London South Bank University
EST 1892

School of Engineering

The School of Engineering at London South Bank University is an ambitious and progressive centre of research strength, ranked 25th nationally for research power in the last Research Excellence Framework. We have a fabulous central London location and are looking for talented potential students interested in research to work with our academic faculty in areas of strength. We are offering a number of funded PhD scholarships below. These studentships are available to UK nationals & EU citizen's and overseas applicants*. Those in possession of their own funding (e.g. via a non-EU government scholarship) are also welcome to apply for a place of study.

PhD Scholarships in:

1) Ultrasound Imaging for Breast Cancer Monitoring and Surgical Assistance
2) Super-resolution Ultrasound Imaging and Microbubble Velocity Tracking
3) Biomechanics of the fabella: a sesamoid bone located in the back of the knee
4) Modelling the Optical and Electronic Properties of Energy Materials
5) 2D Materials for Future Wireless Communications

Further details on each PhD project as well as application information are provided via this link but all PhD scholarships benefit from the following:

- Training in advanced engineering topics
- Mentoring from industry on the application and context of research
- Bespoke technical training
- Enterprise and innovation skills training
- Transferable skills development opportunities to increase employability
- 3-year studentships of ~£15,000 per annum living stipend (usually tax free)
- Payment of all tuition fees*
- A school supported consumables and travel budget to support additional specialist research training courses, access to specialist equipment and travel to international conferences, seminars and workshops
- Industry sponsored* cutting-edge research projects
- Wide choice of PhD projects ranging from applied to blue-sky research
- State-of-the-art research facilities in the centre of London
- Opportunities for overseas secondments to industrial partners and universities
- Excellent career prospects on completion of the PhD

* for eligible students only

LSBU Research Centres Website: http://www.lsbu.ac.uk/research/centres-groups, please click on the link here to see the specific PhD posts available.

Closing date for applications: 1st December 2019 **PhD Start:** January/February 2020

PhD Scholarship in Ultrasound Imaging for Breast Cancer Monitoring and Surgical Assistance

Description: In the UK, 1 in every 7 females will be diagnosed with breast cancer in their lifetime. Ultrasound is commonly used to image breast abnormalities, but it is not used for breast cancer screening alone because it can miss some early signs of cancer. There is a clinical need to improve the existing imaging capabilities of ultrasound.

Breast cancer and many other cancer types exhibit changes in the microvascular (tiny vessels) structure, as well as variations in vascular flow. Monitoring specific structural and functional signatures of microvessels and detecting small changes would potentially enable early cancer diagnosis. To achieve this with ultrasound, the image quality and resolution must be improved. PhD student will develop new techniques to enhance ultrasound imaging performance (resolution, contrast, signal to noise ratio) benefitting several diagnostic applications (breast cancer, stroke detection, liver cancer staging, bone assessment, etc…). Motion correction will be the key research area, since handheld probe movement, respiration, and patient movement significantly degrade the image quality and resolution for multi-acquisition methods.

Ultrasound imaging can help with the breast cancer diagnosis, but imaging alone will only provide limited help. In addition to imaging, the successful candidate may also work on developing surgical assistance for clinicians. There is a need for a simple method to help surgeons find tiny cancers in the operating theatre during surgery. These tiny cancers are either detected early by screening or have been rendered tiny by pre-operative chemotherapy. Metallic markers are implanted at the site of breast tumour and they must be localised before the surgery. PhD student will develop a non-imaging ultrasound probe for detection of metallic markers without the need for the insertion of a preoperative wire. An audio feedback will indicate the proximity of the marker to guide the surgeon during surgery.

The outcomes of this project for the PhD candidate are listed below:

- understand ultrasound imaging;
- gain experience in ultrasound signal and image processing techniques;
- learn existing motion correction methods and adapt them to ultrasound imaging;
- perform experimental measurements with a high-frame rate ultrasound system;
- develop new methods for ultrasound image quality improvement as a team;
- work with clinicians to develop surgical assistance tools;
- present the findings of the project in international conferences;
- perform high-quality research and publish it as journal articles.

This will be a 3-year fully funded studentship for an EU/UK and overseas applicants who are keen to conduct research in ultrasound imaging and sensing at LSBU in the School of Engineering.

Supervisory Team: The successful applicant will be working Dr Sevan Harput (https://scholar.google.co.uk/citations?user=oel2ZHcAAAAJ&hl=en) at the Ultrasound research lab (https://sevanharput.github.io/), which aims to develop new imaging and sensing technologies using acoustic waves at ultrasonic frequencies. As a PhD student, you will join the Bioengineering centre (http://www.lsbu.ac.uk/research/centres-groups/biomedical-engineering-communications-bimec) and work alongside a range of new and experienced PhD students in a collaborative environment.
Informal enquiries should be directed to Dr Sevan Harput (harputs@lsbu.ac.uk). Please send a copy of your CV with a covering letter to Dr Harput before applying.

Requirements: Applicants must be of outstanding academic merit and should have (or be expected to gain) either a first class or an upper second class Honours degree (or the international

equivalent), or an MSc/MRes with distinction. Enthusiastic and self-motivated candidates from all countries with a background in either Engineering, Physics or Mathematics or a related discipline are encouraged to apply.

A good knowledge and experience in ultrasound imaging, signal processing, transducers, programming and/or computational modelling would be advantageous.

PhD Scholarship in Super-resolution Ultrasound Imaging and Microbubble Velocity Tracking

Description: Super-resolution ultrasound is a microvascular imaging modality that can enable real-time microscopic imaging in deep tissue. Super-resolution has already been successfully demonstrated pre-clinically and clinically by Dr Harput's previous research group. Although it is a revolutionary imaging modality, there are significant challenges for the clinical translation, such as huge amount of data and the corresponding computing power required to process such data.

In addition to improving the resolution, tracking microbubbles inside the vessels and calculating their velocity are important for many imaging applications. Velocity maps can easily distinguish opposing flow directions and separate adjacent vessels according to their speed distribution. Therefore, velocity tracking enables further differentiation between vessels otherwise not spatially separated in the image. For this reason, evaluating different tracking methods (including Kalman filters, machine-learning, Hungarian algorithm, Trackmate for ImageJ, etc.) and finding the most suitable technique for super-resolution ultrasound imaging is crucial.

The outcomes of this project for the PhD candidate are listed below:

- understand ultrasound imaging;
- gain experience in super-resolution processing techniques;
- learn existing velocity tracking methods and adapt them to ultrasound imaging;
- perform experimental measurements with a high-frame rate ultrasound system;
- improve the processing speed of existing algorithms by GPU implementation;
- develop new methods for ultrasound image quality improvement as a team;
- present the findings of the project in international conferences;
- perform high-quality research and publish it as journal articles.

This will be a 3-year fully funded studentship for an EU/UK and overseas applicants who are keen to conduct research in ultrasound imaging and sensing at LSBU in the School of Engineering.

Supervisory Team: The successful applicant will be working Dr Sevan Harput (https://scholar.google.co.uk/citations?user=oel2ZHcAAAAJ&hl=en) at the Ultrasound research lab (https://sevanharput.github.io/), which aims to develop new imaging and sensing technologies using acoustic waves at ultrasonic frequencies. As a PhD student, you will join the Bioengineering centre (http://www.lsbu.ac.uk/research/centres-groups/biomedical-engineering-communications-bimec) and work alongside a range of new and experienced PhD students in a collaborative environment.

Informal enquiries should be directed to Dr Sevan Harput (harputs@lsbu.ac.uk). Please send a copy of your CV with a covering letter to Dr Harput before applying.

Requirements: Applicants must be of outstanding academic merit and should have (or be expected to gain) either a first class or an upper second class Honours degree (or the international equivalent), or an MSc/MRes with distinction. Enthusiastic and self-motivated candidates from all countries with a background in either Engineering, Physics or Mathematics or a related discipline are encouraged to apply.

A good knowledge and experience in ultrasound imaging, super-resolution processing, tracking algorithms, programming and/or computational modelling would be advantageous.

PhD Scholarship in Biomechanics of the fabella: a sesamoid bone located in the back of the knee

Description: The fabella, a sesamoid bone located in the lateral head of the gastrocnemius, behind the lateral femoral condyle. Interestingly, it is the only bone in the human body that is more common today than 100 years ago (~3.5 times more common!) Recent analyses on global prevalence rates have shown fabella are more common in older individuals than younger, men than women, and people from Asia/Oceania compared to those from Europe/Africa.

The fabella has both evolutionary and clinical implications. Evolutionarily, it is present is cercopithecines, variably present in lesser apes, absent from great apes, and variably present in humans. This implies selection may have been acting against fabella presence in non-human hominoids, and for fabella presence in hominins.

Clinically, it is associated with several knee ailments, causes medical issues on its own, and can interferes with medical devices. Most interestingly, individuals with osteoarthritis (OA) in the knee are twice as likely to have a fabella compared to individuals without OA. When fabellae become problematic, fabellectomies, or surgical removal of fabellae, are common. As no studies have investigated the biomechanics of the fabella, its removal may or may not have negative consequences.

The outcomes of this project for the PhD candidate are listed below:

- understand ultrasound imaging;
- use ultrasound to identify cohorts of individuals with and without fabellae;
- gather kinematic data on your cohorts;
- construct musculoskeletal (MSk) models to analyse kinematic data;
- interpret biomechanical data from MSk models;
- read and segment microcomputed tomography (microCT) scans of fabellae;
- perform 3D bone morphological analyses;
- interpret results in clinical and evolutionary frameworks;
- present the findings of the project in international conferences;
- perform high-quality research and publish it as journal articles.

This will be a 3-year fully funded studentship for an EU/UK and overseas applicants who are keen to conduct research in ultrasound imaging and sensing at LSBU in the School of Engineering.

Supervisory Team: The successful applicant will be working Dr Michael Berthaume (https://scholar.google.co.uk/citations?user=mua0zR4AAAAJ&hl=en) at the Berthaume Anthroengineering lab at LSBU, which aims to integrate theories and methods from anthropology and engineering to address larger problems. As a PhD student, you will join the Bioengineering

centre (http://www.lsbu.ac.uk/research/centres-groups/biomedical-engineering-communications-bimec) and work alongside a range of new and experienced PhD students in a collaborative environment.

Informal enquiries should be directed to Dr Michael Berthaume (berthaume@lsbu.ac.uk). Please send a copy of your CV to Dr Berthaume before applying.

Requirements: Applicants must be of outstanding academic merit and should have (or be expected to gain) either a first class or an upper second class Honours degree (or the international equivalent), or an MSc/MRes with distinction. Enthusiastic and self-motivated candidates from all countries with a background in Engineering, Sports science, Anthropology, Functional anatomy, or Medicine are encouraged to apply.

A good knowledge of human musculoskeletal anatomy and experience in computational modelling, microCT scan analysis would be advantageous.

PhD Scholarship in Modelling the Optical and Electronic Properties of Energy Materials

Description: To meet future energy demands in a sustainable and environmentally friendly manner, key technologies involving solar and heat energy conversion require significantly enhanced efficiencies. Photovoltaic and thermoelectric devices and associated microelectronics all require semiconductor materials for their operation. Understanding the fundamental properties of such materials will allow design strategies for their improvement to be implemented.

While much work has been done to improve the efficiencies of energy and microelectronic devices in the past, understanding the functional materials in such devices at the fundamental, atomic and scale is crucial for further advances. Point defects, such as missing or additional atoms in a crystalline material, can affect strongly the electronic conductivity, the optical absorption and emission, carrier recombination rates and mechanical and thermal properties. Determining how such defects form in semiconductors, their likely concentrations, associated electronic states and their interactions with mobile electrons or holes are crucial issues when considering the material efficiency and applicability for devices.

This project aims to develop and apply state-of-the-art computational techniques to model the electronic and optical effects associated with point defects in semiconductor materials used in thin-film photovoltaics and microelectronic applications. First principles methods will be applied to determine the electronic structure of the materials containing defects; ground state properties will be calculated using density functional theory (DFT), while excited states will be investigated using many-body techniques beyond DFT. Methods to simulate interactions between electrons, photons and phonons will be developed and applied. The research goal is to understand fundamental processes involving defects in important energy materials, provide guides for experimental investigators and pin-point routes to improve efficiencies.

The outcomes of this project for the PhD candidate are listed below:

- understand electronic structure of materials;
- learn computational methods to investigate the properties of materials;
- develop and apply physical models of fundamental processes in semiconductors;
- learn computer coding skills;
- analyse data using a variety of tools;

- understand key issues regarding energy devices;
- present findings at national and international conferences;
- publish high-quality research in appropriate journals.

This will be a 3-year fully funded studentship for an EU/UK and overseas applicants who are keen to conduct research in materials modelling at LSBU in the School of Engineering.

Supervisory Team: The successful applicant will work with Dr John Buckeridge (https://scholar.google.co.uk/citations?user=hfyoL4AAAAAJ&hl=en), an expert in computational materials physics whose research aims to understand the fundamental properties of a range of functional materials (see https://jbuckeridge.github.io). As a PhD student, you will join the London Centre for Energy Engineering (http://www.lsbu.ac.uk/research/centres-groups/advanced-materials) and work alongside a range of new and experienced PhD students in a collaborative environment.

Informal enquiries should be directed to Dr John Buckeridge (j.buckeridge@lsbu.ac.uk). Please send a copy of your CV to Dr Buckeridge before applying.

Requirements: Applicants must be of outstanding academic merit and should have (or be expected to gain) either a first class or an upper second class Honours degree (or the international equivalent), or an MSc/MRes with distinction. Enthusiastic and self-motivated candidates from all countries with a background in Physics, Engineering, Chemistry, Materials Science or a related discipline are encouraged to apply.

Knowledge of condensed matter physics and/or materials chemistry, energy applications or computational modelling, including coding techniques, would be advantageous.

PhD Scholarship in 2D Materials for Future Wireless Communications

Description: This will be a fully funded studentship for an EU/UK applicant who is keen to conduct research into the theory and manufacture of 2D nanomaterials for small, short-range communication systems.

Development of the Internet of Things (IoT) as well societal demands have promoted the interest for thin and wearable electronic devices. Importantly, the radio frequency (RF) antennas play a key role in facilitating the communication between devices. Typically, antennas are fabricated using metals such as copper, silver, etc. Despite notable advantages, the existing materials exhibit common challenges including cost, bulkiness and skin depths, factors that limit the manufacturing of thin, transparent, light and flexible antennas. Therefore, in view of these issues there is a strong need for high-performance antenna materials.

This project takes an integrated approach. It involves design, engineer, and validate high-performance 2D nanomaterials for wireless communications. The 2D derivatives will be delivered via an environmentally benign, rapid and controllable Continuous Hydrothermal Flow Synthesis (CHFS) route (a synthetic process that is at the forefront of nanomaterials manufacturing approaches). The as-synthesized and characterized materials will be printed and fabricated into antennas and their performance will be tested.

The student will use unique Continuous Hydrothermal Flow Synthesis apparatus and a broad range of materials characterisation techniques including X-Ray Powder Diffraction, Raman Spectroscopy, Atomic Force Microscopy, BET surface area technique, electron microscopy as well as dedicated software (CST), anechoic chamber, antenna measurement tools, all available al LSBU.

Supervisory Team: The successful applicant will be working with Dr Suela Kellici in Nano2D Lab (www.nano2d.co.uk) specialising in 2D materials engineering using innovative techniques) and Prof Sandra Dudley with expertise in antenna design and wireless communications. Dr Kellici: https://scholar.google.co.uk/citations?hl=en&user=Bbn9IREAAAAJ&view_op=list_works&sortby=pubdate Prof. Dudley: https://scholar.google.co.uk/citations?hl=en&user=fdCAgr8AAAAJ&view_op=list_works&sortby=pubdate **How to apply:** Informal enquiries should be directed to Dr Suela Kellici, Email: kellicis@lsbu.ac.uk. To apply, send a copy of your CV with a covering letter to Dr Kellici. References will be obtained following interview of shortlisted candidates.
Applicants must be of outstanding academic merit and should have (or be expected to gain) either a 1st class Honours degree or an upper second class (or the international equivalent) or an MSc/MRes with distinction in a related field such as Chemistry, Electrical and Electronic Engineering or Physics. Enthusiastic and self-motivated candidates with backgrounds in either Chemistry/Materials Science/Physics are encouraged to apply. A good knowledge of electronic material properties and/or radio frequency engineering along with experience in programming and computational modelling would be advantageous