

### PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	School of Advanced Technology
Supervisors	Principal supervisor: Professor Ka Lok Man (XJTLU) Co-supervisor: Dr. Yutao Yue (JITRI) (JITRI) Co-supervisor: Professor Eng Gee Lim (XJTLU)
Application Deadline	Open until the position is filled
Funding Availability	Funded PhD project (world-wide students)
Project Title	Research on Smart Radar for Physical Sign Detection
Contact	Please email _____ (XJTLU principal supervisor's email address) or _____ (JITRI supervisor's email) with a subject line of the PhD project title

#### **Requirements:**

The candidate should have a first class or upper second class honours degree, or a master's degree (or equivalent qualification) in Computer Science/Electrical Engineering/Electronic Engineering/Computer Engineering.

Evidence of good spoken and written English is essential. The candidate should have an IELTS 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:**

This PhD project is a collaborative research project between XJTLU (<http://www.xjtlu.edu.cn>) in Suzhou and JITRI (Jiangsu Industrial Technology Research Institute) Institute of Deep Perception in Wuxi. The student will be registered as an XJTLU PhD student but is expected to carry out the major part of his or her research at the Institute in Wuxi.

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 80,000 per annum). In addition, during the period of undertaking main research at institute in Wuxi , the PhD candidate will be provided with monthly living allowance at a standard of 3000-7000RMB by JITRI Institute of Deep Perception.

### **Project Description:**

The millimeter-wave (MMW) radar detection technology has the advantages of strong penetration, high resolution, strong anti-interference ability, and high detection accuracy. It can maintain high-precision monitoring all day long. MMW radar chips can effectively use key algorithms such as static object elimination algorithms to eliminate false target interference, effectively classify living bodies and other objects, and realize effective monitoring of living bodies. However, the existing non-contact vital signs monitoring radar has harsh monitoring conditions and slow early warning speed, and it is temporarily unable to meet the requirements of emergency warning such as detecting cardiac arrest. Machine learning can provide new ideas in the design of algorithms and break through the limitations of existing algorithms. This project intends to adopt the following research methods:

(1) Research the data receiving process: After receiving the original data from the radar chip, the data format is first sorted, and the data is updated every second; then the data is down-sampled in the fast time and slow time dimensions to ensure that no valid information is lost under the premise of reducing the amount of data calculation.

(2) Research the traditional algorithm processing calculation process: remove the interference of the static background in the environment, determine the position of the human target; calculate the phase and phase difference, and superimpose the phase difference between the distance door where the person is located and the adjacent distance door to improve the signal-to-noise ratio ; Filter out high-frequency interference signals with the low-pass filter; perform FFT spectrum estimation, according to the FFT results, find peaks in the respiratory frequency range, and find the center of gravity and sliding average to obtain the respiratory frequency; suppress the respiratory high-order harmonics through the attenuation window, At the same time, the high-order harmonics of the heartbeat are used to find the peak again, and the center of gravity and the sliding average are calculated to obtain the heart rate.

(3) Research the process of machine learning: collect data sets of different vital signs and label the data. Write a suitable convolutional neural network and train it.

(4) Research result output process: The result-level fusion of meaningful information such as the position of the human target, the real-time phase change waveform, real-time heartbeat, and respiration output by the traditional algorithm and the information output by the machine learning.

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

<http://www.xjtlu.edu.cn/en/study-with-us/admissions/entry-requirements>

<http://www.xjtlu.edu.cn/en/admissions/phd/feescholarships.html>

### **Supervisor Profile:**

#### **Principal Supervisor:**

Ka Lok Man is currently a Professor in the School of Advanced Technology at Xi'an Jiaotong-Liverpool University (XJTLU) in Suzhou, China and an Adjunct Professor in the Faculty of Engineering and Science, Swinburne University of Technology Sarawak, Malaysia. He is an Honorary Recognized Professor at Big Data Excellence Centre, Kazimieras Simonavicius University, Lithuania. He is also a Visiting Professor at imec-DistriNet, KU, Leuven, Belgium and at the Faculty of Informatics, Vytautas Magnus University, Lithuania. He has about 20 years of international teaching experience, several years of industrial experience in integrated circuit design and has been involving in many industry-oriented research projects in Microelectronics and Computer Science, many of them in cooperation with STMicroelectronics, Synopsys and LG. He has a good publication record and to date has more than 500 published academic articles. Also, he has received more than 50 international research awards and fellowships. Ka Lok Man has become a well-established international researcher within a number of related areas, including formal methods, process algebras, hybrid systems, cyber physical systems, recommendation systems, data analytics, low power integrated circuits, wireless sensor networks & communication, IoT, photovoltaic & battery management systems and signal processing. Currently, he is supervising/cosupervising about 20 PhD students, 3 MSc students, a number of UG students and research assistants in the areas of solar energy, wireless sensor networks, communication, middleware, IoT, signal processing, data mining, machine learning, deep learning, cloud computing and image/video identification.

#### **JITRI co-supervisor:**

Yutao Yue received his B.S. degree of applied physics from University of Science and Technology of China in 2004, Ph.D. degree of computational physics from Purdue University in 2010. He then served as senior scientist of Kuang-Chi Institute, team leader of Guangdong "Zhujiang Plan" Introduced Innovation Scientific Research Team, and associate professor of Southern University of Science and Technology of China, etc. He has authored 17 papers and over 300 patents, and advised 13 postdoc researchers. He also serves as the "Industrial Professor" of Jiangsu Province, advisory

panel member of SAIIA, technical review expert of Guangdong, Jiangsu, Shenzhen, and Wuxi. He is now the founder and director of Institute of Deep Perception Technology (IDPT), Jiangsu Industrial Technology Research Institute (JITRI). His research interests include modeling and optimization, computational electromagnetics, radar perception, artificial intelligence theories.

**How to Apply:**

Interested applicants are advised to email \_\_\_\_\_ (XJTLU principal supervisor's email address) or \_\_\_\_\_ (JITRI supervisor's email) the following documents for initial review and assessment (please put the project title in the subject line).

- CV
- Two reference letters with company/university letterhead
- Personal statement outlining your interest in the position
- Proof of English language proficiency (an IELTS score of 6.5 or above)
- Verified school 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