Nan Liu

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EDUCATION

Xi'an Jiaotong University *September 2022 - June 2025 (Expected)*

♢ Master Candidate, School of Cyber Science and Engineering
- ▷ Entering through postgraduate recommendation
- ▷ GPA: 3.82/4.00 (Ranked 2/34)
- ▷ Advisor: Zhou Su

Xi'an Jiaotong University *September 2018 - July 2022*

♢ B.E., School of Information and Communications Engineering
- ▷ Entering with a 60-point bonus through *Independent Recruitment* of XJTU
- ▷ GPA: 3.64/4.30 (Ranked 16/166)

RESEARCH INTERESTS

Reinforcement learning, game theory, distributed machine learning, edge computing, resource allocation, Metaverse

SELECTED PUBLICATIONS

Journal paper

- **Nan Liu**, Tom H. Luan, Yuntao Wang, Yiliang Liu, and Zhou Su. "QoE-Oriented Cooperative VR Rendering and Dynamic Resource Leasing in Metaverse," **submitted** to *IEEE Transactions on Mobile Computing*, 2024.

Conference paper

- **Nan Liu**, Tom H. Luan, Yuntao Wang, Yiliang Liu, and Zhou Su. "Auction-Based Dynamic Resource Allocation in Social Metaverse," in the Proceedings of *the 19th IEEE International Conference on Mobility, Sensing and Networking (MSN 2023)*, Nanjing, China, December 14-16, 2023.

RESEARCH EXPERIENCE

Master Student @ Xi'an Jiaotong University Xi'an, China

Project 1: Qoe-Oriented Cooperative VR Rendering and Dynamic Resource Leasing July 2023 ∼ Present
Supervisor: Prof. Zhou Su, Prof. Tom H. Luan

- Designed a cooperative VR rendering and rendering resource (GPU, CPU, and outbound bandwidth) leasing mechanism for user quality-of-experience (QoE) enhancement in Metaverse.
- Introduced an edge server-user cooperative VR scene pre-rendering framework, and established a **new delay-sensitive and interest-aware user QoE model** under this framework.
- Designed the resource leasing mechanism as an **auction**, where edge servers (auctioneers) allocate the rendering resources to Metaverse users (bidders) using a pricing-based scheme.
- Formulated the users' problem as a *Decentralized Partially Observable Markov Decision Process (Dec-POMDP)* and design **a novel discrete-continuous hybrid action multi-agent reinforcement learning based algorithm** for users' distributed and dynamic decision-making.
- Submitted a journal paper as the first author.

Project 2: Dynamic Resource Allocation Mechanism in Social Metaverse October 2022 ∼ July 2023
Supervisor: Prof. Zhou Su, Prof. Tom H. Luan

- Designed a **resource auction mechanism**, where edge servers act as auctioneers and Metaverse user groups act as bidders.
- In each time period, each user group decides on the offloading scheme and sends bids to the corresponding server. Based on the received bids, each edge server updates the resource prices using the pricing scheme. This procedure iterates until it reaches **the Nash Equilibrium**.
- Published a conference paper as the first author at IEEE MSN 2023.

AWARDS AND HONORS

Grand Prize, XJTU Graduate Study Scholarship 10/2023, 10/2022
Excellent Graduate Student, Xi'an Jiaotong University 10/2023
First Prize, XJTU Graduate Freshmen Scholarship 10/2022
First Prize, the 4^{th} "Tong Da" Cup Software-Defined Radio Contest 05/2022
National Second Prize, 2021 National Undergraduate Electronic Design Contest 12/2021
Second Prize, XJTU Undergraduate School Scholarship 10/2021
Excellent Undergraduate Student, Xi'an Jiaotong University 10/2021, 10/2020

PROFESSIONAL SKILLS

Programming: C, Matlab, Python, LaTeX, Linux (Ubuntu)
Language: Mandarin Chinese, English

EXTRACURRICULAR ACTIVITIES

Volunteer Coach at Tennis Practice Camp, XJTU Fall 2023, Spring 2024
Class Mental Health Coordinator, XJTU September 2022 $\sim$ present