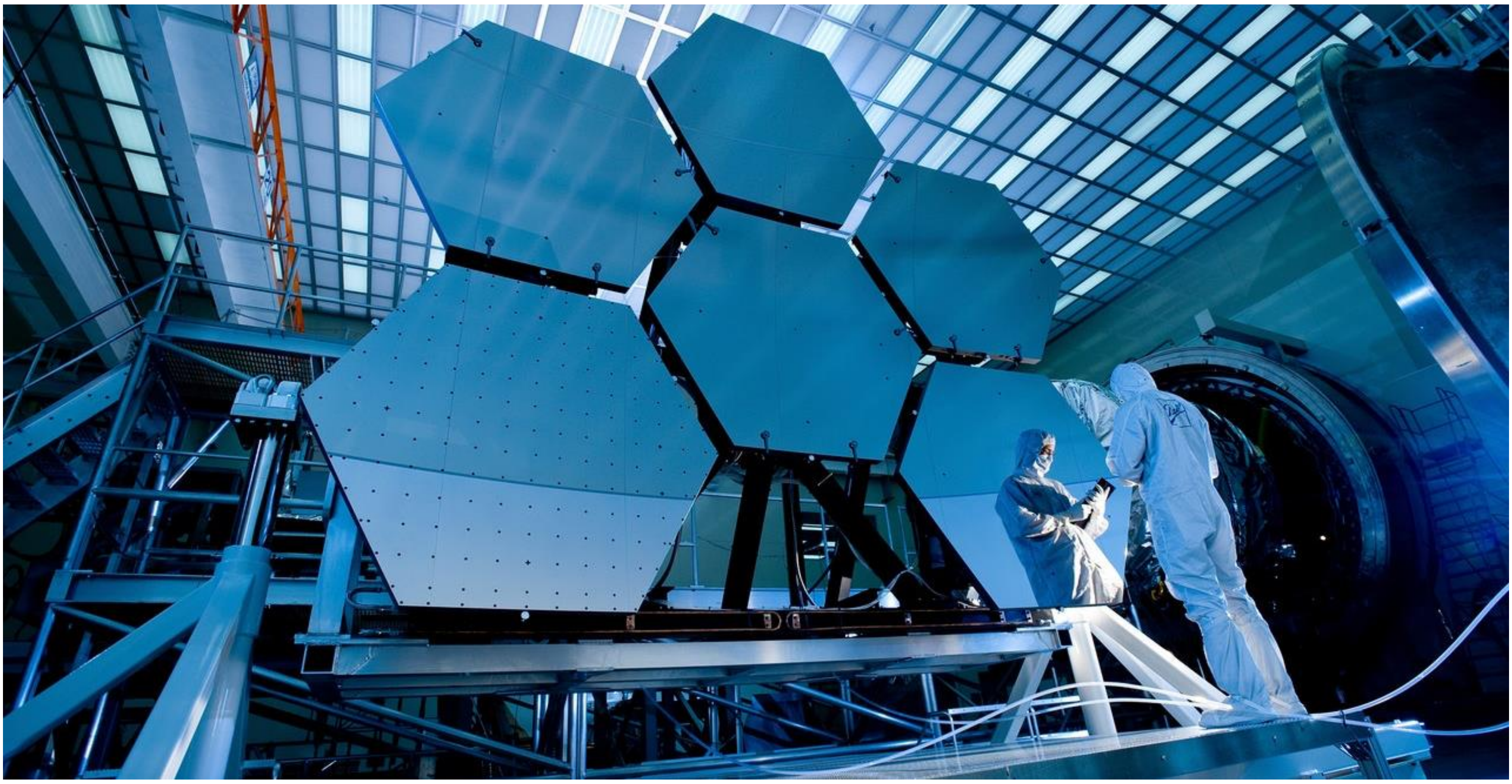
THE UNIVERSITY OF SYDNEY

FACULTY OF ENGINEERING
PhD Scholarship Opportunities April 2022



Each of the projects listed below have a scholarship available funded by the supervisors' research grants and awards. Further scholarships are listed on the University Scholarships website.

If you are interested in a project, send the supervisor of a project an up-to-date CV, your transcripts, and a short description of why you are interested in the project.

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Aerospace, Mechanical and Mechatronic Engineering

Robotic Perception Lab Scholarships

Supervisor:
Viorela Ila - viorela.ila@sydney.edu.au

Research Area:
Sensing, mapping and planning in dynamic environments

Project Description:
The projects aim to develop and deploy on real robots theoretically well-founded solutions to robot localization, mapping and planning in dynamic environments.

Depending on interest and ability, candidates will investigate one or more of:

- Robust techniques for motion segmentation and tracking
- Novel spatial-temporal representations of dynamic environments
- Robust estimation and reconstruction of the dynamic scene
- Heterogeneous sensing for dynamic environments

Research Environment:
Embedded in the Australian Centre for Field Robotics, the Robotic Perception Lab is focused on delivering fundamental methodologies to sensing, mapping and planning in real-word dynamic environments.

The ACFR offers specialised labs and facilities, robotic platforms (underwater, agriculture, electric vehicles) and robotic field labs on-campus and in nearby off-campus sites. You will have access to mechanical and electronics workshops and a pool of technical staff to help realise your research ambitions. The University of Sydney offers a rich academic setting in a world class city, and the ACFR has strong ties to a network of nearby and international academic and industrial collaborators.

Further Information:
Successful candidates will have:

- A bachelor's degree in a relevant discipline
- Interest in robotics
- Strong background in mathematics and programming
- Excellent communication and interpersonal skills
- Hands-on experience with robotic platforms, ROS, Python, C++, and/or deep learning frameworks would also be an asset
- Creativity, curiosity, rigour and passion

How to Apply:

To apply, please email viorela.ila@sydney.edu.au, with the subject line "PhD Application:" and your name. Include the following:

- CV
- Transcripts (can be unofficial)
- Cover letter
- a link to a 2 minute video where you cover the following:
  1. Your strongest engineering/mathematical/programming skills
  2. What do you enjoy most about research?

Advanced Shape Measurement for Aerodynamics and Flight

Supervisor:
Associate Professor Nicholas Lawson - nicholas.lawson@sydney.edu.au

Research Area:
Aerodynamics; Instrumentation; Sensors

Project Description:
Future aircraft will have increasing flexible structures, dominated by advanced composite materials. This presents challenges to the aerodynamics of the vehicle, which are closely coupled to the vehicle shape. The introduction of these new materials, also require more advanced health monitoring over the life of the structure.

Fibre optic based sensors provide the opportunity to measure many properties that are critical to the aerodynamics of the vehicle, including strain, temperature, pressure and shape. They can also be embedded into the composite structures, to provide health monitoring of the structure. Shape measurement can now be performed using a combination of fibre optics, mounted into a sensor rod, which is secured onto an aerodynamic structure.

This research project will apply a fibre optic shape sensing system to a number of aerodynamic test structures, including a wing and fuselage. Several different sensor rods will be used to develop a bending and twist measurement system, through a series of representative model designs, tested in the University of Sydney Aerospace Engineering wind tunnels. The fibre optic shape system will be supplied from a research partner in the UK, Cranfield University. Different sensor configurations will need to be tested to find the highest performance shape and wing test, sensing system. Any performance will be validated using an alternative shape measurement method, such as photogrammetry or image pattern correlation methods. If the measurement performance of the shape system is acceptable, it will also be applied to the University of Sydney flying Jabiru experimental aircraft in a series of flight tests, potentially with the involvement of an industrial partner.

Further information:

We are looking for a talented and motivated individual to join our team to complete this 3 year PhD research project. It is essential that the candidate have a strong background, from their first degree, in Aerospace or Mechanical engineering and be prepared to complete both the theoretical and practical aspects of this project to a high standard. Previous experience in CAD and / or computational methods is also preferred.

This position is available to start from January 2022. Applications should send a cover letter explaining why they are suitable for this position, along with an updated CV to Associate Professor Nicholas Lawson (nicholas.lawson@sydney.edu.au)

Measurement of Unsteady Interior Vehicle Aerodynamics

Supervisor:
Associate Professor Nicholas Lawson - nicholas.lawson@sydney.edu.au

Research Area:
Vehicle Aerodynamics; Flow Measurement; Unsteady Aerodynamics

Project Description:

Recent flow visualisation inside the interior of a moving ambulance has shown a strong dependency of the flow field on the dynamic movement of the vehicle, including whether the vehicle is accelerating, braking or cornering. Results showed that interior flow patterns were significantly disrupted during these manoeuvres, with the induced flow changes overcoming any existing flow patterns, generated from the ventilation systems inside the vehicle. This presents challenges for vehicle interior design and has implications for safety critical environments, such as in an ambulance, where ventilation has been a serious consideration during the COVID pandemic. These flow effects are also relevant to other vehicle interiors, such as airliners, trains or buses.

Experimental modelling and measurement of this of this externally forced, dynamic flow, is the topic of this PhD research program. As little or no data seems to be available in this type of unsteady flow environment, this project will require a simple flow visualisation, scale model, to be constructed, including track and vehicle components. The scaled system must allow a range of acceleration, deceleration and turning manoeuvres, under controlled conditions. The vehicle model will also need to provide optical access for mapping the flow inside a basic interior geometry, during the manoeuvres. As much as possible, the model must be constructed from commercially available, off the shelf items and may require a computer interface to control the vehicle manoeuvres. Flow visualisation can be recorded using simple digital camera systems or an advanced particle image velocimetry (PIV) system, available at the university of Sydney. Any data from the project will be made available to the computational community, to aid any future numerical modelling of these systems.

Further information:

We are looking for a talented and motivated individual to join our team to complete this 3 year PhD research project. It is essential that the candidate have a strong background, from their first degree, in Aerospace or Mechanical engineering and be prepared to complete the practical aspects of this project to a high level, including designing the vehicle and track system. Previous experience in engineering design methods is also preferred.

This position is available to start from January 2022. Applications should send a cover letter explaining why they are suitable for this position, along with an updated CV to Associate Professor Nicholas Lawson:(nicholas.lawson@sydney.edu.au)

Novel High-Performance Copper-Based Materials via Additive Manufacturing

Supervisor:
Dr Keita Nomoto **-** keita.nomoto@sydney.edu.au

Research Area:
Materials Science; Additive Manufacturing; Copper Alloys

Project Description:
Copper and its alloys are key materials in the electrification revolution. This project aims to develop novel high-performance copper-based materials produced by additive manufacturing (3D printing), which will provide significantly higher mechanical performance, superior electrical and thermal properties and enable flexible complex shape options. Atomic-scale microstructural analysis using advanced microscopy techniques will reveal profound new insights into the process-structure-property relationship. Expected outcomes include new understandings of the fundamental physics of new functional materials, eco-friendly products, and an ability to facilitate the increasingly widespread use of the copper-based materials for renewable electricity towards a more sustainable society and economy.

Further information:
There is a full scholarship available for this project. If you are interested in fabricating new materials and analysing the microstructure using state-of-the-art equipment in the Sydney Manufacturing Hub and Australian Centre for Microscopy & Microanalysis, this project is an

excellent opportunity for your PhD journey. Students are advised to email their CV, transcript, and a brief description of why they are interested to keita.nomoto@sydney.edu.au

Development of Ultra-High Temperature Ceramics (UHTC) for Extreme Environments in Energy, Space, and Defence Applications

Supervisor:
Julie Cairney - julie.cairney@sydney.edu.au

Research Area:
Materials Science; Ultra-High Temperature Ceramics; Nanoscale Characterisation

Project Description:
Ultra-High Temperature Ceramics (UHTCs) is a subclass of emerging high-temperature materials for extreme environments – e.g. combination of temperature, radiation, and corrosion. Chemically, most UHTCs are binary compounds of B, C, or N with one of the transition metals: Hf, Ta, Nb, Zr, Ti, V, etc.

Further information:
There is one scholarship available, and we are seeking applicants who can start at their earliest convenience in the next 6 months. This project is jointly supported by DSTG and ANSTO via FutureNow Plus scholarship.

The successful PhD candidate is expected to work collaboratively across both institutions as well as a host university. The student will receive a full FutureNow PhD scholarship of $35k/year, or a combination of $15k/year top-up and the Australian Government Research Training Program (RTP) stipend scholarship. Additional funding of $10k/year from ANSTO's FutureNow Plus is available for travel and consumables of the project. A background in materials science, chemistry, physics or engineering is welcome.

We value diversity and encourage applicants from all backgrounds to apply, however, this program is open to Australian citizens only.

Microstructure and Mechanical Behaviour of Advanced High-Entropy Alloys

Supervisor:
Xianghai An - Xianghai.an@sydney.edu.au

Research Area:
Advanced materials; nanoscale characterization; Nanomechanics

Project Description:
Unlike the traditional alloying strategies that are basically epitomised by the single-major-element approach, the novel metallugical design paradigm of high-entropy alloys (HEAs) is based on incorporating multi-principal elements in near equiatomic concentrations that generally form compositionally complex solid solutions. This new class of materials have triggered tremendous research interests in materials community since they empower us to break through to a new level of materials effectiveness's, which are difficult to attain in conventional alloys, and they open a new avenue of alloy design that has been little explored. In this project, we will apply advanced characterization techniques to understand the origins of their superior mechanical properties. The outcomes will not only advance our knowledge about the deformation mechanisms of HEAs, but also will create an empowering map for the mechanistic HEA design to push the property boundary of possibility for enriching their potential applications.

Further information:
This project is supported by Dr. Linlin Li's DECRA project which aims to start July - October 2021. There are 2 scholarships available and if you are interested, please send your CV, transcript and a brief description of why you are interested to xianghai.an@sydney.edu.au (Dr. Xianghai An, who will be the main supervisor and Dr Linlin Li's DECRA collaborator in USYD). Highly self-motivated candidates with background of mechanical and materials engineering are warmly welcomed.

Trusted Autonomous Marine Systems

Supervisor:
Stefan B. Williams **-** stefan.williams@sydney.edu.au

Research Area:
Robotics; Autonomous Underwater Vehicles; Littoral survey

Project Description:
The University of Sydney's Australian Centre for Field Robotics (ACFR) is one of Australia's leading robotics research groups and undertakes fundamental and applied research in the area of field robotics. Their marine systems group is focused on the development of novel imaging payloads, sensors and vehicle systems for marine survey, visualisation, clustering and classification of extensive marine-based image archives, characterisation of change in multi-year surveys and adaptive mission planning for multi-vehicle systems. They lead Australia's Integrated Marine Observing System (IMOS) AUV facility and undertake marine surveys at sites around Australia and overseas. They are also a core member of the Defence Cooperative Research Centre (DCRC) in Trusted Autonomous Systems (TAS), led by Thales Australia.

The ACFR has funding available through the DCRC TAS program to support a PhD stipend to undertake fundamental and applied research related to the development, design and deployment of novel AUV systems for littoral survey. The project will explore vehicle design, navigation, perception and control systems that will allow teams of vehicles to operate in nearshore environments. Applications include rapid environmental assessment and mine counter measures operations but also extend to environmental monitoring, marine archaeology, deep-sea geology and asset inspection.

Formation of liquid fuel droplets in extremely turbulent environments

Supervisors:
Agisilaos Kourmatzis, Assaad R. Masri - agisilaos.kourmatzis@sydney.edu.au, assaad.masri@sydney.edu.au

Research Area:
Thermofluids; Fluid Mechanics; Future Fuels

Project Description:
Working in close partnership with Mitsubishi Heavy Industries, the successful candidate will improve our fundamental understanding of the atomization processes associated with high Weber number sprays. State of the art experimental techniques will be used which include multi-angle high speed microscopic imaging and phase Doppler anemometry. Sprays will include pure liquids as well as mixtures, with an eventual focus on the combined influences of atomization and evaporation on the dynamics of these very complex two-phase flows.

Multiscale Modelling and Nondeterministic Optimisation for Reliable Stents (ARC DP180104200)

Supervisor:
Qing Li - Qing.Li@sydney.edu.au

Research Area:
Finite element analysis and design optimisation; Biomechanics, Tissue engineering, Biomaterials; Additive manufacturing, Biofabrication

Project Description:
Multiscale Modelling and Nondeterministic Optimisation for Reliable Stents. Intravascular stents signify a class of lifelong micro-devices to support blood vessel for restoring circulation. Despite its remarkable initial outcome, the high rate of long-term mechanical failure remains a major concern. This project aims to study multiscale modelling and nondeterministic optimisation for a more reliable design of stents. It will tackle a series of fundamental yet challenging mechanics issues in design sensitivity for reliability analysis and optimisation. Those involve plasticity, fatigue damage and fracture across different length scales. The proposed nondeterministic optimisation is expected to minimise incidence of failure under uncertain conditions, thereby enhancing the longevity and reliability of stent therapy.

Further information:
Three scholarships are available for both international (if ranked high enough for tuition scholarship in the Faculty) and domestic students, immediately. Strong interest, motivation, and diligence are required for undertaking a high-quality PhD. Research experience would be preferable.

Microstructural-Functional Effect of advanced biomaterials (collaborated with SDI Pty Ltd) (ARC LP180101352)

Supervisor:
Qing Li - Qing.Li@sydney.edu.au

Research Area:
Finite element analysis and design optimisation; Biomechanics, Tissue engineering, Biomaterials; Additive manufacturing, Biofabrication

Project Description:
Microstructural-Functional Effect of advanced biomaterials (collaborated with SDI Pty Ltd). This project aims to develop a fundamental understanding at the nanostructural level of the factors that contribute to the enhanced mineralisation and mechanical properties of dentine and enamel following the treatment with silver diammine fluoride (SDF). A variety of advanced nanomechanical, tomographic and microscopic techniques will be used to characterise sound, carious and SDF treated tissue. The new biomechanical evidence on the underlying mechanisms, alternative protocols, delivery systems enable to optimise the treatment. The scientific insights into arresting/repairing damage processes will provide critical data for developing minimal intervention protocols for pediatric and geriatric populations.

Further information:
Three scholarships are available for both international (if ranked high enough for tuition scholarship in the Faculty) and domestic students, immediately. Strong interest, motivation,

and diligence are required for undertaking a high-quality PhD. Research experience would be preferable.

The impact of A-Site dopant on the electromechanical properties of ferroelectric materials

Supervisor:
Xiaozhou Liao – Xiaozhou.Liao@sydney.edu.au

Research Area:
Materials Science and Engineering; Ferroelectrics; Transmission electron microscopy

Project Description:
With outstanding ferroelectric properties, relaxor ferroelectric materials are ideal for many electromechanical devices, including sensors, actuators, and transducers. They can also be used for non-volatile memories and energy harvest. The ferroelectric properties of relaxor ferroelectric materials can be manipulated via varying the crystal structures and microstructures of the materials. This project aims to apply state-of-the-art ex-situ and in-situ transmission electron microscopy techniques to explore elemental doping effects on the crystal structure, microstructure and electromechanical properties of ferroelectric materials. The PhD student will be supervised by Prof. Xiaozhou Liao together with Prof. Shujun Zhang of the University of Wollongong and Assistant Prof. Zibin Chen of The Hong Kong Polytechnic University.

Further information:

One PhD scholarship is available and the project can be started ASAP. The candidate should have been in Australia. Applicants should include their CV and transcripts in their application.

Biomedical Engineering

Synthetic leukocytes: bio-inspired nanorobots powered by flow (PhD in Computational Engineering and Nanotechnology)

Supervisor:
Dr Mark Baldry – mark.baldry@sydney.edu.au

Research Area:
Computational Fluid Dynamics; Nanotechnology; Biomedical Engineering

Project Description:

This Australian Research Council funded project aims to develop synthetic nanorobots inspired by the way white blood cells (leukocytes) roll along blood vessel walls. To achieve this, we will combine technological advances in nanotechnology, plasma-activation of surfaces for biomolecule immobilisation, and incorporation of novel materials into microfluidics to observe motion in fluid systems. Ultimately, this will allow us to harness rolling motion for the delivery of synthetic particles for detection in flow systems, such as the body.

You will build numerical models to simulate the behaviour of leukocytes in human blood vessels. You will validate your models against experimental observations then design DNA-based synthetic leukocytes with specific functions for early detection of cardiovascular diseases. You will explore the effects of varying the shape, mechanical properties, and surface functionalities of the synthetic leukocytes on the rolling adhesion process, and their performance in disease detection. This project will employ computational fluid dynamics (CFD) to simulate deformable cells entrained in fluid flow and their chemically mediated surface interactions with blood vessel walls. You will develop and apply a custom code combining the immersed boundary method (IBM) with an elastic membrane model in the open source CFD package OpenFOAM. Stochastic and deterministic models to simulate leukocyte-wall interactions will be critically compared and implemented into the model. Commercial CFD packages such as ANSYS Fluent or COMSOL Multiphysics may also be used for proof-of-concept simulations. You will be trained in CFD best practice, including model building, meshing, validation, and modelling-for-design, preparing you for a career in both academia and industry. The successful candidate will develop expertise in the finite volume and finite element methods, industry leading CFD software, and learn how to use numerical modelling to create medical technology.

Further information:
The project is planned to start as soon as possible.

Applicants must hold a Bachelor’s degree in Engineering or Science (computer science, physics, applied mathematics, or biomedical engineering majors preferred) and have an excellent academic track record. The applicant should also have some prior research experience, eg. an Honours degree (First Class), a Master's degree, research assistant job, or equivalent industry experience.

The ideal applicant will have a strong interest in computational fluid dynamics and experience in the physical sciences (physics, maths, computer science). Demonstrated proficiency in fluid mechanics, numerical methods for partial differential equations, the finite element/volume method, surface chemistry, nanotechnology, or programming (C++, Python) is highly desired but not essential. Applicants must be able to demonstrate strong written and oral communication skills (including the University requirements for English language proficiency) and the capacity to work both independently and as part of a team.

Plasma Bio-Engineering Scholarships

1. **Multifunctional coatings for surface engineering of bone implants: Antibacterial and osteogenic functionalization of 3D printed scaffolds**
2. **Plasma-engineered hybrid solid-hydrogel materials for brain tissue regeneration**
3. **Hydrogel-based nano composite coatings: Biomimetic surface engineering of artificial blood vessels and nerve guide conduits**
4. **Hydrogel-solid scaffolds with controlled drug release for cancer therapy and wound healing**

Supervisor:
Dr Behnam Akhavan - behnam.akhavan@sydney.edu.au

Research Area:
Biomaterials, Surface Engineering, Biotechnology

Project Description:
4 PhD scholarships are available in Plasma Bio-engineering. The scholarships are for research on the development of functional solid-hydrogel hybrid materials and nanoparticles for tissue engineering and regenerative medicine applications. The successful applicants will carry out their PhD projects in a multidisciplinary research environment with national and international collaborations.

Further information:
4 scholarships are available and applicants should have completed an Honours, MSc or equivalent degree in one or more of the following fields: Chemistry, Physics, Mechanical Engineering, Chemical Engineering, Material Science and Engineering, Biomedical Engineering, or related disciplines.

Documents for Application: CV, academic transcripts, IELTS results (international applicants), and a cover letter outlining your suitability for the project.

Develop single-cell mechanobiological methods for discovering molecular mechanisms of cardiovascular and neuronal mechanical force sensing

Supervisor:
Dr Arnold Lining Ju - arnold.ju@sydney.edu.au

Research Area:
Mechanobiology; Cardiovascular Engineering; Neuroengineering

Project Description:

In view of the high complexity and dynamics of protein complexes that perform important physiological functions, it is difficult to visualise and characterise their kinetic and signalling processes on single living cells using traditional biochemical and biophysical techniques. It is therefore urgent to develop high-resolution bioimaging and single-molecule manipulation technologies to observe life activities in native cellular environments at nanoscale.

Over the last 5 years, Dr Ju has developed the state-of-the-art pico-force (10^{-12} Newton) BFP technique as the first of its kind in Australia. Using this powerful nanotool, he has made conceptual advances on the inner workings of many mechanosensory proteins including the platelet integrin receptor in thrombosis (*Nature Materials* 2019; *Nature Communications* 2018; *eLife* 2018), the Apolipoprotein A-IV (*Nature Communications* 2018), glycoprotein Ib (*eLife* 2016) and von Willebrand factor (*Science Advances* 2018) in haematology and the syndecan receptor in cancer biology (*Nature Communications* 2014).

This project will combine BFP with high-resolution microscopy leading to a more advanced BFP imaging platform. It will become the first in the world capable of correlating the mechanical stimulation profile with the real-time cellular responses of a single platelet with the superior temporal, spatial, and force resolutions at 0.7 milli-second, 3 nano-meter, and 1 pico-newton respectively. The whole system provides precise controls and quantitative readouts in both mechanical and chemical terms, which is particularly suited for live-cell mechanosensing studies over the traditional methods in biochemistry and cell biology that are usually population-averaged and non-real-time. In future, it will further upgrade the platform in the combination of patch clamp to realise the single-molecule electrophysiology, imaging and manipulation in one system.

The lab will apply these cutting-edge technologies for the following biomedical application: 1) define the mechanosensing functions of key protein players in the cardiovascular system such as integrin receptors and mechanosensitive ion channels, and elucidate their contributions to the cardiovascular diseases - particularly thrombosis and guide the development of new anti-thrombotic therapeutic strategies; 2) investigate the transmembrane conduction of mechanical forces in neurology. In particular, the generation and regulation of force signals during membrane fusion such as the formation and regulation of SNARE complexes during neurotransmitter release. This study will provide fundamental biological insights for ongoing sensory bionics and implantable neuroprosthesis research.

Further information:

We are looking for candidates with the following skills and experience:

- Academic knowledge in the discipline of biophysics, biomechanics, electrophysiology, cell biology and biochemistry.
- Experience of instrumenting or operating single-molecule force spectroscopies such as atomic force microscopy, optical tweezers, magnetic tweezers, patch clamp electrophysiology systems, micromanipulation and microinjection systems, or other biomedical experimental devices such as rheometers and parallel plate flow chambers.
- Familiar with using two or more of Labview, ImageJ, AutoCAD, MATLAB, 3D-max, PRO-E, SolidWorks and other software.

Preferred experience includes:

- Solid basic knowledge of biology and hands-on experience in PC2 biological laboratory, using flow cytometer, ELISA, Western blots, protein-protein interaction assays, protein/antibody purification and functional characterisations.
- Capability of independently output processing models and drawings, be capable of CNC programming, use other conventional processing platform equipment to manufacture mechanical parts, and use 3D printers for part manufacturing.
- Pre-doctoral track records with publications, conference papers, reports, professional or technical contributions with evidence of independent research ability.
- Excellent oral and written communication skills.

Develop point-of-care microfluidic technologies for cardiovascular and cerebrovascular diseases

Supervisor:
Dr Arnold Lining Ju - arnold.ju@sydney.edu.au

Research Area:
Mechanobiology; Cardiovascular Engineering; Neuroengineering

Project Description:
Excessive clotting (thrombosis) leads to cardiovascular diseases such as heart attack and stroke—the No.1 world-wide killer, killing one Australian every 12 minutes. It has long been recognized that platelets play a central role in thrombosis and are unique in their ability to form stable adhesive interactions under conditions of rapid blood flow. We have recently discovered a new 'biomechanical' prothrombotic mechanism that highlights the remarkable platelet sensitivity to the shear stress gradients of blood flow disturbance. Importantly, we found that the current anti-thrombotic drugs such as Aspirin, Plavix® or Brilinta®, have limited effect against this biomechanical thrombosis.

To address this pressing need, we are developing simple-to-use, high-throughput and highly-informative microfluidic biochips to understand sequences of molecular events underlying biomechanical thrombosis (mechanobiology). We are also developing computational fluid dynamics (CFD) simulation to correlate the haemodynamic parameters with thrombotic phenotypes. We are assembling a team of bioengineers and clinicians at the newly-launched Biomedical Engineering School and Charles Perkins Centre—the national flagship research hub for cardiovascular diseases and diabetes. The anticipated outcome could translate into point-of-care tools that facilitate physicians' decisions on diagnosis, follow disease progression, optimise treatment courses, or even deploy on ambulance to improve patient care.

Further information:
We are looking for candidates with the following skills and experience:

- Academic knowledge in the discipline of biophysics, biomechanics, electrophysiology, cell biology and biochemistry.
- Capability of using two or more of ANASYS, Comsol, Labview, AutoCAD, MATLAB, 3D-max, PRO-E, SolidWorks, ZEMAX and other software.
- Experience with the use of computational fluid dynamics (CFD) for haemodynamics or PIV analysis of haemorheology.

Preferred experience includes:

- At least one year of experience in clean room micro/nano processing and soft lithography;
- Experience in theoretical simulation using and Matlab or Comsol, or Labview programming to control equipment and devices.
- Capability of independently output processing models and drawings, be capable of CNC programming, use other conventional processing platform equipment to manufacture mechanical parts, and use 3D printers for part manufacturing.
- Pre-doctoral track records with publications, conference papers, reports, professional or technical contributions with evidences of independent research ability.
- Excellent oral and written communication skills.

Molecular dynamics simulation and computational design for anti-thrombotic peptide drugs

Supervisor:
Dr Arnold Lining Ju **-** arnold.ju@sydney.edu.au

Research Area:
Mechanobiology; Cardiovascular Engineering; Neuroengineering

Project Description:

An estimated 1.2 million (5.6%) Australian adults aged 18 years and over had 1 or more conditions related to heart or vascular disease in 2017–18, where myocarditis, stroke and encephalopathy can potentially result in mortality. Increasing number of studies demonstrate the elevating shear in blood flow mediates the activation of proteins like von Willebrand factor (VWF) and FVIII as a key event in hemostasis and thrombosis. The current view indicates that this phenomenon is related to an autoinhibitory mechanism regulated by the flanking regions. Yet, detailed mechanism is still elusive since limited knowledge on the fully resolved structure of these proteins.

To address the unknown, this project intends to use molecular dynamic (MD) simulation to visualize and study the single molecular interaction with the aid of the recent introduced AlphaFold, which is a deep learning based predictor for protein structure and has incredible accuracy in simulating conformation of protein (an average 95% RMSD-Cα to the experimental structure of less than 1Å). We aim to use steered MD simulation to investigate autoinhibition effect of flanking region on the binding interface between ligands and their receptors, and thereafter detailly elucidate the activating mechanism of VWF and FVIII in high-shear environment. Since the current thrombotic drug such as Aspirin, Plavix® or Brilinta® has limited effect against biomechanical thrombosis and increased the risk of bleeding, the protein structural finding of this theme will be further implemented to design and screen new anti-thrombotic peptide drug, which will effectively impede thrombosis but has minimum complication which interfere hemostasis.

Further information:

We are looking for candidates with the following skills and experience:

- Academic knowledge in the discipline of biophysics, biomechanics, electrophysiology, cell biology and biochemistry.
- Experience of Linux/Unix commanding line (Unix shell).
- Capability of using two or more of GROMACS, Hex, LabVIEW, Python, AutoCAD, MATLAB and other software.

Preferred experience includes:

- Solid basic knowledge of biology and hands-on experience in PC2 biological laboratory, using flow cytometer, ELISA, Western blots, protein-protein interaction assays, protein/antibody purification and functional characterizations.
- Experience in theoretical simulation using and MATLAB or COMSOL, or LabVIEW programming to control equipment and devices.
- Capability of independently output processing models and drawings, be capable of CNC programming, use other conventional processing platform equipment to manufacture mechanical parts, and use 3D printers for part manufacturing.
- Pre-doctoral track records with publications, conference papers, reports, professional or technical contributions with evidence of independent research ability.

- Excellent oral and written communication skills.

Develop single-molecule and super-resolution microscopy imaging technologies in the cardiovascular disease

Supervisor:
Dr Arnold Lining Ju **-** arnold.ju@sydney.edu.au

Research Area:
Mechanobiology; Cardiovascular Engineering; Neuroengineering

Project Description:

This project will focus on development, improvement, and application of single-molecule tracking and super-resolution imaging, such as TIRF, HiLo, PALM, STORM, Lattice Light-Sheet Microscopy and other technologies, for the analysis of key proteins in the process of thrombosis and platelet activation, dynamic processes such as molecular conformational changes (i.e. integrin receptors, cytoskeletons, and mechano-sensitive ion channels), protein assembly and relocation, and protein-protein interactions. We aim to make technological breakthroughs in time, space and multiple dimensions, and draw the platelet "molecular interactome" of healthy people and cardiovascular patients with diabetes, obesity and metabolic syndromes. Finally, the high-volume 2D-3D image data analyses are combined for anti-platelet drug screenings.

Further information:

We are looking for candidates with the following skills and experience:

- Skilled in using at least one optical design software such as ZEMAX, Lighttools, Codev, TRACEPRO.
- Master basic optical theory, diffractive optics, Fourier optics, photoelectric information processing and other basic theories, and understand the design principles of microscope imaging systems.
- Familiar with the design of optoelectronic system architecture. Experience in microscope and imaging optical system design and production is preferred.
- Responsible for optical system design and component selection, assembly and debugging of optical systems.
- Solid basic knowledge of biology and rich experience in the PC2 biological laboratory, applicants with related scientific backgrounds such as pathological imaging diagnosis, intracellular organ imaging mechanism analysis, bioprobe labeling, targeted therapy, etc.

Preferred experiences include:

- Optical microscopy imaging, optical super-resolution imaging, adaptive optics, the principles and characterization of fluorescent materials, and the principle of photon matter interaction.
- Using spatial light modulator, deformable mirror device, and acoustic optical deflector.

Real-time cell mass identification of cellular processes to build the next generation of diagnostics

Supervisor:
David Martinez Martin - david.martinezmartin@sydney.edu.au

Research Area:
Nanobiotechnology; Cellular biophysics; Physical Biology

Project Description:
Cell growth and mass regulation is a fundamental process for all living organisms, yet it is poorly understood – partly due to our inability to detect changes in mass at cellular level. We develop technologies that measure and monitor cell growth in real time at the single-cell level, enhancing our understanding of cell development. Considering that dysregulation of cell mass is a critical underlying force in the development and progression of many diseases, understanding how cells regulate their mass has enormous potential to transform the way we diagnose, monitor and treat disease conditions such as cancer, diabetes, obesity, cardiovascular disease, ageing or infectious diseases. Our research is at the interphase of engineering, biology and physics, and involves working with exciting methods and techniques of microfabrication, nanotechnology, advanced optical microscopies, programming, cell biology, atomic force microscopy, etc.

https://www.sydney.edu.au/research/opportunities/opportunities/2789

Further information:
Starting date to be discussed and after June 2021

Development of novel synthetic tendon/ligament tissues

Supervisor:
Hala Zreiqat - hala.zreiqat@sydney.edu.au, ros.wu@sydney.edu.au

Research Area:
Biomaterials; Tissue Regeneration and Artificial Intelligence; Tissue engineering; Medical devices;

Project Description:
The project is industry-collaborative and focused on the development of novel synthetic tendon/ligament tissues. In order to eliminate the reliance on human donor tissue grafts, a novel synthetic tendon/ligament material is being developed at ARC-TCIB. The successful PhD applicant is expected to work closely with their PhD supervisors to optimize the composition and microstructural properties of these synthetic soft tissues.

Further information:
The start date is October 2021.

Thin Film Coatings and Hydrogels for Cell Culture Microenvironments

Supervisor:
Marcela Bilek - marcela.bilek@sydney.edu.au

Research Area:
Surface Engineering; Thin Film Deposition

Project Description:
These projects are all linked to an Australian Research Council Laureate Research Program entitled "Plasma surface engineering for break-through technologies in biomedicine". This research program focuses on development and demonstration of new technologies for biomedical applications using biologically functional surfaces and materials created by environmentally sustainable plasma processes. Projects are available in the areas of

nanotechnology, microfluidics, biosensing, implantable biomedical devices, organ-on-a-chip as well as the development of novel materials and plasma processes are available. Techniques employed include computational modelling and experimental studies utilising a wide range of plasma processes and diagnostics; processing discharges; surface and materials analysis techniques; as well as cell culture and biochemical studies.

Further information:
Applicants should have good communication skills and an interest to work in multidisciplinary teams will be advantageous.

Plasma Polymerised Nanoparticles for Diagnostics and Therapeutics

Supervisor:
Marcela Bilek - marcela.bilek@sydney.edu.au

Research Area:
Plasma polymerisation; Plasma processing; Biomolecule Functionalisation

Project Description:
These projects are all linked to an Australian Research Council Laureate Research Program entitled "Plasma surface engineering for break-through technologies in biomedicine". This research program focuses on development and demonstration of new technologies for biomedical applications using biologically functional surfaces and materials created by environmentally sustainable plasma processes. Projects are available in the areas of nanotechnology, microfluidics, biosensing, implantable biomedical devices, organ-on-a-chip as well as the development of novel materials and plasma processes are available. Techniques employed include computational modelling and experimental studies utilising a wide range of plasma processes and diagnostics; processing discharges; surface and materials analysis techniques; as well as cell culture and biochemical studies.

Further information:
Applicants should have good communication skills and an interest to work in multidisciplinary teams will be advantageous.

Surface Functionalisation for Microfluidic Devices

Supervisor:
Marcela Bilek - marcela.bilek@sydney.edu.au

Research Area:
Functional Materials; Composite and Hybrid Materials; Surface Coatings

Project Description:
These projects are all linked to an Australian Research Council Laureate Research Program entitled "Plasma surface engineering for break-through technologies in biomedicine". This research program focuses on development and demonstration of new technologies for biomedical applications using biologically functional surfaces and materials created by environmentally sustainable plasma processes. Projects are available in the areas of nanotechnology, microfluidics, biosensing, implantable biomedical devices, organ-on-a-chip as well as the development of novel materials and plasma processes are available. Techniques employed include computational modelling and experimental studies utilising a wide range of plasma processes and diagnostics; processing discharges; surface and materials analysis techniques; as well as cell culture and biochemical studies.

Further information:
Applicants should have good communication skills and an interest to work in multidisciplinary teams will be advantageous.

Interfaces for Biosensing

Supervisor:
Marcela Bilek - marcela.bilek@sydney.edu.au

Research Area:
Surface Coatings; Plasma processing; Composite and Hybrid Materials

Project Description:
These projects are all linked to an Australian Research Council Laureate Research Program entitled "Plasma surface engineering for break-through technologies in biomedicine". This research program focuses on development and demonstration of new technologies for biomedical applications using biologically functional surfaces and materials created by environmentally sustainable plasma processes. Projects are available in the areas of nanotechnology, microfluidics, biosensing, implantable biomedical devices, organ-on-a-chip as well as the development of novel materials and plasma processes are available. Techniques employed include computational modelling and experimental studies utilising a wide range of plasma processes and diagnostics; processing discharges; surface and materials analysis techniques; as well as cell culture and biochemical studies.

Further information:
Applicants should have good communication skills and an interest to work in multidisciplinary teams will be advantageous.

Scaffolds and tailored environments for tissue regeneration and disease modeling

Supervisor:
Marcela Bilek - marcela.bilek@sydney.edu.au

Research Area:
Biomolecule Functionalisation; Biofabrication

Project Description:
These projects are all linked to an Australian Research Council Laureate Research Program entitled "Plasma surface engineering for break-through technologies in biomedicine". This research program focuses on development and demonstration of new technologies for biomedical applications using biologically functional surfaces and materials created by environmentally sustainable plasma processes. Projects are available in the areas of nanotechnology, microfluidics, biosensing, implantable biomedical devices, organ-on-a-chip as well as the development of novel materials and plasma processes are available. Techniques employed include computational modelling and experimental studies utilising a wide range of plasma processes and diagnostics; processing discharges; surface and materials analysis techniques; as well as cell culture and biochemical studies.

Further information:
Applicants should have good communication skills and an interest to work in multidisciplinary teams will be advantageous.

Biomolecule patterning for guided biomolecule and cell responses

Supervisor:
Marcela Bilek - marcela.bilek@sydney.edu.au

Research Area:
Biomolecule Functionalisation; Biofabrication

Project Description:
These projects are all linked to an Australian Research Council Laureate Research Program entitled "Plasma surface engineering for break-through technologies in biomedicine". This research program focuses on development and demonstration of new technologies for biomedical applications using biologically functional surfaces and materials created by environmentally sustainable plasma processes. Projects are available in the areas of nanotechnology, microfluidics, biosensing, implantable biomedical devices, organ-on-a-chip as well as the development of novel materials and plasma processes are available. Techniques employed include computational modelling and experimental studies utilising a wide range of plasma processes and diagnostics; processing discharges; surface and materials analysis techniques; as well as cell culture and biochemical studies.

Further information:
Applicants should have good communication skills and an interest to work in multidisciplinary teams will be advantageous.

The role of surface charge and electric fields in biomolecule interactions

Supervisor:
Marcela Bilek - marcela.bilek@sydney.edu.au

Research Area:
Surface Activation; Electrical Discharges

Project Description:
These projects are all linked to an Australian Research Council Laureate Research Program entitled "Plasma surface engineering for break-through technologies in biomedicine". This research program focuses on development and demonstration of new technologies for biomedical applications using biologically functional surfaces and materials created by environmentally sustainable plasma processes. Projects are available in the areas of nanotechnology, microfluidics, biosensing, implantable biomedical devices, organ-on-a-chip as well as the development of novel materials and plasma processes are available. Techniques employed include computational modelling and experimental studies utilising a wide range of plasma processes and diagnostics; processing discharges; surface and materials analysis techniques; as well as cell culture and biochemical studies.

Further information:
Applicants should have good communication skills and an interest to work in multidisciplinary teams will be advantageous.

Chemical and Biomolecular Engineering

Sustainable ammonia with plasma-catalysis

Supervisors:
Patrick Cullen - patrick.cullen@sydney.edu.au; Fengwang Li - fengwang.li@sydney.edu.au

Research Area:
catalysis, plasma, ammonia, sustainability, hydrogen

Project Description:
Ammonia is one of the world's most important chemicals directly sustaining over 50% of our food supply. But the current means of its production is highly eco-destructive and responsible for over 1% of global CO_2 emissions, a similar value to global air travel. Moreover, if driven by renewables, ammonia offers an effective means of exporting hydrogen. Ammonia has nine times the energy density of Li-ion batteries, and three times that of compressed hydrogen, creating potential as a carbon-free energy carrier. This project aims to produce green ammonia from renewable sources of water, electricity and air. The research will study plasma-catalytic conversion of air providing insights into the reaction mechanisms, energy efficiency and a pathway for future adoption of the technology by industry.

Further information:
The candidate will be joining a multi-disciplinary team of researchers and students between the Atmospheric Plasma Lab led by Prof. PJ Cullen and the Lab for Electrochemical Energy led by Dr Fengwang Li both within the School of Chemical and Biomolecular Engineering, The University of Sydney.

The candidate should have, or expect to achieve, a first-class degree (or equivalent) in a relevant Engineering or Science discipline. Backgrounds and interest in chemical engineering, chemistry or material science are suitable for the position. Applicants should also have good analytical, experimental, project management and communication skills.

If you are interested, email your CV and transcript to the supervisors.

Fundamental Mechanism of Protein Phase Behaviour

Supervisor:
Yi Shen - yi.shen@sydney.edu.au

Research Area:
protein liquid-liquid phase separation; Microfluidics; Biomaterials

Project Description:
The key focus of this project will be on understanding the mechanisms behind protein phase behaviour through physical parameters (e.g. temperature, size and interface), and identifying the methods to prevent the pathological transition.

Further information:
Planned start date: October 2021. Email your CV, transcript and research interests.

Biomaterials from Protein/Peptides Manipulation

Supervisor:
Yi Shen - yi.shen@sydney.edu.au

Research Area:
protein liquid-liquid phase separation; Microfluidics; Biomaterials

Project Description:
Development of biomaterials for microplastic replacement by taking advantage of protein phase behaviour.

Further information:
Planned start date: October 2021. Email your CV, transcript and research interests.

Chemical Recycling of Mixed Waste Plastics

Supervisor:
Ali Abbas **–** ali.abbas@sydney.edu.au

Research Area:
Chemical Engineering; Computational Fluid Dynamics; Heterogeneous Chemical Kinetics

Project Description:
Waste plastic is a growing problem in Australia and elsewhere in the world. Many plastics are uneconomic to process using conventional physical recycling technologies.

Recent advances have already demonstrated that thermochemical approaches can convert waste contaminated plastic into a feedstock for remanufacturing plastic.

The Scale-up, Optimisation and Modelling of Chemical Recycling of Mixed Waste Plastics Postgraduate Research Scholarship has been established to provide financial assistance to PhD students who are undertaking research in using advanced engineering reactors to become the next generation of processing technology that specifically targets the conversion of mixed and contaminated (non-recyclable), post-consumer waste plastic into feedstock materials for the virgin plastics manufacturing industry.

Further information:
Suitable for students with a background in Engineering or Science

Advanced Food Engineering – Smart Food Packaging

Supervisor:
Fariba Dehghani **–** fariba.dehghani@sydney.edu.au

Research Area:
Technologies for nutritional food products

Project Description:
Food is at the centre of many of society's global challenges: ensuring a safe, sustainable and secure food supply for growing populations; addressing the increasing incidence of chronic diseases; and meeting the issues arising from an ageing population.

There is also an increased demand for high-quality food, the need to minimise food waste and to ensure that the Australian food industry remains competitive in the global marketplace.

The Centre for Advanced Food Enginomics (CAFE) aims to meet these challenges by providing innovative solutions in food products, processes and supply chains to promote human wellbeing globally.

Scholarships are available to support students conducting research into smart food packaging sensors.

Further information:
Suitable for students with a background in Biochemistry, Physics, Chemical Engineering or Bioengineering.

Advanced Food Engineering – Biosensors for applications in medicine, food and agriculture

Supervisor:
Fariba Dehghani **–** fariba.dehghani@sydney.edu.au

Research Area:
Biosensors for the detection of biomolecules at the point-of-care

Project Description:
This collaborative research project involves engineers and a biochemist from the University of Sydney and Padova University (Italy) and aims to develop a new class of biosensors with potential applications in medical, food and agriculture. The project aims to design a miniaturised cascade sensor for detection of biomolecules particularly enzymes at point-of-care.

In this project the candidate will acquire experience in electrochemistry, polymer chemistry, engineering, advanced manufacturing, and biochemistry to develop miniaturised sensors for biological systems. The candidate will work with prominent researchers and will have access to excellent advanced manufacturing facilities at the University of Sydney.

Further information:

Suitable for students with a background in expertise in *electrochemistry* or *sensors*. Having knowledge of biochemistry particularly enzymatic reactions is desirable in this project.

Computational Modelling for Designing Optimum Structural, Mechanical, and Physical Properties of Materials for a Heart Valve

Supervisor:
Fariba Dehghani **–** fariba.dehghani@sydney.edu.au

Research Area:
Computational Modelling

Project Description:
In this project, fluid structure simulations of flow through a heart valve will be performed to understand the impact of design parameters and the properties of novel materials. There will be an opportunity to perform experimental work to collect flow data for use in model validation. Also, there is the possibility to be involved in other projects for in silico gut models.

Further information:
Suitable for students with a background in Engineering or Applied Mathematics

Engineering Processable Tough Hydrogels

Supervisor:
Fariba Dehghani **–** fariba.dehghani@sydney.edu.au

Research Area:
Polymer Engineering

Project Description:
This project will aim to design a type of hydrogel with broad applications in soft robotic, medical devices such as heart valves, vasculature, and development of in vitro model that mimic physical properties of digestion system including colon, intestine and stomach.

Further information:
Suitable for students with a background in Polymer Engineering or Chemistry

Civil Engineering Projects

Material characterisation and residual stresses of 3D-printed steel structures

Supervisor:
Anna Paradowska **-** anna.paradowska@sydney.edu.au

Research Area:
3D printed structures; steel structures; material characterisation

Project Description:
Successful 3D-printing of steel structures requires optimisation of the printing process which in this project consists of wire-arc additive manufacturing (WAAM). The project will investigate the influence of weld track spacing and overlapping, scanning sequence, heat input, wire feed rate and pause time between track depositions. Test specimens will be 3D-printed for selected combinations of process parameters, and weld residual stresses will be measured in-situ on the neutron strain scanner at ANSTO, allowing the residual stress evolution to be investigated. The development of the residual stresses will be then modelled using finite element (macroscale) simulations that predict the overall residual stress field and distortion of WAAM-printed components. After verifying the accuracy of the numerical predictions against experimental results, the models will be used to uncover the interdependency between the weld process variables, including voltage, amps, speed, patterning, dwell time and interpass temperature, and the mechanical properties and residual stress fields, thereby enabling the rapid optimisation of WAAM-process variables.

Further, to understand the microstructure of WAAM-printed materials, optical, Scanning Electron Microscopy (SEM) and Electron Back-Scatter Diffraction (EBSD) procedures will be used for identification of microstructure, and neutron radiography and imaging will be used to study the efficiency of the printing process and the formation of volumetric defects such as porosity and inclusions. Based on these observations, a parameter set that minimises defects and optimises for residual stress, required microstructure and strength will be identified. The project will provide the successful candidate with cutting-edge and industry sought-after knowledge about the material characterisation of 3D-printed steel structures. It is part of a larger project supported by the Australian Research Council which comprises multiple PhD projects including research on the crystal plasticity mechanisms that control microstructure and mechanical properties, and the macroscopic testing and analysis of structural connections.

Further information:

The scholarship is available to domestic and international students. The start date is flexible.

Multi-scale multi-physics modelling of 3D metal printing

Supervisor:
Kim Rasmussen **-** kim.rasmussen@sydney.edu.au

Research Area:
3D printed steel structures; Modelling of welding and solidification process; Mesoscale numerical models for predicting microstructure and mechanical properties

Project Description:
The project aims to develop multi-scale multi-physics predictive models for understanding the processing-microstructure-property relationship in the case of the wire-arc additive manufacturing (WAAM) 3D metal printing. The project will establish mesoscale numerical models for predicting the microstructure (grain size, texture, dislocations, etc.) and its

effects on mechanical properties. The analysis tools comprise the sequential coupling of phase-field models with classical crystal plasticity models. The phase-field mathematical framework will capture the solidification process and grain growth during the WAAM process, while the crystal plasticity model will predict the resultant mechanical properties of WAAM-printed alloys. The models will be further validated against measurements of 3D-printed specimens using standard electron backscatter diffraction (EBSD) techniques and newly established in-situ EBSD techniques available at ANSTO and the University of Sydney.

The project will provide the successful candidate with outstanding analytical skills and an understanding of the processes controlling the microstructure, strength and residual stresses of the increasingly important field of 3D-printed structural components. It is part of a larger project supported by the Australian Research Council which comprises multiple PhD projects including research on the material characterisation and residual stresses of WAAM-printed steel components, and the macroscopic testing and analysis of structural connections.

Further information:

The scholarship is available to domestic and international students. The start date is flexible.

Aligned recycled carbon fibre composites for high grade structural elements

Supervisor:
Ali Hadigheh **-** ali.hadigheh@sydney.edu.au

Research Area:
Composite recycling; Structural applications; Advanced manufacturing

Project Description:
By 2025, fibre composites will be a key waste stream worldwide. Current recycling methods are inept as they cause major reduction in mechanical and physical properties of recovered fibre. This project aims to produce high grade, low cost structural component from carbon fibre composite recyclates, and revolutionise their use in construction by carrying out an integrated experimental and advanced computational analyses. Outcomes include development of a novel method for recovery and realignment of fibres without compromising mechanical and physical properties. This provides significant benefits by expanding fundamental knowledge of material science and advanced manufacturing, solving problem on waste and efficient use of natural resources.

URL: https://www.sydney.edu.au/research/opportunities/opportunities/2337

Further information:
1 scholarship is available. Applicants need to email their CV, transcript, published works and a brief description of why they are interested in this project.

Dispersion of buoyant plumes in atmosphere over various terrains

Supervisor:
Kapil Chauhan **-** kapil.chauhan@sydney.edu.au

Research Area:
Pollution transport; Turbulent flows; Wind tunnel

Project Description:
This experimental study aims to characterise the movement of a scalar (pollutant) in the atmospheric turbulent boundary layer in a controlled setting of a boundary layer wind tunnel. The scalar will have a different density than the ambient air. At the same time, local conditions such as surface roughness, source parameters, heat-flux etc will be varied to

document the variation in spread characteristics. The results will be important for developing prediction models and validating numerical methods whilst also driving analytical developments.

Further information:
Applicants need to email their CV, transcript, published works and a brief description of why they are interested in this project.

Geoenvironmental Laboratory Scholarships

1. Transport of microplastic and co-contaminants in soil and groundwater

Supervisor:
Professor Abbas El-Zein - abbas.elzein@sydney.edu.au

Research Area:
Geoenvironmental Engineering; Soil Hydrology; Soil Chemistry

Project Description:
A PhD scholarship is available at the Geoenvironmental Laboratory at the School of Civil Engineering of the University of Sydney, working with Prof Abbas El-Zein to investigate nano- and microplastics in landfills and surrounding environments. The opportunity is open to Australian citizens and residents, as well as international students. This is one of two PhD projects currently open, funded by the Australian Research Council (ARC), and undertaken in collaboration with researchers located at Monash and Deakin Universities as well as Queen's University in Canada. Microplastics (MP) and nanoplastics (NP) are persistent polymeric contaminants. They have been found in many ecosystems on Earth, including rivers, forests, agricultural soils, beaches, deep oceans, as well as the food chain and water sources of many species including humans. 60% of all plastic ever produced is now buried in landfills and, recently, municipal waste landfills have been found to be a large sink, and a potential source, of MP/NP.

The aim of this PhD project is to develop experimentally validated computational models for predicting the transport of MP/NP, and co-contaminants, in soil and applying them to the assessment of risk to groundwater in landfill environments. Successful applicants must have a BSc or BEng Honours degree or equivalent, with research projects in Physics, Mathematics, Civil or Chemical Engineering or a closely related discipline. Preferably, they have experience with computational modelling, soil hydrology and/or contaminant transport. Applicants must have excellent numerical/mathematical and analytical skills. They must also have excellent communication skills, in written and spoken forms. They are able to work both independently and as members of a research team, while demonstrating a collaborative attitude. They are able to write high-quality research proposals and to review, and engage with, interdisciplinary studies. They are driven by curiosity and are highly motivated about working at the interface between fundamental and applied research.

Interested students are advised to email Prof Abbas El-Zein, following these steps:

1. write in the email's subject line "MP Modelling PhD - Expression of Interest",
2. state in the body of the email why you are interested in this opportunity, and
3. attach a CV and relevant transcripts, including, for international students from non-English speaking backgrounds, any available results of English testing (e.g., TOEFL etc.).

2. Developing new methods for the characterisation of nanoplastics in solids and liquids

Supervisor:
Dr Elizabeth Carter and Professor Abbas El-Zein - elizabeth.carter@sydney.edu.au
abbas.elzein@sydney.edu.au

Research Area:
Spectrometry; Soil Chemistry; Geoenvironmental Engineering

Project Description:
A PhD scholarship is available at the Geoenvironmental Laboratory of the University of Sydney, working with Dr Elizabeth Carter at Sydney Analytical and Prof Abbas El-Zein at the School of Civil Engineering, to investigate nano- and microplastics in landfills and surrounding environments. The opportunity is open to Australian citizens and residents, as well as international students. This is one of two PhD projects currently open, funded by the Australian Research Council (ARC), and undertaken in collaboration with researchers located at Monash and Deakin Universities as well as Queen's University in Canada. Microplastics (MP) and nanoplastics (NP) are persistent polymeric contaminants. They have been found in many ecosystems on Earth, including rivers, forests, agricultural soils, beaches, deep oceans, as well as the food chain and water sources of many species including humans. 60% of all plastic ever produced is now buried in landfills and, recently, municipal waste landfills have been found to be a large sink, and a potential source, of MP/NP.

The aim of this PhD project is to design, test and validate protocols for the measurement of MP/NP in solid and leachate samples. A range of characterisation techniques including dynamic light scattering, vibrational spectroscopy and mass spectrometry (ICP-MS, LC-MS and GC-MS, respectively) will be tested for this project. Successful applicants will be joining two world-leading research groups at Sydney Analytical and the Geoenvironmental Laboratory of the University of Sydney. Successful applicants must have a BSc or BEng Honours degree or equivalent, with research projects in Chemistry, Physics, Material Science, Civil or Chemical Engineering or a closely related discipline. Preferably, they have experience with one or more of the above listed characterisation techniques. Applicants must have excellent analytical and communication skills, in written and spoken forms. They are able to work both independently and as members of a research team, while demonstrating a collaborative attitude. They are able to write high-quality research proposals and to review, and engage with, interdisciplinary studies. They are driven by curiosity and are highly motivated about working at the interface between fundamental and applied research.

Interested students are advised to email Dr Elizabeth Carter, cc to Prof Abbas El-Zein, following these steps:

1. write in the email's subject line "Nanoplastic PhD - Expression of Interest",
2. state in the body of the email why you are interested in this opportunity, and
3. attach a CV and relevant transcripts, including, for international students from non-English speaking backgrounds, any available results of English testing (e.g., TOEFL etc.).

Computer Science Projects

Adaptive and Ubiquitous Trust Framework for Internet of Things interactions

Supervisor:
Professor Athman Bouguettaya - athman.bouguettaya@sydney.edu.au

Research Area:
Trust; Internet of Things (IoT); Crowdsharing

Project Description:
These PhD scholarships are funded by the Australian Research Council (ARC) Discovery Projects (DP) grant.

The project’s aim is to address the trust challenges in Internet of Things (IoT) environments, thus enabling the wide deployment of potentially billions of IoT devices. This project will generate new knowledge in the area of IoT Trust by developing novel techniques to establish trust in highly dynamic crowdsourcing IoT environments.
The project's main outcomes include the development of a ubiquitous and adaptive multi-component trust framework reflecting trust perspectives. The developed solutions will allow the establishment of trusted interactions among crowdsourced IoT devices and wider deployment of convenient and just-in-time services, thus enabling the development of novel applications, such as the crowdsourcing of green energy.

The successful applicants will be working in a world leading lab which focuses on services, clouds, and sensors focusing on the use of a range of techniques that span IoT and advanced machine learning techniques. Further information about the research conducted in the lab can be found at: http://scslab.net

Further Information: Up to two PhD scholarships will be available.

Deep Learning Theory

Supervisor:
Dr Tongliang Liu - tongliang.liu@sydney.edu.au

Research Area:
Deep learning algorithms; error bounds

Project Description:
Deep learning algorithms have given exciting performances e.g., painting pictures, beating GO champions and autonomously driving cars, among others, showing that they have very good generalisation abilities (small differences between training and test errors). These empirical achievements have astounded yet confounded their human creators. Why do deep learning algorithms generalise so well on unseen data? It lacks mathematical elegance. We do not know the underlying principles that guarantee it’s success. Let alone to interpret or pertinently strengthen its generalisation ability. We are interested in analysing error-bounds, e.g., generalization-error-bound and excess-risk-bound.

Fundamental Trade-offs between Data, Computation, and Privacy

Supervisor:
Dr Clement Canonne **-** clement.canonne@sydney.edu.au

Research Area:
Computational Learning;

Project Description:
Computational learning theory, or the theoretical study of what learning algorithms (broadly construed) can achieve, is a well established field, drawing among many others from the works of Valiant (PAC learning), Kearns (Statistical Query learning), and Goldreich, Goldwasser and Ron (property testing). However, statistical and computational aspects of learning and testing tasks (how much data is required, and how much time the algorithms take) are no longer the only resources one has to take into account. In many settings, we need to consider other crucial constraints, such as the privacy of data (e.g., as captured in the framework of differential privacy), the memory used by the algorithms (e.g., in the streaming setting), the amount of communication involved between parties (in distributed settings), or the robustness to malicious noise or misspecification. Balancing all those constraints leads to a much richer, and theoretically challenging, algorithmic landscape. This Ph.D. project aims to characterize the inherent trade-offs between those different aspects: establishing the theoretical limits of what algorithms can achieve, under which computational models, and how these different information or computation constraints affect the complexity of the task.

System ML, IoT/edge Driven ML Adaptation

Supervisor:
Dr Shuaiwen Song - shuaiwen.song@sydney.edu.au

Research Area:
Machine Learning; Internet of Things; Neural Networks & Architecture

Project Description:
The topics include but are not limited to: Machine learning model deployment, large-scale system optimisation, software-hardware co-designing for training and inference, recommendation models and their deployment, emerging neural networks and models exploration and deployment, neural architecture search, real time optimisation on power and performance efficiency, tiny ML, compiler-hardware co-design, system design and prototyping, symbolic AI + compilation optimisation on small devices.

Large-Scale Transformer Neural Networks in the Real World

Supervisor:
Dr Chang Xu - c.xu@sydney.edu.au

Research Area:
Neural Networks; Computer Vision

Project Description:
Transformer neural networks have received impressive success in Natural Language Processing, and recently also demonstrated promising performance on different Computer

Vision tasks. To further boost Vision Transformer performance, we tend to introduce more inductive bias specific to computer vision tasks into the formulation of this special type of deep neural network. Also, we will conduct a thorough comparison between the classical convolutional neural network and the new fashion of transformer neural networks and deliver new designs of some hybrid neural networks while investigating the challenges from the real-world vision applications.

Large Scale Multi-Modal Deep Learning

Supervisor:
Associate Professor Zhiyong Wang - zhiyong.wang@sydney.edu.au

Research Area:
Machine Intelligence; Deep Learning

Project Description:
While big multi-modal data including image, video and text provides unprecedented opportunities to bring current machine intelligence to next level with human-like multi-modal capacity, it has been an open question on how to utilise the enormous amount of multi-modal data. Along this direction, we aim to investigate novel multi-modal deep learning models, such as self-supervised multi-modal and cross-modal learning, efficient and scalable multi-modal deep learning, and transfer learning with multi-modal deep models

Beyond Worst-Case Analysis: Tools for Developing Practical Algorithms

Supervisor:
Professor Joachim Gudmundsson - joachim.gudmundsson@sydney.edu.au

Research Area:
Algorithm Design

Project Description:
There is a well-known discrepancy between theoretically efficient algorithms and effective practical algorithms. The traditional goal of theoretical computer science is to prove that an algorithms performs well in the worst case: if one can prove that an algorithm performs well in the worst case, then one can be confident that it will work well in every domain. However, there are many examples of algorithms that work much better in practice than in the worst case. Understanding precisely why these algorithms work well empirically is essential to developing better practical algorithms. This project will fulfill the acute need for new analytical tools and models that will enable better design of practical algorithms

Unravelling the Nascent Privacy Risks of 3D Spatial Mixed Reality Data

Supervisor:
Dr. Kanchana Thilakarathna

Research Area:
Computer Science; Cybersecurity; Computer Vision

Project Description:
With the ever increasing advancements in mobile vision and sensing technologies, augmented, mixed, and/or virtual reality technology (AR/MR/VR; we collectively refer as MR) is increasingly becoming popular. From face filters on online social networks to game applications augmenting virtual pets or monsters that seemingly inhabit the physical world, various MR applications are now widely accessible to most mobile users.

MR platforms require spatial understanding to detect objects or surfaces, often including their structural (i.e. spatial geometry) and photo-metric (e.g. color and texture) attributes, to allow applications to place virtual or synthetic objects seemingly "anchored" on to real world objects; in some cases, even allowing interactions between the physical and virtual objects. These functionalities require MR platforms to capture the 3D spatial information with high resolution and high frequency. However, these pose unprecedented risks to user privacy. Compared to images and videos, spatial data poses additional and, potentially, latent risks to users of MR. Aside from objects being detected, spatial information also reveals the location of the user with high specificity, e.g. in which part of the house the user is, or even detect user poses, movement, or changes in their environment which the user did not indent to share. Adversaries can vary from a background service that delivers unsolicited ads based on the objects detected from the user's surroundings to burglars who are able to map the user's house, and, perhaps, the locations and dimensions of specific objects in their house based on the released 3D data. Furthermore, turning off GPS tracking for location privacy may no longer be sufficient once the user starts using MR applications that can expose their locations.

This project focuses on thorough experimental validation of the existence of privacy risks associated with 3D point cloud data, and development of privacy preserving user configurable transformation mechanisms for 3D point cloud data resulting in novel 3D data regeneration models and frameworks.

Further Information:

We are looking for a PhD student who possesses demonstrated expertise in the following criteria:

- First-class honor bachelor degree or MSc or equivalent degree in computer science and engineering, telecommunication or electrical engineering.
- Excellent knowledge in applied machine learning, or computer networking and mobile systems.
- Hands on experience in programming and software development.
- Excellent interpersonal and communication skills

If you are interested email your up-to-date CV and transcript to Dr. Kanchana Thilakarathna: Kanchana.thilakarathna@sydney.edu.au

Towards Everlasting Security: Quantum Safe Algorithms for secure and decentralized storage and management

Supervisor:
Dr Qiang Tang - qiang.tang@sydney.edu.au

Research Area:
Quantum; Crypto; Blockchain

Project Description:
Industry 4.0 refers to a new phase in the Industrial Revolution that focuses heavily on interconnectivity, automation, large scale data processing and analytics. It heavily relies on data storage and computing facilities like cloud and edge devices. Remote data storage brings security and privacy challenges. Data breaches can reveal sensitive personal information of individuals. That is why privacy laws like GDPR and CCPA encourage

encryption and authentication of data. However, many of these encryption algorithms rely on public key cryptography which are vulnerable on attacks by quantum computers.

In order to secure data stored in remote servers, clients need to periodically re-encrypt data with fresh cryptographic keys. That is why, our IT systems recommend changing passwords from time to time. It has been observed that if these keys (or passwords) are not changed properly, then attackers can retrieve the keys and get access to the data. Another challenge is that this process has to be efficient and should involve minimum effort of the client.

The aim of this project is to design encryption and authentication algorithms that are quantum-safe, efficient and can withstand data breaches over long period of time. Our algorithms will address the following:

1. Efficient and Secure password and key management by designing password vaults
2. Efficient re-encryption algorithms for data sharing and key update
3. Protection against malicious service providers.

Further Information:
We are looking for candidates with the following skills and experiences:

- Strong background in applied Cryptography, data structure and algorithms, strong mathematical inclination.
- Strong programming skills, especially in C, C++, Python

If you require additional information regarding the project, eligibility or other questions, please contact qiang.tang@sydney.edu.au

Efficient Key-Value store for future hardware

Supervisors:
Baptiste Lepers and Willy Zwaenepoel - baptiste.lepers@sydney.edu.au

Research Area:
Data Structures, Hardware, Operating Systems and Databases

Project Description:
The objective of the project is to design an efficient key-value store for future hardware, using fast NVMe SSDs and persistent byte-addressable memory.

In our modern digital life, activities from buying clothes to accessing government services depend on working with computer applications which store information in a long-lasting form, that is, they need a data store, where information (called ”values”) is found using a label or ”key”, So the key-value store is vital for the functionality and performance of all applications. Even relational databases typically contain a key-value store as a storage engine, underneath layers that support a richer query model.

The current key-value stores are designed for today’s typical hardware environment with a memory hierarchy of slow but capacious hard disk, flash-based SSD, and fast but limited and volatile RAM. Currently, no key-value store can leverage the speed of fast NVMe SSDs and byte-addressable persistent memory -- existing key-value stores become CPU bound before reaching the limit of these devices.

The goal of this project is to rethink the way data is stored in memory and on disk to design a fast key-value store for modern drives and persistent memory. The project will start with a study of the characteristics of persistent memory. Then existing data-structures designed for volatile DRAM will be ported and optimized for persistent memory. Finally, new designs will be proposed.

Further information:
Requirements: fluent C, C++, or Rust programming, notions of good practices in optimizations and efficient programming.

Contact: baptiste.lepers@sydney.edu.au with cover letter and resume.

Persistent Memory in the Linux kernel.

Supervisors:
Baptiste Lepers and Willy Zwaenepoel - baptiste.lepers@sydney.edu.au

Research Area:
Kernels, Memory, Operating Systems and Databases

Project Description:
The objective of the project is to improve the Linux kernel by allowing it to store data in fast persistent byte-addressable memory.

The Linux kernel has been designed with the idea that persistent storage is slow, has high latency, and can only be accessed asynchronously (i.e., by sending a request to a disk that will only answer at a later point in time). As a consequence, the Linux kernel avoids using persistent storage as much as possible and keeps most of its state in DRAM. Many subsystems of the kernel, such as the page cache or the swap mechanism, are fundamentally designed for slow drives, delaying accesses to the disk as much as possible. These subsystems are currently unable to leverage the speed and low latency of modern persistent byte-addressable memory (PMEM) -- unlike traditional disks, PMEM can read and write data at GB speed and persist data with sub-microsecond latency.

The goal of the project is to rethink the relationship between the Linux kernel and storage. The project will start with an analysis of the page cache. The page cache can be easily modified to leverage persistent memory by avoiding the need to flush dirty data to disk. We expect this change to provide an important speedup for applications that sync data to disk frequently (e.g., databases).

Further information:
Requirements: fluent C programming, ability to navigate in a large codebase (Linux kernel).

Contact: baptiste.lepers@sydney.edu.au with cover letter and resume.

Detecting data races in the Linux kernel

Supervisors:
Baptiste Lepers and Willy Zwaenepoel - baptiste.lepers@sydney.edu.au

Research Area:
Data Races, Kernels, Operating Systems and Databases

Project Description:
The objective of the project is to design a new mechanism to specify and detect data races bugs in the Linux kernel.

The Linux kernel is a highly optimized multi-core system. As a consequence, kernel developers frequently use relaxed synchronization models: instead of protecting shared variables with locks, the code is carefully engineered so that variables can be read outside of critical sections while still providing a consistent view of the data. For instance, the kernel often allocates an object, initializes it, and then inserts it in a list. The inserts to the list are protected by a lock, but the list can be read without taking any lock. The code is thus only correct if the inserted object has been fully and correctly initialized before being inserted in the list. The kernel relies on memory barriers to order the initialization and the insert.

However, memory barriers are notoriously tricky to use correctly. A quick search in kernel commits found hundreds of bugs related to missing barriers. These bugs are tricky to understand and to fix.

In this project, we want to create a tool that would help developers get formal guarantees on code that relies on ordering and barriers for correctness. The key idea of the project is to use existing comments in the kernel code to figure out ordering constraints between variables or functions. Kernel developers often comment on the intent of the code, and informally document the ordering constraints of their code. We want to use these comments to figure out if the commented constraints are respected throughout the entire kernel.

Further information:
Requirements: notions of static analysis, ability to navigate in a large codebase (Linux kernel).

Contact: baptiste.lepers@sydney.edu.au with cover letter and resume.

Applied cryptography and blockchain research

Supervisor:
Qiang Tang - qiang.tang@sydney.edu.au

Research Area:
Blockchain; Cryptography; Privacy

Project Description:
The research will be on applied cryptography and blockchain, to solve real-world security and decentralised application problems via rigorous protocol design.

Further information:
Expected background: strong theoretical computer science or math background (e.g., probability or algebra), big plus if previously exposed to modern cryptography or blockchain, or with strong programming skills.

If you need the Data61 scholarship, example topics would be password protected cryptocurrency wallet; secure key rotation for compliance; secure messaging etc. But there can be flexibility on concrete topics.

The Data61 scholarship is currently available for students who can be physically in Australia. But if you do not need the scholarship and enthusiastic about doing top tier research in the frontier of blockchain and crypto, you are also welcome to get in touch, topics could be determined based on discussions and common interests. More information about our group can be found at **https://alkistang.github.io/**

Geometric Networks in the Presence of Obstacles

Supervisor:
André van Renssen **-** andre.vanrenssen@sydney.edu.au

Research Area:
Algorithms; Computational Geometry; Graph Theory

Project Description:
Geometric networks are networks where every node has a location associated with it. When two nodes are connected, they know each other's location. These networks are quite well understood and most networks allow for modifications in order to enhance it, such as guaranteeing a certain maximum degree for each node, bounding the number of hops needed to reach any other node, or having efficient routing algorithms. However, when there are obstacles that block communication between nodes on opposite sides, far less is known about these networks. In this project, we aim to shed some light on these networks in the presence of obstacles in order to design networks that have additional good properties and/or allow for efficient routing algorithms.

Further information:
A strong background in discrete math and/or algorithms is strongly recommended for this project.

Routing in Geometric Networks

Supervisor:
André van Renssen - andre.vanrenssen@sydney.edu.au

Research Area:
Algorithms; Computational Geometry; Graph Theory

Project Description:
Geometric networks are networks where every node has a location associated with it. When two nodes are connected, they know each other's location. These networks are quite well understood and a number of efficient routing algorithms have been developed for them. Some of these routing algorithms come with theoretical worst-case guarantees on the length of the routing path, but not all do. Hence, we aim to perform a comprehensive study comparing various routing algorithms in order to discover which performs best in practice and which types of geometric graphs the known routing algorithms have trouble with. The latter will also provide a starting point for the development of new routing algorithms specifically designed to handle these problematic situations.

Further information:
A strong background in discrete math and/or algorithms is strongly recommended for this project.

Electrical and Information Engineering Projects

Logic Development of MAC Systems for Wireless Communications

Supervisor:
Wibowo Hardjana - wibowo.hardjawana@sydney.edu.au

Research Area:
Wireless Communications, 5G, 6G , Long-Range WiFi, IoT, Artificial Intelligence

Project Description:
This industrial PhD project will be jointly supervised with our industry partner, Morse Micro, a leader in the design and manufacturing of Wi-Fi HaLow solutions. Wi-Fi HaLow is based on the IEEE 802.11ah standard and targets long-range and wide-range wireless internet-of-things (IoT) applications with transmission rates ranging from 0.3 to 234 Mbps using the unregulated frequency band around 900MHz. Collision as a result of contention access has been identified as one of the issues that prevents achieving optimal wireless capacity in the above systems. The identified features that can control contention in IEEE 802.11ah are Target Wake Time (TWT), Restricted Access Window (RAW) and modulation coding rates (MCS). TWT permits an access point (AP) to define a specific time or set for individual stations to access the medium. RAW allows partitioning of the stations within a Basic Service Set (BSS) into groups and restricting channel access only to stations belonging to a given group at any given period. MCS determines the length of transmission frames. We will develop a mathematical formulation and artificial intelligence (AI) model for scheduler logic and validate the results via theoretical analysis and network simulators, culminating in hardware prototypes. The project will also investigate MAC level system performance for different operating bands (such as ISM 2.4 GHz band) and propose improvements on IEEE 802.11n MAC layers. The PhD candidate must be willing to spend between 50% and 75% of the time at the partner company offices when necessary and to adapt the research directions if needed.

Further information:

If you are interested, please email your up-to-date CV, transcript and a short description of why you are interested to Dr Hardjana

Automation and Robotics

Supervisors:
Professor Yonghui Li **-** Yonghui.li@sydney.edu.au
Professor Branka Vucetic - branka.vucetic@sydney.edu.au

Research Area:
Robotics; Automation; Artificial Intelligence

Project Description:
Centre of Excellence in IoT and Telecommunications in the School of Electrical and Information Engineering is seeking an excellent PhD to work closely with our industry partner to research and design automation solutions for waste sorting applications.

The project will require:

- A 1st class degree in electrical engineering, computer science or robotics, automation or mechanical engineering
- Expertise in mathematics and programming

- Hands on experience in programming and software tools
- Strong interpersonal and communication skills, with an ability to build and maintain relationships with key internal and external stakeholders, work effectively in a team, and an ability to manage resources and prioritise tasks to achieve project outcomes
- Experience in robotics and automation systems is a plus

Further information:
If you are interested, please email your up-to-date CV, transcript and a short description of why you are interested to Professor Li and Professor Vucetic

Nanophotonic radiation control for sustainable energy

Supervisor:
Dr Alex Song - alex.song@sydney.edu.au

Research Area:
Nanophotonics

Project Description:
This project will explore nanostructured approaches to sustainable energy, broadly defined. The need for energy efficiency, recycling, and harvesting is ever-pressing in our modern society. Nano control of radiation provides unique opportunities for sustainable energy, with a wide range of applications such as in building cooling, engine heat reusing, and human-body cooling. This project expands from our series of works in nanostructured textiles, for example, in Science 353, 1019 (2016), Nature Sustainability 1, 105-112 (2018), Adv. Mater. 30, 1802152 (2018), ACS Photonics 7, 1729 (2020).

There is one scholarship available for this project. Start date is flexible. Applications from both domestic and international students are welcomed.

Further information:
For more information, please visit our website: https://alexsong.group/

Frontiers of Nanophotonics

Supervisor:
Dr Alex Song - alex.song@sydney.edu.au

Research Area:
Nanophotonics; Topology; Non-Hermicity; Non-reciprocity

Project Description:

This project will explore cutting-edge research topics in photonics including topological phases, non-Hermitian physics, and quantum optics. These are future-facing research thrusts that aim to lay the groundwork for next-generation integrated photonic platforms in sensing, communication, and information processing.

There is one scholarship available for this project. Start date is flexible. Applications from both domestic and international students are welcomed.

Further information:
For more information, please visit our website: https://alexsong.group/

Project Management Projects

Project analytics and the delivery of major projects Project Conception and Future Making

Supervisor:
Professor Jennifer Whyte **-** jennifer.whyte@sydney.edu.au

Research Area:
Project Analytics; Megaprojects

Project Description:

This doctoral research project will develop new insights from the data that is used on projects, enabling predictive rather than retroactive approaches to decision making. It will explore how project analytics could help megaprojects move beyond capturing the data, allowing them to see how the projects are performing, predict what's likely to happen, and inform the best action to take.

Further information:
There is one PhD Scholarship on offer. To be eligible for this doctorate, your 1st class honours degree or masters need to be in computer science or engineering, and involve units on data analytics (and/or related topics such as machine learning). We will assess transcripts, CV, publications, references and 1 page on how you would develop this topic into a proposal https://www.sydney.edu.au/study/how-to-apply/postgraduate-research/how-to-write-a-research-proposal-for-a-strong-phd-application.html)

Applications to be submitted to jennifer.whyte@sydney.edu.au

Project Conception and Future Making

Supervisor:
Professor Jennifer Whyte **-** jennifer.whyte@sydney.edu.au

Research Area:
Project Conception

Project Description:
This doctoral research project will empirically study how project sponsors make early decisions on which projects to invest in, how they manager portfolios and programs. It will draw on my recent published research on ‘future making’ as a process of inquiry, to analyse data on the practices of project conception, and how these involve and exclude relevant stakeholders.

Further information:
There is one PhD Scholarship on offer. To be eligible for this doctorate, your 1st class honours degree or masters need to be in sociology, management or related social sciences, and include units on qualitative research methods. We will assess transcripts, CV, publications, references and 1 page on how you would develop this topic into a proposal https://www.sydney.edu.au/study/how-to-apply/postgraduate-research/how-to-write-a-research-proposal-for-a-strong-phd-application.html)

Applications to be submitted to jennifer.whyte@sydney.edu.au

Digital delivery in project-based industries

Supervisor:
Professor Jennifer Whyte **-** jennifer.whyte@sydney.edu.au

Research Area:
Digital Solutions; Supply Chain

Project Description:
This doctoral research project will map the dynamics as global software, as software companies work with project-based firms, projects and programs. It will develop interests in how software inscribes processes into organizations, and changes the way that projects are delivered and run, the supply-chains that are important for projects, and the relationships between projects and firms in project-based industries.

Further information:
There is one PhD Scholarship on offer. To be eligible for this doctorate, your 1st class honours degree or masters need to be in economics, management, engineering or the social sciences, and include units on innovation studies or project management. We will assess transcripts, CV, publications, references and 1 page on how you would develop this topic into a proposal https://www.sydney.edu.au/study/how-to-apply/postgraduate-research/how-to-write-a-research-proposal-for-a-strong-phd-application.html)

Applications to be submitted to jennifer.whyte@sydney.edu.au