Dr. Zirui Zhuang

CONTACT INFORMATION

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EDUCATION

Beijing University of Posts and Telecommunications, Beijing, China
Ph.D. in Information and Communication Engineering,   November, 2020
B.S. in Electronic Information Engineering,   July, 2015

ACADEMIA EXPERIENCE

Beijing University of Posts and Telecommunications, Beijing, China
State Key Laboratory of Networking and Switching Technology
School of Computer Science
    Associate Researcher   **January, 2023 - Present**
    Postdoctoral Research Fellow   **January, 2021 - Janurary, 2023**
University of Houston, Texas, United States
Wireless Networking, Signal Processing and Security Lab
ECE Department
    Visiting Scholar   **May, 2019 - November, 2019**

INDUSTRY EXPERIENCE

E-Byte Co., Ltd., (*formerly known as* EBupt Co., Ltd.,) Beijing, China
Technical Expert   **February, 2022 - Present**
Senior Research and Development   **November, 2020 - February, 2022**
Research and Development   **July, 2015 - November, 2020**
Internship   **September, 2014 - July, 2015**

GRANT

Academia Projects

1. **Principal Investigator** of general project: "Knowledge-Driven Intelligent Decision Theory for Edge Networks Routing," China Postdoc Science Foundation, CNY 80,000, 2022M710468, 2022-2024.

2. **Principal Investigator** of young scientists project: "Case-Based Learning for Intelligent Routing in Edge Networks: Mechanism, Theory, and Stability Analysis," National Natural Science Foundation of China, CNY 300,000, 62101064, 2021-2024.

3. **Participant** of general project: "A Research on Transient Edge Resource Collaboration Theory for Autonomous Driving Networks," National Natural Science Foundation of China, CNY 640,000, 62071067, 2021-2024.

4. **Participant** of a subproject of "Broadband Communications and New Networks," National Key Research and Development Program of China, CNY 6,740,000, 2020-2023.

5. **Participant** of general project: "A research on Machine Leaerning-Based Resource Management Optimization for Software-Defined Networks," Natural Science Foundation of Beijing, CNY 180,000, 4182041, 2018-2020.

6. **Participant** of general project: "A Research on Multi-Path Transmission Mechanisim and Joint Optimization Theory for Software-Defined Data Centers," National Natural Science Foundation of China, CNY 580,000, 61671079, 2017-2020.

Industry Projects

1. **Participant** of collaboration project "A Research on the Theory and Technologies of Knowledge-Defined Networking," BUPT-CM Innovation Center, CNY 2,450,000, 2020-2023.

PROFESSIONAL ACTIVITIES

Editor

- Guest Editor, Electronics, special issue on "Advances in Information Retrieval and Natural Language Processing", 2023.

Technical Program Committee

- Member of Technical Program Committee of IEEE Global Communications Conference (GLOBECOM), 2023

- Member of Technical Program Committee of European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECMLPKDD), 2023

- Member of Technical Program Committee of ACM International Conference on Multimedia Retrieval (ICMR), 2023

Invited Talk

- Invited Talk, "Knowledge-Defined Edge Network Routing," 2022 Cross Strait Radio Science and Wireless Technology Conference (CSRSWTC), December, 2022

Reviewer

- IEEE Journal on Selected Areas in Communications
- IEEE Internet of Things Journal
- IEEE Systems Journal
- IEEE Transactions on Mobile Computing
- IEEE Communications Letters

- Future Generation Computer Systems
- Ad Hoc & Sensor Wireless Networks
- Journal of Communications and Networks
- Springer Journal of Cloud Computing: Advances, Systems and Applications
- Scientific Reports
- SN Applied Sciences
- Artificial Intelligence in Medicine
- Results in Control and Optimization
- ACM ICMR 2023
- IEEE WCNC 2022
- IEEE WCNC 2021 Workshops
- IEEE ICCC 2020
- MobiQuitous 2019

PUBLICATIONS

Edited Books

1. Qi Qi, Xiaoyuan Fu, Zirui Zhuang, Jingyu Wang, and Jianxin Liao. *Deep Reinforcement Learning for Network Intelligence*. Posts & Telecom Press Co., Ltd., 2021.

2. Jingyu Wang, Haifeng Sun, Jianxin Liao, Jing Wang, Qi Qi, and Zirui Zhuang. *Smart Service Cloud Networks (Edition 2)*. Posts & Telecom Press Co., Ltd., 2019.

3. Jingyu Wang, Jianxin Liao, Jing Wang, Qi Qi, and Zirui Zhuang. *Smart Service Cloud Networks*. Posts & Telecom Press Co., Ltd., 2017.

Journal Publications
Published or Accepted

1. Long Zhang, Xiaozheng Ma, Zirui Zhuang, Haitao Xu, Vishal Sharma, and Zhu Han. "Q-Learning Aided Intelligent Routing with Maximum Utility in Cognitive UAV Swarm for Emergency Communications." IEEE Transactions on Vehicular Technology, November 2022, 1–16. *Early access.*

2. Tianjian Dong, Qi Qi, Jingyu Wang, Zirui Zhuang, Haifeng Sun, Jianxin Liao, and Zhu Han. "Standing on the Shoulders of Giants: Cross-Slice Federated Meta Learning for Resource Orchestration to Cold-Start Slice." *IEEE/ACM Transactions on Networking*, August 2022, 1–18. *Early access.*

3. Tianjian Dong, Zirui Zhuang, Qi Qi, Jingyu Wang, Haifeng Sun, F. Richard Yu, Tao Sun, Cheng Zhou, and Jianxin Liao. "Intelligent Joint Network Slicing and Routing via GCN-Powered Multi-Task Deep Reinforcement Learning." *IEEE Transactions on Cognitive Communications and Networking* vol. 8, num. 2, (June 2022): 1269–1286.

4. Jingyu Wang, and Zirui Zhuang. "Research on a Knowledge-Defined Polymorphic Network Attainable Service Architecture." *Journal on Communications* vol. 43, num. 4, (April 2022): 71–82.

5. Jingyu Wang, Cheng Zhou, Lei Zhang, Cong Liu, Zirui Zhuang, Hongwei Yang, Danyang Chen, Yanhong Zhu, Lu Lu, and Jianxin Liao. "Knowledge-Defined Intent-Based Network Autonomy." *Telecommunications Science* vol. 37, num. 9, (September 2021): 1–13.

6. Tianjian Dong, Qi Qi, Jingyu Wang, Alex X. Liu, Haifeng Sun, Zirui Zhuang, and Jianxin Liao. "Generative Adversarial Network-Based Transfer Reinforcement Learning for Routing with Prior Knowledge." *IEEE Transactions on Network and Service Management* vol. 18, num. 2, (May 2021): 1673–1689.

7. Zirui Zhuang, Jingyu Wang, Qi Qi, Jianxin Liao, and Zhu Han. "Adaptive and Robust Routing with Lyapunov-Based Deep RL in MEC Networks Enabled by Blockchains." *IEEE Internet of Things Journal* vol. 8, num. 4, (February 2021): 2208–2225.

8. Kai-Chu Tsai, Zirui Zhuang, Ricardo Lent, Jingyu Wang, Qi Qi, Lichun Wang, and Zhu Han. "Tensor-Based Reinforcement Learning for Network Routing." *IEEE Journal of Selected Topics in Signal Processing* vol. 15, num. 3, (February 2021): 617–629.

9. Dezhi Chen, Qi Qi, Zirui Zhuang, Jingyu Wang, Jianxin Liao, and Zhu Han. "Mean Field Deep Reinforcement Learning for Fair and Efficient UAV Control." *IEEE Internet of Things Journal* vol. 8, num. 2, (January 2021): 813–828.

10. Qi Qi, Lingxin Zhang, Jingyu Wang, Haifeng Sun, Zirui Zhuang, Jianxin Liao, and F Richard Yu. "Scalable Parallel Task Scheduling for Autonomous Driving Using Multi-Task Deep Reinforcement Learning." *IEEE Transactions on Vehicular Technology* vol. 69, num. 11, (November 2020): 13861–13874.

11. Zirui Zhuang, Jingyu Wang, Qi Qi, Haifeng Sun, and Jianxin Liao. "Toward Greater Intelligence in Route Planning: A Graph-Aware Deep Learning Approach." *IEEE Systems Journal* vol. 14, num. 2, (June 2020): 1658–1669.

12. Jingyu Wang, Zirui Zhuang, Qi Qi, Tonghong Li, and Jianxin Liao. "Deep Reinforcement Learning-Based Cooperative Interactions Among Heterogeneous Vehicular Networks." *Applied Soft Computing* vol. 82, (September 2019): 105557.

13. Zirui Zhuang, Wang Jingyu, and Tong Xu. "Tenant-Oriented Customized Vm Networking Technology." *Telecommunications Science* vol. 31, num. 10, (October 2015): 144–150.

In Revision or Submitted

14. Yu Liu, Zirui Zhuang, Qi Qi, Jingyu Wang, Dezhi Chen, Lu Lu, Hongwei Yang, Jianxin Liao, and Zhu Han. "Slice Sandwich: Jagged Slicing Multi-tier Dynamic Resources for Diversified V2X Services." Submitted to *IEEE Transactions on Mobile Computing*.

15. Yu Liu, Jingyu Wang, Qi Qi, Zirui Zhuang, Jianxin Liao, and Zhu Han. "Towards High-Powered Connected Autonomous Vehicles: A Cooperative Solution via Transient Edge Intelligence Provision." Submitted to *IEEE Communications Magazine*.

16. Haifeng Sun, Jingyu Wang, Huazheng Wang, Zirui Zhuang, Qi Qi, Lu Lu, and Jianxin Liao. "Intent-based Edge Device Cooperation: Resource Knowledge Graph for Incomplete Semantic Reasoning." Submitted to *IEEE Communications Magazine*.

Conference Publications
Published or Accepted

1. Menghao Zhang, Jingyu Wang, Jing Wang, Qi Qi, Zirui Zhuang, Haifeng Sun, and Ning Xiao. "Robust Video Anomaly Detection Framework via Prior Knowledge and Multi-Path Frame Prediction." In *2023 IEEE International Conference on Acoustics, Speech and Signal Processing* (ICASSP'23). Rhodes Island, Greece, 2023. *Accepted.*

2. Peng Zhan, Guangyi Qin, Xingxin Qian, Xiong Wang, Jing Ren, Zirui Zhuang, and Shizhong Xu. "Deep Reinforcement Learning Based Fast Anomaly Detection and Localization for Programmable Networks." In *2023 IEEE International Conference on Communications* (ICC'23). Rome, Italy, 2023. *Accepted.*

3. Chen Hu, Lei Zhang, Dezhi Chen, Zirui Zhuang, Qi Qi, Cong Liu, Jianxin Liao, and Jingyu Wang. "Digital Twins-Based Multi-Agent Deep Reinforcement Learning for UAV-Assisted Vehicle Edge Computing." In *The 2022 IEEE International Conference on Ubiquitous Intelligence and Computing* (UIC'22). Haikou, China, 2022.

4. Shaoxiong Zhu, Qi Qi, Zirui Zhuang, Jingyu Wang, Haifeng Sun, and Jianxin Liao. "FedNKD: A Dependable Federated Learning Using Fine-Tuned Random Noise and Knowledge Distillation." In *2022 ACM International Conference on Multimedia Retrieval* (ICMR'22), 185–193. Newark, NJ, USA, 2022.

5. Yixiao Li, Lixiang Li, Zirui Zhuang, Yuan Fang, and Yixian Yang. "ResNet Approach for Coding Unit Fast Splitting Decision of HEVC Intra Coding." In *2021 IEEE Sixth International Conference on Data Science in Cyberspace* (DSC'21), 130–135. IEEE, 2021.

6. Bo He, Jingyu Wang, Qi Qi, Haifeng Sun, Zirui Zhuang, Cong Liu, and Jianxin Liao. "DeepHop on Edge: Hop-by-Hop Routing by Distributed Learning with Semantic Attention." In *International Conference on Parallel Processing* (ICPP'20), 1–11, 2020.

7. Zirui Zhuang, Jingyu Wang, Qi Qi, Jianxin Liao, and Zhu Han. "Adaptive and Robust Network Routing Based on Deep Reinforcement Learning with Lyapunov Optimization." In *IEEE/ACM International Symposium on Quality of Service* (IWQoS'20), 1–10. IEEE, 2020.

8. Yu Zhang, Zirui Zhuang, Feifei Gao, Jingyu Wang, and Zhu Han. "Multi-Agent Deep Reinforcement Learning for Secure UAV Communications." In

IEEE Wireless Communications and Networking Conference (WCNC'20), 1–5. IEEE, 2020.

9. Zirui Zhuang, Jingyu Wang, Qi Qi, Haifeng Sun, and Jianxin Liao. "A Case-Based Decision System for Routing in Packet-Switched Networks." In *IEEE International Performance Computing and Communications Conference* (IPCCC'18), 1–2. IEEE, 2018.

10. Zirui Zhuang, Jingyu Wang, Qi Qi, Haifeng Sun, and Jianxin Liao. "Graph-Aware Deep Learning Based Intelligent Routing Strategy." In *IEEE Conference on Local Computer Networks* (LCN'18), 441–444. IEEE, 2018.

11. Yunming Xiao, Haifeng Sun, Zirui Zhuang, Jingyu Wang, and Qi Qi. "Common Knowledge Based Transfer Learning for Traffic Classification." In *IEEE Conference on Local Computer Networks* (LCN'18), 311–314. IEEE, 2018.

TEACHING EXPERIENCE

Beijing University of Posts and Telecommunications, Beijing, China

- *Guest Lecturer*, Undergraduate
  - *The Introduction of Software-Defined Networking*
  - **Spring, 2023**

- *Guest Lecturer*, Undergraduate
  - *The Evolution of Information Technology*
  - **Fall, 2021, 2022**

HOBBY

Swimming, cycling, and weight-lifting.