

## PhD studentship (Full-time)

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| Institution          | Xi'an Jiaotong-Liverpool University, China                                                                                                                                                                                                                                                                                         |
| School               | School of Advanced Technology                                                                                                                                                                                                                                                                                                      |
| Supervisors          | <p><i>Please list all the names in the supervisory team. It should be consistent with the information on your approved PGRS proposal.</i></p> <p>Principal supervisor: Dr. Yuxiao Fang (XJTLU)<br/> Co-supervisor: Professor Chun Zhao (XJTLU)<br/> Co-supervisor: Professor Ivona Mitrovic (UoL)</p>                              |
| Application Deadline | Open until the position is filled                                                                                                                                                                                                                                                                                                  |
| Funding Availability | Funded PhD project (world-wide students)                                                                                                                                                                                                                                                                                           |
| Project Title        | Functional Reliability and Interface Dynamics in Emerging Transistor Devices                                                                                                                                                                                                                                                       |
| Contact              | <p>Please email Yuxiao.Fang02@xjtlu.edu.cn (XJTLU principal supervisor's email address) with a subject line of the PhD project title.</p> <p>The principal supervisor's profile is linked here:<br/> <a href="https://scholar.xjtlu.edu.cn/en/persons/YuxiaoFang02/">https://scholar.xjtlu.edu.cn/en/persons/YuxiaoFang02/</a></p> |

### **Requirements:**

A Master's degree with Merit and a Bachelor's degree with first-class or upper second-class honors are required for PhD admissions. Exceptional candidates holding only a Bachelor's degree may be considered on an individual basis in certain disciplines.

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. This position is open to all qualified candidates irrespective of nationality.

### **Degree:**

The student will be awarded a PhD degree from the University of Liverpool (UK) upon successful completion of the program.

### **Funding:**

The PhD studentship is available for three years subject to satisfactory progress by the student. The award covers tuition fees for three years (currently equivalent to RMB 99,000 per annum). It also provides up to RMB 16,500 to allow participation at international conferences during the period of the award. The scholarship holders are expected to conduct the majority of their

research at XJTLU in Suzhou, China. However, they may apply for a short-term research visit to the University of Liverpool if the project requires it.

### **Project Description:**

Artificial intelligence is rapidly expanding from cloud-based models towards edge intelligence, embodied AI and autonomous systems, creating growing demand for real-time, energy-efficient and adaptive hardware. However, frequent data movement between memory and processing units introduces substantial power consumption and latency. Neuromorphic hardware integrates memory and computing at the device level, offering a promising route towards more efficient AI systems.

This project will focus on synaptic transistors or resistive random-access memory (RRAM), covering the fabrication, characterisation and optimisation of individual devices and arrays. It will investigate how materials, interfaces, device structures and pulse programming schemes determine synaptic plasticity, weight-update linearity and symmetry, retention, endurance, energy consumption and device uniformity. Particular attention will be given to how interface and defect dynamics affect the functional reliability of neuromorphic devices. Moving beyond basic proof-of-concept demonstrations, the project will address whether these devices can operate in a stable, controllable and scalable manner.

Using experimental data obtained from devices and arrays, the project will further evaluate how device characteristics influence the accuracy, robustness and energy efficiency of neuromorphic computing. The aim is to establish practical links between device physics and AI performance, providing design and optimisation strategies for reliable neuromorphic hardware. The PhD student will primarily conduct experimental research on devices and arrays, with opportunities to participate in testing system development and computing validation.

人工智能正从云端大模型走向端侧智能、具身智能和自主系统，对实时、低功耗和自适应计算提出了更高要求。然而，传统架构中频繁的数据搬运带来了显著的功耗与延迟。能够在器件层面融合存储与计算的神经形态硬件，为发展更高效的 AI 系统提供了新的路径。

本项目将围绕突触晶体管或阻变存储器（RRAM），开展单器件与阵列的制备、测试和优化，研究材料、界面、器件结构及脉冲调控方式如何决定突触可塑性、权重更新的线性度与对称性、保持性、耐久性、能耗和器件均匀性，重点揭示界面与缺陷动力学对神经形态器件功能可靠性的影响。项目将从基础概念验证进一步走向器件的稳定性、可控性和阵列可扩展性研究。

在此基础上，项目将利用真实器件和阵列数据，分析器件特性对神经形态计算精度、鲁棒性和能效的影响，建立器件物理特性与 AI 计算性能之间的联系，为高可靠神经形态硬件提供设计与优化方法。博士生将主要从事器件和阵列实验，也可根据兴趣进一步参与测试系统开发与计算验证。

For more information about doctoral scholarship and PhD programme at Xi'an Jiaotong-Liverpool University (XJTLU), please visit

<https://www.xjtlu.edu.cn/en/admissions/doctoral/entry-requirement-phd>

<https://www.xjtlu.edu.cn/en/admissions/doctoral/postgraduate-research-scholarships>

**How to Apply:**

Interested applicants are advised to email Yuxiao.Fang02@xjtlu.edu.cn (XJTLU principal supervisor's email address) the following documents for initial review and assessment (please put 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