  Apple, Inc. — *2023/5-2024/5*
  - Implementing performance evaluation of iPhone DL/UL rate adaptation with data collection and analysis. In charge of lab setup including fader, attenuator, NED, FF, and etc. in RF shield box for RvR testing, concentrating on data analysis and performance debugging on link adaptation and medium utilization on MAC and PHY. Looking for improvements and proposing algorithm tuning for current communication products for performance enhancement.
- **2022 Summer Intern 5G O-RAN Engineer** — Cupertino, CA
  Celona Inc. — *Summer 2022*

- 5G O-Ran Integration of 5G Core network, Baseband Unit, Active Antenna Unit, User Equipment. Implementation of End-End UE connection to 5G core network. Chip-level Data collection (QXDM/QCAT) using serial communication from UE for Debugging, performance (UE coverage, throughput, latency, jitter, and handover) analysis, and business product validation. UERANSIM is utilized to verify the Celona 5G core performance in which multiple UEs and one gNodeB are instantiated to emulate the end-to-end communication scenarios.

- **2019 Summer Intern Spectrum Research** Naperville, Chicago
  Nokia *Summer 2019*
  - European railway communication system suffers from power coexistence issue of different communication systems (Operator base stations with different standard and railway communication base stations), Doppler effect, and power leakage, for which I verified and explored improvements that the current filter design and dynamic spectrum schemes. I applied dynamic spectrum sharing algorithms (convex/non-convex optimization, convolutional neural network, deep reinforcement learning) to solve the coexistence issue and the data analysis had been implemented for link budget between different transceivers to analyze the severity of interference.

- **Algorithm Engineer** Xi'an, China
  TCL Technology *Spring 2021*
  - Implemented neural network based end-to-end Text-to-Speech (TTS). My work involves generating Mel-spectrogram from text, and then synthesize speech from the Mel-spectrogram using vocoder such as convolutional neural network and transformer with self-attention mechanism. The applied transformer with non-parallel sequence generation can generate parallel Mel-spectrogram, which is faster than traditional auto-regressive RNN-based method such as BERT etc.

Research Projects

- **5G New Radio Vehicle-to-Everything (V2X) Simulator** Washington D.C.
  National Institute of Standards and Technology (NIST) *Matlab*
  Advisor: Chunmei Liu
  - Developed end-to-end 5G NR V2X simulator aligning with the current 3GPP 5G New Radio (NR) sidelink Release 16. This simulator provides researchers with a comprehensive simulation platform that allows for extensive NR sidelink link-level evaluation. I participated in the transport block generation for side-link control information and physical side-link shared channel. Developed OFDM Modulation, Precoding, channel modelling, channel estimation, and channel equalization in 5G NR V2X transceiver architecture. The simulator delivers block error rate from the transmitting baseband data stream to receiving data stream considering the comprehensive MAC layer and flexible PHY layer configuration.

- **Deep Reinforcement learning-aided for AP-coordination in Wi-Fi 7** Seattle, WA
  university of Washington *Python, NS3*
  Advisor: Sumit Roy
  - Enterprise Wi-Fi constitutes the design challenge for next-generation networks. Recently started IEEE 802.11be indicates Significant medium access control layer changes are needed to coordinate multi-AP channel access due to high collision probability with IEEE 802.11 DCF, especially in dense overlapping Wi-Fi networks. Coexistence of multiple Access point and Multiple mobile devices can be further improved by deep reinforcement learning while the traditional communication protocol such as IEEE 802.11 DCF remains unaffected with only the replacement of binary exponential backoff mechanism. I applied deep Q-learning and Asynchronous Actor-Critic Agent (A3C) to achieve the enhancement to the throughput and fairness in the IEEE 802.11be network. To enable faster training speed and better performance, federated learning is applied in multi-agent network.

- **5G NR data multiplexing and Cloud computing** Seattle, WA
  University of Washington *Python, Matlab*
  Advisor: Sumit Roy
  - 5G New Radio (NR) is envisioned to efficiently support both enhanced mobile broadband (eMBB) and ultra-reliable low-latency communication. Scheduler considering physical layer parameters, proportional fairness among eMBB and URLLC users, and throughput maximization is formulated as a complex integer programming which is solved using difference of convex, concave-convex procedure and improvised proportional fairness algorithm. The optimization theory is applied to a newly proposed mobile edge computing model in AR/VR and online gaming scenarios considering joint computation, caching, communications between mobile edge devices and remote servers

- **Efficient PHY Layer Abstraction under Imperfect Channel Estimation** Seattle, WA
  University of Washington *Python, Matlab, NS3*
  Advisor: Sumit Roy, Tom Henderson
  - As network simulators such as NS3 have been suffering from the large computational complexity in the physical (PHY) layer, a PHY layer abstraction model that efficiently and accurately characterizes the PHY layer performance from the system level simulations is well-needed. This project improves an efficient PHY layer method, EESM-log-SGN PHY layer abstraction, by considering the presence of channel estimation error. Finally, the developed methods are validated under different orthogonal frequency division multiplexing (OFDM) scenarios.

- **IEEE 802.11ax/be simulator Design and Optimized Channel Sounding** Seattle, WA
  University of Washington *Matlab, Python*
  Advisor: Sumit Roy
  - This simulator is design for full phy layer plus frame level packet exchange for IEEE 802.11ac/ax/be performance analysis on packet level emphasizing channel sounding considering time-varying IEEE channel model.
  - The channel sounding period optimization is one of the major advancing direction in next-Gen WiFi system because the channel sounding period and the correspondingly introduced overhead can impact the overall network throughput significantly.
  - In this project, channel sounding period problem is formulated as a non-convex problem, which brings huge challenge to optimal channel sounding period.
  - Optimization theory, machine learning techniques are utilized to propose the algorithm to pinpoint the globally optimal channel sounding period with high time-complexity and sub-optimal channel sounding period with lower time-complexity for universal WiFi systems.

Journal Publications

- **Lyutianyang Zhang**, Hao Yin, Sumit Roy, Liu Cao*, Xiangyu Gao and Valin Sathya, "IEEE 802.11be Network Throughput Optimization with Multi-Link Operation and AP Controller," IEEE Internet of Things Journal, vol. 11, no. 13, pp. 23850-23861, 1 July1, 2024.
- **Lyutianyang Zhang**, Yaping Sun, Zhiyong Chen* and Sumit Roy, "Communications-Caching-Computing Resource Allocation for Bidirectional Data Computation in Mobile Edge Networks," IEEE Transactions on Communications, vol. 69, no. 3, pp. 1496-1509, March 2021.
- Hao Yin, **Lyutianyang Zhang*** and Sumit Roy, "Multiplexing URLLC Traffic Within eMBB Services in 5G NR: Fair Scheduling," IEEE Transactions on Communications, vol. 69, no. 2, pp. 1080-1093, Feb. 2021.
- **Lyutianyang Zhang**, Hao Yin*, Sumit Roy, and Liu Cao,"Multi-Access Point Coordination for Next-Gen Wi-Fi Networks Aided by Deep Reinforcement learning," IEEE Systems Journal, vol. 17, no. 1, pp. 904-915, March 2023.
- Xiangyu Gao, Hao Yin, Sumit Roy, and **Lyutianyang Zhang***,"Static Background Removal in Vehicular Radar: Filtering in Azimuth-Elevation-Doppler Domain," in IEEE Sensors Journal, vol. 25, no. 3, pp. 5249-5258, 2025.
- L. Cao, **Lyutianyang Zhang**, Sumit Roy, "Efficient PHY Layer Abstraction under Imperfect Channel Estimation," IEEE Wireless Communications Letters, vol. 12, no. 3, pp. 530-534, March 2023.
- Peng Liu, Chen Shen, Chunmei Liu, Fernando J. Cintrón, **Lyutianyang Zhang**, Liu Cao, Richard Rouil, Sumit Roy, "Towards 5G new radio sidelink communications: A versatile link-level simulator and performance evaluation," Computer Communications, Volume 208, 2023, Pages 231-243, ISSN 0140-3664.
- Liu Cao, **Lyutianyang Zhang***, Sian Jin and Sumit Roy, "Revisiting Multi-User Downlink in IEEE 802.11be/bn: A Designers Guide to MU-MIMO", under review, IEEE Communications Standard Magazine.
- **Lyutianyang Zhang*** and et. al., "Scheduling IEEE 802.11be Multi-Link Operation for Low Latency and High Reliability", under major review, IEEE Transactions on Green Communications and Networking.
- **Lyutianyang Zhang**, et.al., "Cross-Layer Channel Sounding Optimization Towards Next-Gen Wi-Fi: A Hybrid Model and Data Driven Method", submitted to IEEE Transactions on Wireless Communications

Conference Publications

- **Lyutianyang Zhang**, Mengbin Ye, Brian D.O. Anderson, Peter Sarunic and Hatem Hmam,"Cooperative localisation of UAVs in a GPS-denied environment using bearing measurements," 2016 IEEE 55th Conference on Decision and Control (CDC), Las Vegas, NV, USA, 2016, pp. 4320-4326.
- Hao Yin, Pengyu Liu, Keshu Liu, Cao Liu, **Lyutianyang Zhang**, Yayu Gao and Xiaojun Hei,"ns3-ai: Fostering Artificial Intelligence Algorithms for Networking Research," In Proceedings of the 2020 Workshop on ns-3 (WNS3 '20). Association for Computing Machinery, New York, NY, USA, 2020, pp. 57–64.
- **Lyutianyang Zhang**, Hao Yin, Zhanke Zhou, Sumit Roy and Yaping Sun,"Enhancing Wi-Fi multiple access performance with federated deep reinforcement learning," 2020 IEEE 92nd Vehicular Technology Conference (VTC2020-Fall), Victoria, BC, Canada, 2020, pp. 1-6.
- Liu Cao, Hao Yin, Jie Hu and **Lyutianyang Zhang**,"Performance Analysis and Improvement on DSRC Application for V2V Communication," 2020 IEEE 92nd Vehicular Technology Conference (VTC2020-Fall), Victoria, BC, Canada, 2020, pp. 1-6.
- Vanlin Sathya, **Lyutianyang Zhang** and Mehmet Yavuz,"Towards Private 5G O-RAN Implementation: Performance and Business Validation," 2022 IEEE Future Networks World Forum (FNWF), Montreal, QC, Canada, 2022, pp. 676-681.
- Vanlin Sathya, **Lyutianyang Zhang** and Mehmet Yavuz,"A Comparative Measurement Study of Commercial WLAN and 5G LAN Systems," 2022 IEEE 96th Vehicular Technology Conference (VTC2022-Fall), London, United Kingdom, 2022, pp. 1-7.
- Peng Liu, Chen Shen, Chunmei Liu, Fernando J. Cintrón, **Lyutianyang Zhang**, Liu Cao, Richard Rouil and Sumit Roy,"5G New Radio Sidelink Link Level Simulator and Performance Analysis," In Proceedings of the 25th International ACM Conference on Modeling Analysis and Simulation of Wireless and Mobile Systems (MSWiM '22). Association for Computing Machinery, New York, NY, USA, 2022, pp. 75-84.

- **Lyutianyang Zhang**, Liu Cao and Sumit Roy,"Efficient PHY Layer Abstraction for 5G NR Sidelink in ns-3," In Proceedings of the 2023 Workshop on ns-3 (WNS3 '23). Association for Computing Machinery, New York, NY, USA, 2023, pp. 115–120.
- Vanlin Sathya, **Lyutianyang Zhang**, Mohit Goyal and Mehmet Yavuz,"Warehouse Deployment: A Comparative Measurement Study of Commercial Wi-Fi and CBRS Systems," 2023 International Conference on Computing, Networking and Communications (ICNC), Honolulu, HI, USA, 2023, pp. 242-248.
- Yaping Sun, **Lyutianyang Zhang**, Zhiyong Chen and Sumit Roy,"Communications-Caching-Computing Tradeoff Analysis for Bidirectional Data Computation in Mobile Edge Networks," 2020 IEEE 92nd Vehicular Technology Conference (VTC2020-Fall), Victoria, BC, Canada, 2020, pp. 1-5.
- Liu Cao, Hao Yin, Ran Wei and **Lyutianyang Zhang**, "Optimize Semi-Persistent Scheduling in NR-V2X: An Age-of-Information Perspective," 2022 IEEE Wireless Communications and Networking Conference (WCNC), Austin, TX, USA, 2022, pp. 2053-2058.

Reviewers

- IEEE Transactions on Communications (TCOM)
- IEEE Transactions on Mobile Computing (TMC)
- IEEE Internet of Things Journal (IOTJ)
- IEEE Transactions on Vehicular Technology (TVT)
- IEEE Wireless Communications Letters
- IEEE Global Communications Conference
- IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)
- IEEE Wireless Communications and Networking Conference (WCNC)
- TPC reviewer: 2025 International Conference on Computer Sciences, Engineering, and Technology Innovation (ICoCSETI) (ICoCSETI 2025).
- TPC reviewer: IEEE International Conference on Advanced Networks and Telecommunication Systems (IEEE ANTS)