

XJTLU-XJTU-UoL Joint Doctoral Supervision Project (Full-time)

Reference No.	SFXJTU2506
XJTLU School	School of Advanced Technology
PhD Programme	Electrical and Electronic Engineering
Supervisors	XJTLU supervisor: Dr Yuanjian Li XJTU supervisor: Dr Xin Chen UoL supervisor: Professor Yi Huang
Project Title	Quantum Deep Reinforcement Learning-Aided Resource Coordination for Energy-Efficient 6G Networks 面向高能效 6G 网络的量子深度强化学习资源协同调度方法研究
Application Deadline	Open until the position is filled

Requirements:

A UK first-class or upper second-class honours Bachelor's degree and a UK Master's degree with Merit (or their equivalent) are required for PhD admissions. Exceptional candidates holding only a Bachelor's degree may be considered on an individual basis.

Evidence of good spoken and written English is essential. The candidate should have an IELTS (or equivalent) score of 6.5 or above, if the first language is not English.

For more information about entry requirements and admission procedures of PhD programme at XJTLU, please visit:

[Entry Requirement - Xi'an Jiaotong-Liverpool University](#)

[How to Apply - Xi'an Jiaotong-Liverpool University](#)

Other Requirements (if any):**Preferred Academic Background**

Candidates with educational training in one or more of the following disciplines are encouraged to apply:

1. Electrical and Electronic Engineering
2. Telecommunications Engineering
3. Computer Science or Engineering
4. Applied Mathematics or Physics (with a focus on quantum computing or machine learning)

Technical Skills

Candidates should demonstrate proficiency in at least three of the following areas:

1. 5G/6G wireless communications and Internet of Things (IoT)
2. Smart grid

3. Deep reinforcement learning
4. Quantum computing or quantum machine learning
5. Programming languages: Python and MATLAB
6. Familiarity with machine learning frameworks, e.g., PyTorch, TensorFlow, Qiskit, or PennyLane

Research Experience (Preferred but not mandatory)

Prior research in one or more of the following:

1. Resource allocation in 5G/6G wireless systems or the smart grid
2. Distributed or federated learning
3. Quantum-inspired algorithms or variational quantum circuits
4. Multi-agent systems or collaborative decision-making

Publication(s) in top-tier journals/conferences will be considered a plus

Soft Skills

1. Ability to work independently and as part of a collaborative research team
2. Self-motivated with a strong desire to push the boundaries of knowledge
3. Willingness to engage in interdisciplinary research bridging wireless communications, smart grid, artificial intelligence, and quantum computing

Programme Structure:

Doctoral students in the joint programme are registered with both XJTLU and the UoL. Upon successful completion of the programme, the students will be awarded a PhD degree from University of Liverpool.

During their doctoral studies at XJTLU, students are expected to conduct research at XJTLU as visiting students. Additionally, students have the opportunity to apply for a three to six-month research visit to UoL.

Project Description:

The sixth-generation (6G) wireless systems, supporting applications such as the Internet of Things (IoT), smart grid/city, and power IoT, cannot be practically implemented without efficient resource management. Leveraging machine learning (ML)-based optimisation techniques and distributed intelligent decision-making frameworks is essential for achieving scalable, robust, and flexible system resource coordination. The demonstration of quantum supremacy by IBM and Google, the development of the Majorana 1 chip by Microsoft, and the Nobel Prize in Physics awarded for pioneering experiments with quantum-entangled particles underscore the transformative potential of quantum computing in driving the next industrial revolution. Moreover, recent studies on quantum ML have demonstrated its advantages in improving computational efficiency and enhancing generalisation capabilities in ML systems. This project will integrate quantum computing with deep reinforcement learning (DRL) to develop quantum-enhanced DRL frameworks for distributed and collaborative resource coordination in 6G networks. Specifically, the research will focus on optimising capacity dispatch and data flow across highly heterogeneous and dynamic network environments, with the overarching goal of

maximising energy efficiency and ensuring resilient system operation. This approach aims to address critical challenges in next-generation wireless systems by providing a scalable and intelligent solution for resource allocation, flow control, and energy-aware network optimisation.

Joint Supervisory Team:

XJTLU supervisor: [Dr Yuanjian Li](#)

XJTU supervisor: [Dr Xin Chen](#)

UoL supervisor: [Professor Yi Huang](#)

How to Apply:

Interested applicants are advised to email Dr Yuanjian Li (yuanjian.li@xjtlu.edu.cn), Dr Xin Chen (xin.chen.nj@xjtu.edu.cn) or Professor Yi Huang (yi.huang@liverpool.ac.uk) the following documents for initial review and assessment (Please include the project title in the subject line).

- CV
- Two formal reference letters
- Personal statement outlining your interest in the position
- Certificates of English language qualifications (IELTS or equivalent)
- Full academic transcripts in both Chinese and English (for international students, only the English version is required)
- Verified certificates of education qualifications in both Chinese and English (for international students, only the English version is required)
- PDF copy of Master Degree dissertation (or an equivalent writing sample) and examiners reports available