COLLEGE OF ENGINEERING, SCIENCE AND ENVIRONMENT

VACATION SCHOLARSHIPS (2021/22)

Research Topics

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Global Centre for Environmental Remediation:

TOPIC NO.	TITLE OF RESEARCH TOPIC	DESCRIPTION OF RESEARCH PROJECT	PRINCIPAL SUPERVISOR CONTACT DETAILS	RESEARCH GROUP/ CENTRE	DISCIPLINE	SCHOOL
126	Assessment of some heavy metal(loid)s in vegetables, cereals and fruits in Newcastle markets	Atmospheric depositions, exposure to agrochemicals, soil contaminations and marketing systems of vegetables may play a significant role in elevating the levels of heavy metal(loid)s in vegetables, cereals and fruits having potential health hazards to consumers of such foodstuffs. The concentration of some heavy metal(loid)s Fe, Mn, Cu, Zn, Pb, As and Cd in various vegetables (roots, stems, leafy, fruits, cereals and legumes) sold in the markets in Newcastle area will be assessed using inductively coupled plasma mass spectrometry (ICPMS 7900, Agilent Technologies, Japan) and inductively coupled plasma emission spectrometry (Perkin Elmer, Avio 200). The obtained results will be analysed to see whether the major studied metal(loid)s are lower than or exceeding the recommended maximum acceptable levels proposed by the Joint FAO/WHO Expert Committee on Food Additives.	Mahamayagoda (Ayanka) Wijayawardena Ayanka.Wijayawardena@newcastle.edu.au		Environmental Sciences	GCER
130	A comparative evaluation of the effectiveness of three commercial adsorbents for pfas remediation in soil	Per- and poly-fluoroalkyl substances (PFAS) are chemical contaminants (> 4000 compounds) that are of concern globally because of their persistence in the environment and potential toxicity to human health. One of the common sources of PFAS in soils and water is the release from PFAS-containing fire-fighting foams that have been used across various industries for many years, among other man-made products. It is difficult to breakdown the carbon-fluorine bonds in PFAS, and hence research into a wide range of innovative management technologies for PFAS in soils and water is gaining increasing attention globally. Compared to destruction technologies, the remediation technologies that are based on PFAS adsorption in soils are more cost effective. Adsorption technologies help 'lock up' PFAS in soils to minimise their release into surface-, ground-, and drinking water, as well as prevent PFAS exposure to plants, animals, and humans. So far, there is no independent study that has compared the effectiveness of some or all of the currently available adsorbents in the market. If available, such studies will help decision making by contaminated land stakeholders, including site practitioners, consultants, and regulators, particularly regarding choosing the most effective adsorbent for PFAS remediation in soils. In this regard, a study is proposed to compare the transport and adsorption of selected PFAS, that are of regulatory importance to Australia, in soil. The proposed study is part of an ongoing project that is focused on the long-term transport of PFAS in adsorbent amended and unamended soils, at the Global Centre for Environmental	Anthony Umeh anthony.umeh@newcastle.edu.au 02 4025 3252		Chemical Contamination, Risk Assessment, and Remediation	GCER

		Remediation. Interested students will gain useful understanding and experience on PFAS chemistry, the use of batch and 1-D dynamic column experiments to study contaminant transport in soils, contaminant transport modelling, as well as data analysis among other skills. Such skills will contribute to actualising the University's Looking Ahead Strategic Plan, particularly with regards to helping students acquire skills that are relevant in the Contaminated Land Industry within Australia and beyond.			
131	Boosting the bioeconomy using microalgae	Overview : United Nations general assembly adopted 17 goals to attain sustainable development which are referred as "Sustainable Development Goals" to improve the livelihood of people around the world. Thus, many countries have pledged to incorporate SDGs into government policies in a way to achieve net zero emissions by 2050. Bioeconomy strategies have converged with the aims of the SDGs to embrace sustainability and circularity principles such as converting waste to product from renewable biological resources such as microalgae that protects natural resources and biodiversity. Microalgae uses carbon dioxide to produce biomass that can be used for various applications from bio-fuels, plastics and fertilizers. Also, certain microalgae have exceptional capability to remediate polluted environments. The present study will focus on the environmental sustainability aspects of converting waste to resource by microalgae using closed loop approach where waste is valorised through cascade of opportunities to boost the circular economy.	Megharaj Mallavarapu megh.mallavarapu@newcastle.edu.au	Environmental Remediation	GCER
133	Monitoring of Volatile Organic Compounds (VOCs) with Portable Chromatography-mass Spectrometer (GC-MS)	Volatile Organic Compounds (VOCs) are a subset of the category of air pollutants known as air toxics or hazardous air pollutants. VOCs are a group of compounds that may have both short- and long-term health consequences. VOCs are present in many goods we use to create and maintain our houses, including petroleum fuels, hydraulic fluids, paint thinners, and dry-cleaning chemicals. Consequently, VOCs have a significant impact on indoor air quality, with many VOC concentrations continuously greater inside (up to 10 times higher) than outside. Monitoring VOC concentrations is critical since it will give valuable information for environmental health and risk assessment. The traditional technique of detecting VOCs is usually used in conjunction with sample concentrating equipment that uses thermal desorption and a benchtop Chromatography-mass Spectrometer (GC-MS). The portable GC-MS allows for quick chemical analysis of VOCs and has been extensively employed in a variety of applications, including indoor air samples.	Ying Cheng ying.cheng@newcastle.edu.au	Environmental Remediation	GCER

School of Architecture & Built Environment:

TOPIC NO.	TITLE OF RESEARCH TOPIC	DESCRIPTION OF RESEARCH PROJECT	PRINCIPAL SUPERVISOR CONTACT DETAILS	RESEARCH GROUP/ CENTRE	DISCIPLINE	SCHOOL
1	Women in Construction	It has long been recognized that women are underrepresented in the construction industry. In Australia there is less than 5% of women working in the construction industry despite women making up about half the workforce (ABS, 2018). Attracting and retaining women in the construction industry has been a priority as it is seen as a way to address skill and labour shortages worldwide. The industry would also benefit from the talents of a more diverse workforce. There has, however, been very limited success in achieving a gender balanced workforce in the construction industry (CSQ, 2018). The construction management program at UoN has around 6% female participation but has grown slightly over the last 3 years and we would like to take it to a bold and aspirational 20% by 2023. One way to attract female students into the program is to make them aware of the diverse and women friendly career options that the construction management discipline offers. This research project aims to develop narratives of the future of work for construction management female graduates.	Liyaning (Maggie) Tang Maggie.Tang@newcastle.edu.au		Construction Management	SABE
3	Technological advances and applications of geothermal energy pile	Currently, the renewable clean energies used are mainly sourced from hydroelectric energy, wind energy and solar energy. Compared with other clean energies, geothermal energy has larger reserves, wider distribution, higher utilization efficiency and lower application cost. Geothermal energy piles can provide both foundation (structural) support to the building and the heating/cooling required. This project aims to review the recent advances in the development of energy pile solutions and deliberate on what can best be done to leverage the opportunities.	Wai (Patrick) Tang patrick.tang@newcastle.edu.au 02 4921 7246		Construction Management	SABE
19	Climate action competencies development for professionals in the Construction industry.	Short description: Key research (Gage et al. 2011; Morris 2017; Lawlor and Moreley 2017) and professional reports such as Association of Project Management, Australian Institute of Building, UK-SPEC, Royal Academy of Engineers, ANAEE 2018, European Union Engineers, and Engineers Australian) identify gaps in core professional knowledge in understanding where climate change competencies for problem resolutions are missing from professional Engineering, Construction and Project Management practice. To be able to participate in climate action the research project will aim to identify what competencies professionals working in engineering, construction and project management require to address impacts of climate change in the built environment.	Sittimont Kanjanabootra sittimont.kanjanabootra@newcastle.edu.au		Construction Management	SABE

22	Banquet: architectures of food production	This project is part of a forthcoming exhibition and creative work, currently shortlisted for Tin Sheds gallery at University in Sydney, as well as sites in Melbourne, Newcastle and Brisbane. The project is a collaboration with Marissa Lindquist, Tim Burke, Ceren Sinanoglu, Robyn Schmidt and performance artist Imogen Sage. The component for the Summer Vacation scholarship will be working with Michael Chapman on the production of drawings, models and film content for an interactive machine tied to the coffee sequence in Godard's 1967 film "Two or Three Things I knew About Her". The work involves an existential exploration of the mechanical history of coffee production, its relationship to architectural space and it's deconstruction and representation in a gallery setting. The work will be exhibited and published over the summer in Newcastle, prior to the full exhibition and performance of Banquet in October 2022.	Michael Chapman michael.chapman@newcastle.edu.au	Architecture	SABE
29	Phytoremediation Gardens	Phytoremediation is a low cost, natural way of removing toxins from soils, we have an externally funded research project in Mayfield on the former BHP site (DelPrat cottage) where we are testing a range of species native and non-native for their phytoremediation adeptness. Many of these species have not been tested in field conditions and importantly this is a garden, so it is a designed, educative garden to support communities in understanding how to change toxic soil conditions in their own gardens. (See https://delpratgarden.com.au/) The Student will be working in the garden, taking samples to send to our UTS Science partners, and assisting with planning and implementing a public event (open house and garden) in late January / February.	Sue Anne Ware sueanne.ware@newcastle.edu.au	Landscape Architecture	SABE
53	Power relations & decision-making in mega construction and infrastructure projects	Global infrastructure spending has been estimated at USD3.4 trillion per year between 2013 and 2030, which equates to approximately 4% of total global Gross Domestic Product (GDP), with a majority of the projects delivered as large scale megaprojects. This figure is expected to increase rapidly to 24% of the global GDP in the next decade. Coupled with large-scale spending plans by governments alongside significant private sector investment are forecasts of increased population growth and urbanisation, requiring increased spending on infrastructure and facilities to meet people's basic needs, while allowing for economic growth and expansion. The economic, social and environmental impacts of megaprojects are broad and lasting. Given the scale and scope accompanying megaprojects entire companies, governments, and national economies can collapse when these projects fail. It is argued that there has never been a more important time to better understand the megaproject phenomenon. Megaprojects involve large budgets with complex decision-making processes, they are transformational and can shape the future of cities and economies. However, less is known about the actual decision-	Jessica Pooi Sun Siva Jessica.Siva@newcastle.edu.au	Construction Management	SABE

		making practices that occur in megaprojects. Their sheer size, duration and complexity make them fertile ground for problematic power dynamics impacting on decision-making and project performance. Existing investigations and policy directions reflect a preoccupation with developing governance frameworks and prescriptive models that largely assume decision-making can be structured and controlled with little reference to the power relations influencing them. Decision-making is not wholly predetermined by formalised contracts and protocols but instead often emerges from the informal use of power whereby deviations and non-conformities are part and parcel of megaprojects. The research problem is concerned with the inability to capture the diverse forms of power exercised when dealing with the deviations that characterise megaproject decision-making. This research addresses the knowledge gap in empirical research to explain the nature of power relations influencing megaproject decision-making.			
85	Using digital databases to investigate sustainable materials in building construction	The production and application of the construction materials used in buildings imposes significant impacts in the overall effectiveness and efficiency of green building performance throughout the building lifecycle, contributing to increased carbon emissions, waste generation, natural resource depletion, human health issues, water pollution and over-consumption of non-renewable energy. In order to mitigate climate change and other direct environmental issues of the building industry, a range of Green Building Rating systems have been developed around the world to evaluate the sustainability of buildings and encourage environmentally friendly buildings. Despite the important influence of the selection of building materials in the overall sustainability of the building, clients, designers, engineers and developers are often only motivated to investigate, procure and use more environmentally sustainable building materials when they are required to comply with the Green Building Rating system they have opted in for. In this way, the materials criteria in Green Building Ratings systems are influencing the future of building material selection; however not all Green Building Ratings systems assess the same areas, and further do not assess these areas in the same way or with the same level of focus. Very little research has been undertaken to understand the different emphasis of compliance areas placed on materials as sustainability criterion by the different Green Building Ratings systems. This leaves a gap in knowledge for building professionals seeking information on sustainable materials and for product designers who are entering the sustainable products market, not knowing where to best focus their product design, manufacture and communication of their product's sustainability features. The objective of this study is to provide a clear picture of the emphases of the LEED Green Building Rating systems in their approach to assessing	Josephine Vaughan josephine.vaughan@newcastle.edu.au 02 4985 4292	Construction Management	SABE

		the sustainability of construction materials and offers new insights into the impacts of material selection in green buildings. This research uses the data provided by the LEED on building assessments since 2014. The research reveals the different environmental and social areas targeted by LEED, and explores the data using the variables available from LEED, including location, time and building type. The emphasis that LEED places on different environmental and social impacts of building materials would then be compared to existing published cases of different Green Building Ratings systems, showing similarities and disparities between the studies and the wider environmental movement.			
95	Development of an educational framework to build more resilient regional communities	The student will undertake a desktop literature review around educational frameworks to undertake disaster resilience education for school children.	Helen Giggins helen.giggins@newcastle.edu.au 02 4921 6424	Construction Management	SABE
132	Machine de Courtesan au Chocolat	This research project involves the production of a commissioned and peer reviewed architectural exhibition held in Sydney and corresponding book publication in 2022. The 'Machine de Courtesan au Chocolat' will examine Wes Anderson's, 'The Grand Budapest Hotel' Courtesan au Chocolat scene, exploring the packaging, wrapping and unwrapping of food as a process of seduction and ritual. The research will synthesise this and various other theoretical and literary sources to produce an operable machine, a drawing that describes the construction and operation of the machine, and an edible artifact that is linked to the machine and its interactive process. Through the exhibition format, the machine will be configured to be interactive and engaging, to create individual and intimate experiences that heighten bodily experience of the space and alter its atmosphere.	Timothy Burke timothy.burke@newcastle.edu.au 02 4913 8781	Architecture	SABE

School of Environmental & Life Sciences:

TOPIC NO.	TITLE OF RESEARCH TOPIC	DESCRIPTION OF RESEARCH PROJECT	PRINCIPAL SUPERVISOR CONTACT DETAILS	RESEARCH GROUP/ CENTRE	DISCIPLINE	SCHOOL
8	Quantifying and managing climate-related risk	Anthony Kiem's research focus is on understanding the drivers and impacts of climate variability and change in the Asia-Pacific region. Of particular interest are hydrological extremes and how these may change in the future. I am happy to discuss projects on anything to do with water, climate, and land including, but not limited to, characterising impacts of climate variability and change, seasonal/interannual forecasting, extreme event (e.g. flood, drought, bushfire etc.) risk analysis, hydrological modelling, stochastic modelling, and water resources management.	Anthony Kiem anthony.kiem@newcastle.edu.au 02 4921 8656	Centre for Water, Climate and Land (CWCL)	Earth Sciences	SELS
13	Folding polymers to make synthetic proteins	The beauty and activity of proteins comes from their unique ability to fold into complex 3D shapes in solution – this allows them to form highly active and specific therapeutics and catalysts. Inspired by this we are using short oligonucleotides to fold polymers into secondary structures, in order to make synthetic protein mimics. By leveraging the high throughput polymer synthesis techniques we established we can study the effect of structure on the polymer's ability to fold.	Robert Chapman robert.chapman@newcastle.edu.au	PRC Drug Development	Chemistry	SELS
16	Advancing bioacoustic analysis for frog conservation	Detection of cryptic or threatened animals that vocalise can occur via the installation of acoustic data loggers that can record ambient noise in the field for long periods of time. The result is that we can collect vast amounts of acoustic data, but manual identification of target calls is time-intensive. Several proprietary software products exist that can analyse these large data sets but this also takes a lot of time and the products are licensed and expensive. AviaNZ (https://www.avianz.net/) is a new open source (free) product developed for analysing acoustic recordings of birds and has had some limited investigation for frog calls. This desktop project investigates the potential for AviaNZ software to support effective analysis of frog calls. The project may suit a computer science/software engineering student or science student with an interest in acoustic analysis. The Conservation Science Research Group holds a library of sound records from sites where we were trying to detect 7 threatened frog species. One of these frogs already has a partly labelled library of sounds. The summer scholarship project would involve: - Familiarisation with AviaNZ software - Development of effective recognisers for 7 frog species (includes identification of target species in acoustic files and labelling) - Testing of recognisers for 7 frog species to achieve 90% accuracy (and management of false positives and false negatives) - Improvement of recognisers using AviaNZ neural network	Matthew Hayward matthew.hayward@newcastle.edu.au	Conservation Science	Environmental Science and Management	SELS

		programming as required - Commence running of sound library through AviaNZ.				
17	Spermatogonial stem cells: from fertility preservation to wildlife conservation	My research is primarily focused on understanding how the stem cells in the testis function to drive sperm production, and on harnessing this knowledge to support stem cell maintenance in an in vitro environment. Potential applications of such in vitro techniques include treatment of infertility in childhood cancer patients and developing novel biobanking strategies for endangered wildlife. My preliminary research has shown that spermatogonial stem cells prefer hypoxic (low oxygen) environments. As such, current projects are investigating the response of spermatogonial stem cells to decreased concentrations of oxygen in culture, and defining the role of hypoxia-inducible transcription factors in regulating their function.	Tessa Lord tessa.lord@newcastle.edu.au 02 4055 3026	PRC for Reproductive Science	Biology	SELS
20	Quantifying underwater sound and its effect on marine communities	Noise pollution is an increasing concern for marine species due to their reliance on sound for most aspects of their life including navigation, communication and predatory behaviours. Research identifies many sources of underwater noise, with shipping and boating a main contributor which is confirmed to effect the critical life processes of oceanic fauna. However, little research has been undertaken in estuarine environments. This project will investigate the underwater soundscapes of Lake Macquarie and its effects of fish communities using a combination of hydrophones and underwawter video.	Troy Gaston troy.gaston@newcastle.edu.au	Coastal and Marine Science	Environmental Science and Management	SELS
27	Microencapsulation of Grape Seed Oil	Grape seeds account for 8-20% of the grapes processed by the wine industry, and they are part of the agro-industrial residues of the industry. Interestingly, grape seeds have great biological potential that could be exploited because they are rich in oil and polyphenols. Although interest in grapeseed oil is growing, there is no commercial grape seed oil production within Australia. In this project, grape seeds will be recovered from grape pomace and dried. The grape seed oil will then be extracted using the microwave-assisted extraction technique and microencapsulated. The microencapsulation methodology will involve the use of a complex coacervation technique where emulsified oil is coated with a gelatin and sodium hexametaphosphate complex giving a multicore microcapsule.	Taiwo Akanbi taiwo.akanbi@newcastle.edu.au 02 4348 4117		Food Science and Human Nutrition	SELS
30	Advanced Electrochemical Energy Storage Options	Energy storage is a critical aspect of contemporary society and it is expected to grow in importance in the future. Many options exist for electrochemical energy storage and conversion, with the optimal choice dependent on the application. Our research group conducts cutting edge fundamental and applied research into the materials, mechanisms and performance of these systems. Opportunities exist to explore various battery materials in applications such as implantable pacemakers and micro-batteries, fundamental charge storage mechanisms in electrochemical capacitors, as well as large scale	Scott Donne scott.donne@newcastle.edu.au 02 4921 5477	PRC for Frontier Energy Technologies and Utilization	Chemistry	SELS

		energy delivery in the high temperature direct carbon fuel cell, a system developed at the University of Newcastle. Please establish contact to discuss tailor-making a project to satisfy mutual interests.				
35	Mapping Local aposymbiotic corals on the central coast	In conjunction with a PhD student this project will involve conducting surveys of the local aposymbiotic corals around the central coast	William (Bill) Leggat bill.leggat@newcastle.edu.au		Environmental Science and Management	SELS
36	Building a database of scientific literature relating to shorebirds and wetland management for Hunter estuaries	We currently lack an oversight of existing knowledge relevant to shorebird and wetland conservation for the Hunter and Port Stephens estuaries. This is because this knowledge sits in a disparate collection of reports and papers, some electronic, some in hard copies, spread out between various computers and physical locations. This is hindering land management decisions and leading to work already done being done again. This project will involve a close dialogue with Hunter Local Land Services staff to collate and build an online sharable library of existing research on shorebird and wetland management in the Port Stephens and Hunter estuaries. The student will build the online database library and create a system of searchable keywords. The library will become an invaluable resource for local land managers and be made available to the public.	Andrea Griffin andrea.griffin@newcastle.edu.au	The Conservation Science Research Group	Environmental Science and Management	SELS
38	Invertebrates as food sources for fish	Estuarine invertebrates act to connect ecosystem components, such as sediments, seagrasses and epiphytes, to their fishy predators. Field samples of invertebrates will be used to build a baseline of the main food sources of fish over seagrass in Lake Macquarie, in terms of relative abundance, ecological characteristics and stable isotope contributions to the diets of yellowfin bream, tarwhine and whiting. This funded project will involve supervised field sampling and laboratory activities, including data analyses, and will produce ecologically significant data against which to interpret future changes in estuarine ecosystems.	Margaret Platell margaret.platell@newcastle.edu.au 02 4349 4809		Environmental Science and Management	SELS
43	Discovery of novel bacteriophage as an alternative treatment for antibiotic resistant infections	Antibiotic resistance is a growing problem that could be one of the greatest threats to global health in the coming century. As an alternative to developing novel antimicrobial drugs, bacteriophage (viruses that kill bacteria) can be used to treat pathogenic infections in humans even when they are resistant to most known drugs. This project will look to identify, isolate and characterise novel phage for future use in patient therapies.	Ian Grainge ian.grainge@newcastl.edu.au 02 4921 7238	PRC Drug Development	Biology	SELS
45	A computationally modelling-led approach to inhibitors of a histone lysine demethylase protein	This project will involve the modelling of a selection of compounds into the binding site of a histone lysine demethylase protein via receptor-ligand docking methods. The synthesis of a select number of 'hit' ligands will then occur, which will subsequently be sent for biological analysis to validate their inhibitory activity.	Jennifer Baker Jennifer.r.baker@newcastle.edu.au 02 4921 5464		Chemistry	SELS

54	Uncovering Munibung Hill waterways	To explore the social, cultural and environmental significance of water in remnant bushland at the edges of urban development, for example: tracing the changes to waterways and their impact on Indigenous, non-Indigenous and more-than-human communities; and creating an archive of stories associated with Munibung Hill's waterways.	Michelle Duffy Michelle.Duffy@newcastle.edu.au 02 4921 5097		Human geography	SELS
56	Urban and Regional Development	Project to advance knowledge in the area of social, cultural, or political aspects of urban and regional studies, including geographies of care, home and homemaking, homelessness, social housing (including community housing), living in new suburbia, and geographies of mobility.	Kathleen (Kathy) Mee kathy.mee@newcastle.edu.au 02 4921 6451	Centre for Urban and Regional Studies	Geography and Environmental Studies	SELS
57	Novel switchable polymers at mineral surfaces	The summer scholar will work alongside a postdoctoral fellow investigating the potential to improve the adsorption of novel polymers on mineral surfaces with the goal being for the polymer to change its conformation reversibly to switch between hydrophilicity or hydrophobicity as required. This largely fundamental polymer physical chemistry project is part of the Centre of Excellence in Minerals where our goal is to use far less water and power to optimise metallic ore processes that give us the >50 metals in our everyday devices.	Erica Wanless erica.wanless@newcastle.edu.au 02 4033 9355	Advanced particle processing and transport	Chemistry	SELS
64	Drugs to treat chem-resistant leukemia	Our team has identified a group of chemicals that show promise in treating drug resistant leukaemia. These compounds are effective (curative) in animal models of human leukemias. We have designed new analogues with greater promise and this project will involve their synthesis and supply to our biology collaborators for further evaluation. The required chemistry procedures have been developed and trialed within our team. The successful student will gain skills in transferable skills in medicinal chemistry (synthesis, design, NMR and compound evaluation), and potentially engage across a national program to develop new approaches to treating human cancers.	Adam McCluskey adam.mccluskey@newcastle.edu.au 02 4921 6486		Chemistry	SELS
67	Designing colorimetric, non-toxic sulfate sensors from the intramolecular level	The overarching aim of this work is to develop novel nanomaterials for colourimetric detection of contaminants or biomacromolecules. Lipid cubic mesophases are thermodynamically stable, nanostructured gels formed by the self-assembly of amphiphiles in aqueous conditions. The amphiphilic nature of these materials means that a wide range of molecules, ranging in size, shape and hydrophilicity, can be incorporated. Additionally, the isotropic nature of this material makes it ideal to host and observe colourimetric molecules. Sulphate ions are a concerning pollutant in water and at high concentrations they are associated to health and ecological risks, including the mobilisation of heavy metals. To date, monitoring of sulphates concentrations relies on expensive and highly specialised techniques. Efficient sulphate sensing molecules, squaramides (Fig. 1, right) have been synthesised at USyd, however, they have limited solubility and therefore limited utility. By incorporating these amphiphilic molecules into cubic phases, this limitation can be overcome. The squaramide	Wye (Khay) Fong khay.fong@newcastle.edu.au	PRC particles and processing, PRC Drug development	Chemistry	SELS

		molecular sensors will be anchored into the interface of the cubic phases of monoolein (V2 Im3m) and phytantriol (V2 Pn3m). As the sulphate ions diffuse into the matrix, it is expected that they will bind to the squaramide molecule, resulting in a quantifiable visual (yellow to blue) response.				
69	The development of potent Dynamin Inhibitors as anti-cancer agents	Dynamins are a superfamily of large proteins which mediate endocytosis - a vital cellular process through which substances are internalized into the cell. Endocytic abnormalities are implicated in various diseases such as Huntington's disease, Alzheimer's disease, epilepsy, and cancer. As such the development of novel chemical probes against Dynamins are valuable in exploring the endocytic pathways in these diseases and in contributing better drugs. The successful student will be designing and synthesizing analogues of the drug Sertraline; a clinically used SSRI anti-depressant; repurposing it for use against Dynamin. The student will develop molecular docking skills using the Molecular Operating Environment (MOE) software which will provide insight into the computational rationale of drug design. The student will also hone key synthetic organic chemistry skills in generating intermediates and final products that will be assayed against Dynamin. These will include an understanding of Nuclear Magnetic Spectroscopy, Mass Spectrometry and organic chemistry reactions and mechanisms.	Xihan (Beatrice) Chiew beatrice.chiew@newcastle.edu.au	McCluskey Lab	Chemistry	SELS
71	Graphene - Carbon Nanotube' Artificial Crystals	This project aims to prepare 'buckypaper' made of orderly stacked graphene and carbon nanotubes using a unique vortex fluidic device (which led to the winning of IgNobel Prize for 'unboil an egg'). The chemistry and structures of the 'artificial' materials will be controlled and systematically characterised using different techniques. A further chemical and thermal graphitisation of composite films will be pursued towards unprecedented pure-carbon structures. The materials will be potentially useful for many applications such as electrodes in batteries and supercapacitors.	Xianjue (Sam) Chen sam.chen@newcastle.edu.au		Chemistry	SELS
73	Bandicoots at Munibung Hill	Munibung Hill is a relatively isolated remnant of bushland north of Speers Point. A bandicoot population has persisted on Munibung Hill since European colonisation, but there are fears this population is dwindling towards extinction. This project will survey for areas of foraging locations using the characteristic diggings that bandicoots make, coupled with camera trapping across habitats to determine occupancy in different habitats. This will provide a baseline for longer term studies that should occur to secure the conservation of this ecologically important area.	Liam Phelan Liam.Phelan@newcastle.edu.au 02 4921 6464	Conservation Biology Research Group	Environmental Science and Management	SELS
74	Development of a metal ion biosensor in Acinetobacter	This project combines synthetic biology with important basic research into an emerging human pathogen. It aims to develop metal ion biosensors that put fluorescent protein expression under the control of a metal sensing regulatory switch. The sensors will be used to	Karl Hassan karl.hassan@newcastle.edu.au 02 4921 7236	Centre of Excellence in Synthetic Biology	Biology	SELS

		identify factors involved in metal ion homeostasis in Acinetobacter. Due to the importance of metals for bacterial survival, these factors could be novel targets for the development of future antimicrobials.				
76	Water on the Hill	Munibung Hill is a remnant of bushland near Lake Macquarie, largely isolated by surrounding urban development. Conserving and revitalising the biodiversity and cultural appreciation of the area, will be dependent on the condition of its water bodies and natural flows, which have been impacted by landscape degradation and urbanisation. This project will provide an assessment of the current habitat condition and water quality status of these waterways, as an important reference base for restoration efforts in this ecologically and culturally significant area.	Craig Evans craig.evans@newcastle.edu.au 02 4921 5630	Freshwater Ecology and Water Quality Science (FEWQS) group	Environmental Science & Management	SELS
79	Seaweeds as food crops in Eastern Australia	On its own, seaweed is an important source of food for a large part of the world's population. It contains nutrients such as sodium, calcium, iodine, zinc, and vitamin B-12. ... The macroalgae is extremely productive—it's ready for harvest after just 6 weeks—and requires only simple technology to farm. This project will use a desk top systematic review and survey data to assess the potential for sea weed food crops in the local Central Coast Area.	Emma Beckett emma.beckett@newcastle.edu.au 02 4348 4158	PRC PAN	Food and Nutrition Science	SELS
89	Preparation of Magnetic Molecularly Imprinted Polymers for Drug Capture	Selective polymeric adsorbents can be conveniently prepared by the process of molecular imprinting. Molecularly imprinted polymers or MIPs are robust, porous polymeric (i.e. plastic) molecular moulds with recognition capabilities specific to a target molecule also used as the template. The performance of MIPs as a selective extractant could be enhanced by embedding the polymer with magnetic properties to facilitate the extraction process of an analyte from complex matrices. To create the magnetic MIPs or MMIPs, polymerisation and molecular imprinting is introduced at the surface of magnetic inorganic iron particles. Thus, after analyte capture, the insoluble MMIPs can be simply recovered from the sample matrix by a magnetic separator without the need of filtration or centrifugation. For this proposed project, the aim is to generate MMIPs for 5-fluorouracil (5-FU), a cancer drug, potentially to be used for the capture of residual 5-FU in urine for subsequent quantitative analysis. This project will involve the synthesis of the MMIP particles and and evaluating its binding efficiency (target binding capacity, pH effect, stability and strength of binding, selectivity) either by HPLC or NMR.	Clovia Holdsworth clovia.holdsworth@newcastle.edu 02 4921 5481	Polymers/MIP Group	Chemistry	SELS
94 A	Kooragang Island bell frogs	Two summer scholarship students will assist with nocturnal surveys of the green and golden bell frog at breeding ponds on Kooragang Island in the Hunter Wetlands National Park. Six to eight surveys are conducted per month at eleven breeding ponds and these take place from sunset until midnight. Students will also assist with fyke netting and water quality monitoring two days a month during the morning	Matthew Hayward matthew.hayward@newcastle.edu.au		Environmental Management and Sustainability	SELS

		and late afternoon. Students will also help with behavioural experiments and observations of frogs in mesocosms at the Forum. PLEASE NOTE THIS IS FOR $2,000 ONLY				
94 B	Kooragang Island bell frogs	Two summer scholarship students will assist with nocturnal surveys of the green and golden bell frog at breeding ponds on Kooragang Island in the Hunter Wetlands National Park. Six to eight surveys are conducted per month at eleven breeding ponds and these take place from sunset until midnight. Students will also assist with fyke netting and water quality monitoring two days a month during the morning and late afternoon. Students will also help with behavioural experiments and observations of frogs in mesocosms at the Forum. PLEASE NOTE THIS IS FOR $2,000 ONLY	Matthew Hayward matthew.hayward@newcastle.edu.au		Environmental Management and Sustainability	SELS
96	Microbial mosquito control and microbiome	The University is collaborating with CSIRO, NSW Health Pathology and University of Melbourne to manage populations of local mosquitoes that affect quality of life and spread debilitating viruses, including Ross River Fever. This summer scholarship project will focus on trapping local mosquitoes and screening them for Wolbachia sp. and arbovirus by PCR. Informed by these results we will develop a RT-PCR method to monitor local mosquitoes, mosquito symbionts and viruses.	Toby Mills toby.mills@newcastle.edu.au	HRMI	Biological Science	SELS
97	Exploring cyanobacterial specialised metabolism using heterologous expression	Microbial natural products have served as a major inspiration for the development of novel pharmaceuticals. The search for new natural products is a continuing endeavour, with new niches and microorganisms being probed to determine their ability to produce useful bioactive molecules. Cyanobacteria are a largely untapped phyla that produce a multitude of natural products eliciting a range of pharmaceutically-relevant activities. A large limitation for the exploitation of these molecules is the lack of accessibility in the natural host due to slow growth rates, relatively low production levels, and a inability to genetically manipulate the cyanobacteria. Therefore, this project will involve the isolation of cyanobacterial natural product biosynthesis genes, engineering them for heterologous expression in Escherichia coli, and gene knockouts to characterise the enzymology of biosynthesis.	Brett Neilan brett.neilan@newcastle.edu.au	HRMI	Biological Science	SELS
102	Combination of UV-C treatment and different packaging materials to maintain climacteric fruits quality after harvest.	UV-C treatment has been reported in maintaining fruits quality after harvest. However, there are few reports on combination treatments of UV-C and different packaging materials on climacteric fruits qualities after harvest. This project will use semi-commercial UV-C treatment to maintain climacteric fruit quality, followed by storage in different packaging materials. The packaging materials will be selected according to its permeability, where gas compositions of carbon dioxide and oxygen; temperature and humidity will be monitored. Fruits quality will be assessed based on commercial acceptability.	Penta Pristijono penta.pristijono@newcastle.edu.au 02 4349 4783		Food Science and Human Nutrition	SELS
109	Lower-Body Muscle Activity During Hip	Hip strength assessments have recently become common practice in a variety of high-performance sport and clinical settings, due to the	Joshua Secomb josh.secomb@newcastle.edu.au	PRCPAN	Exercise and Sport Science	SELS

	Strength Assessments	relationship of these measures to both performance and injury risk. In both the literature and in practice, a wide variety of hip and knee flexion angles are used for these assessments, which based on functional anatomy will greatly alter the magnitude of muscle activity within the lower-body musculature. However, to date no research has investigated the lower-body muscle activity in these variety of commonly used positions. Therefore, this project will investigate the muscle activity of the key lower-body muscles in the positions most commonly utilised to assess hip strength. The results of this study will enhance our understanding of the muscles involved in such strength assessments, providing researchers and practitioners with an evidence-base to select the most appropriate position to assess hip strength of the specific muscles of interest.				
110	Optimising 1-Dimensional van der Waal Heterostructures	Atomically-thin 2D materials (graphene, boron nitride, etc.) are the building-blocks of a new and exciting class of functional materials – 2D van der Waals (vdW) heterostructures. 2D vdW heterostructures are formed by 'stacking' multiple atomically-thin 2D materials. Each layer in the stack is held in place via interlayer vdW interactions with its neighbouring layers. 2D vdW heterostructures are the foundation of a new generation of nanoelectronics devices and applications. This project aims to translate the concept of a 2D vdW heterostructure to a single dimension, by understanding the structure and properties 1D vdW heterostructures - heterostructures composed of inorganic nanotubes held in place via radial vdW interactions – like a nanoscale coaxial cable. The project may also consider how such 1D heterostructures might be formed during chemical vapour deposition synthesis.	Alister Page alister.page@newcastle.edu.au 02 4923 9357		Chemistry	SELS
111	Use of 3D printed coralline algae by sea urchin larvae	Most marine invertebrates have a larval phase that searches for a suitable habitat before metamorphosing into the adult phase that then inhabits the reef environment. Understanding the processes that influence metamorphosis of benthic organisms (sponges, corals, sea urchins) is a key area of marine ecology. The sea urchin, Heliocidaris erythrogramma, preferentially metamorphoses on coralline algae. This project will use 3D printing to create artificial coralline algae and will test the response of sea urchin larvae to these 3D printed habitats.	Megan Huggett megan.huggett@newcastle.edu.au 02 4348 4025		ESM	SELS
117	Bio-inspired polymeric for efficient water management in mining operations	The successful summer scholar will within the Centre of Excellence in Minerals developing new water efficient processes to manage and recycle waste from mining operations. The project will engineer new bio-inspired polymers to improve the dewatering of clay suspensions which are one of the major waste streams from the extraction of rare earth metals. The summer scholar will work alongside a postdoctoral fellow on a broad suite of experimental methods and techniques. Rare earth metals are the key component of modern life; from	Joshua Willott joshua.willott@newcastle.edu.au 02 4913 8622	ARC Centre of Excellence for Enabling Eco-Efficient Beneficiation of Minerals	Chemistry	SELS

		smartphones to electric vehicles and renewable energy supply. The successful scholar will work within the Centre of Excellence for Minerals developing new polymers to improve the efficiency the processes needed to extract these critical minerals. This project will work with synthetic polymer chemists to design novel flocculants using a rapid bacterial replication approach that will specifically bind to clay particles, rendering them hydrophobic. While based in physical chemistry principles, the project will also evaluate the real-world application of the polymers.				
120	RNA transport in the male reproductive tract and the impact of environmental stressors on sperm cell quality	The role of small non-coding RNA's in sperm cell biology is quickly gaining much attention. This is partly due to mounting evidence that these RNA epigenetic factors are not only important for male fertility, but they also have significant roles in the programming of early embryo development after fertilisation. Our group has recently uncovered evidence that external environmental factors can alter sperm RNA cargo, however the molecular processes of how RNA's are finally packaged into spermatozoa and how these processes are perturbed by environmental impacts, such as mobile phone and Wi Fi electromagnetic energies, are currently unknown. This project will aim to characterise the major RNA binding proteins in sperm and their potential role in protecting RNA's under simulated environmental insult.	Geoffry De Iuliis geoffry.deiuliis@newcastle.edu.au 02 4921 7295	Reproductive Sciences Group, PRC in Reproductive Science	Biology	SELS
121	An inter-comparison of global gridded drought datasets	Global gridded datasets of drought metrics are useful for assessing patterns over space and time. For example, we can study how drought has evolved over the last decade, or determine when both the western USA and eastern Australia experience drought simultaneously. This project will use GIS and spatial science to compare and contrast the available gridded drought datasets. Students must have completed GEOS2161 to to be considered for this project.	Danielle Verdon-Kidd danielle.verdon@newcastle.edu.au 02 4921 5749		Earth Sciences	SELS

School of Engineering:

TOPIC NO.	TITLE OF RESEARCH TOPIC	DESCRIPTION OF RESEARCH PROJECT	PRINCIPAL SUPERVISOR CONTACT DETAILS	RESEARCH GROUP/ CENTRE	DISCIPLINE	SCHOOL
7	Solar driven carbon electrolysis	Carbon electrolysis takes carbon dioxide and splits it into its two starting components, carbon and oxygen. If using renewable energy to force this to occur, the technology is essentially a carbon negative manufacturing route able to generate advanced carbon materials using renewable energy inputs. In this project, the anode of a carbon electrolysis operation will be investigated in order to determine reaction limitations and to develop corrosion resistant materials able to withstand the high temperatures and molten salt environment of a novel carbon electrolyser design.	Jessica Allen j.allen@newcastle.edu.au	Priority Research Centre for Frontier Energy Technology and Utilisation	Chemical Engineering	SENG
9	Ultrasonic Control System	This project will involve the design and implementation of ultrasonic controllers that compensate for transient changes in load conditions. The student should have a background in mechatronics or electrical engineering with experience with embedded control systems.	Andrew Fleming andrew.fleming@newcastle.edu.au 02 4921 6493	Precision Mechatronics Lab	Electrical, Computing, and Medical	SENG
14	Analysis of Shark Attacks	The number of shark attacks increased steadily over the past decades. This is attributed to more people spending longer times in the water and, possibly, a recovering shark population. Effective countermeasures require an in-depth understanding of these attacks. Therefore, this summer research project targets a comprehensive analysis of shark attacks with a particular focus on the victim's activities and the inflicted injuries.	Thomas Fiedler Thomas.Fiedler@newcastle.edu.au		Mechanical Engineering	SENG
15	Conceptual Design of Community Scale Organic Waste Processing Facility in Tuvalu	Tuvalu is a small island developing state (SIDS), least developed country (LDC) located in the South Pacific with high risk of becoming uninhabitable due to climate change. This project will continue developing a conceptual design of a community scale organic waste processing facility. The facility will target greenwaste and piggery waste on the capital Island, Funafuti. Work will include use of CAD (CreoParametric or similar) to optimise an existing layout configuration in 3D and incorporate different equipment.	Dusan Ilic dusan.ilic@newcastle.edu.au	NIER, Centre for Bulk Solids and Particulate Technologies	Mechanical Engineering	SENG
23	Satellite Remote Sensing for Environmental Analysis	Satellite remote sensing offers valuable tools to study our environment. In this project, students are required to use various satellite measurements including water storage changes from the Gravity Recovery And Climate Experiment (GRACE) and precipitation and vegetation index from different satellite platforms to analyse the environmental factors and their interconnections. During this project students will learn how to deal with remote sensing data, apply some basic computations and interpret the results.	Mehdi Khaki mehdi.khaki@newcastle.edu.au		Civil, Surveying and Environmental Engineering	SENG
25	Synchronisation of action potentials in neural networks	Most neurones use action potentials to transmit information. Synchronisation of action potentials is important for studying the neural network models of rhythmic body movements during animal	Zhiyong Chen zhiyong.chen@newcastle.edu.au 02 4921 6352	CDSC	Electrical Engineering	SENG

		locomotion. This is also a fundamental mechanism in design of biomorphic robots. This project aims to build an electronic neurone prototype that can generate action potentials and realise the synchronisation behaviour using the new theoretical discoveries.				
31	Catalytic Dehydroaromatization of Methane in a Dielectric Barrier Discharge Plasma Reactor	We are interested in producing hydrogen from natural gas. This research project is aimed at producing a useful, valuable compound (benzene) as well as hydrogen from natural gas through the use of a catalyst inside a dielectic barrier discharge reactor.	Eric Kennedy eric.kennedy@newcastle.edu.au	Process Safety and Environment Protection Group	Chemical Engineering	SENG
33	Producing hydrogen from biomass	We are interested in producing hydrogen from biogas (mixture of CO2 and CH4). This research project is aimed at maximising the yield of hydrogen from biogas through the use of a catalyst inside a dielectic barrier discharge reactor.	Eric Kennedy eric.kennedy@newcastle.edu.au	Process Safety and Environment Protection Group	Chemical Engineering	SENG
34	Regeneration of spent Granular Activated Carbon	We are interested in regenerating spent Granular Activated Carbon (GAC), material which is deactivated due to its adsorption of PFAS.	Eric Kennedy eric.kennedy@newcastle.edu.au	Process Safety and Environment Protection Group	Chemical Engineering	SENG
39	Mineral carbonation of fly ash	In this project we will utilise coal furnace fly ash and waste steel slags and in so doing provide valuable knowledge needed to address a common waste problem whilst at the same time reducing CO2 emissions.	Eric Kennedy eric.kennedy@newcastle.edu.au	Process Safety and Environment Protection Group	Chemical Engineering	SENG
40	Recovery of Rare Earth from Fly Ash	In this project we will investigate strategies for the recovery of rare earth elements from fly ash and steel slag materials	Eric Kennedy eric.kennedy@newcastle.edu.au	Process Safety and Environment Protection Group	Chemical Engineering	SENG
41	Economic materials handling research for Biomass for Bioenergy	The research is sponsored by the Department of primary industries who are developing biomass feedstocks for future bioenergy and bioproducts industry. The project is centred on agricultural and forestry residues (e.g. wheat and rice straw, forestry residues) and also dedicated short rotation dedicated biomass crops. The project will investigate the economical of materials handling from paddock to process using new and novel test methods, analysis techniques and modelling concepts to determined economic transport and materials handling systems for the new biomass economy.	Kenneth Williams Ken.Williams@newcastle.edu.au	NIER and the Centre for Bulk Solids and Particulate Technologies	Mechanical, Mechatronics and Aerospace engineering	SENG
44	Impacts of stamp-charged cokemaking on plastic layer properties and coke quality	In metallurgical coke production, stamp charging is commonly employed to improve coke oven productivity and reduce the cost of raw materials through increased use of poorly coking coals in blends. Although it is generally understood that higher charging densities improve coke quality, the exact mechanism of this effect is not clearly understood. It is unclear how increased charged density influences plastic layer properties and the quality of coke, and to what extent are these properties influenced by parent coal properties. In this context, this project aims to improve the knowledge of coal to coke transformation at elevated charge densities utilising the 4kg coke oven and permeability test rig at the NIER site. The project will explore	Arash Tahmasebi arash.tahmasebi@newcastle.edu.au	Centre for Ironmaking Materials Research (CIMR), NIER	Chemical Engineering	SENG

		the impact of higher charge densities on plastic layer properties, generation of internal gas pressure, plastic layer permeability, and ultimately on coke strength.				
48	Grinding Mill Simulation and Design	Comminution is a key operation in mineral processing that utilises grinding mills to reduce the size of ore for further mineral enrichment processing. The aim of this project is to design a lab-scale pilot plant to test new advanced simulation techniques that will be developed in association with our industry partner Bradken.	Craig Wheeler craig.wheeler@newcastle.edu.au	PRC for Advanced Particle Processing and Transport	Mechanical Engineering	SENG
52	Effect of salts on foam	Foams are present in many applications such as food, cosmetics, mining (froth flotation) and wastewater treatment plants. These applications usually involve inorganic salts. This research project aims to investigate the effect of inorganic salts on foam characteristics, focusing on the ion-specific effect on foam stability, foamability and interfacial propoerties of foams.	Mahshid Firouzi mahshid.firouzi@newcastle.edu.au	Centre of Excellence for Eco-efficient beneficiation of minerals	Chemical Engineering	SENG
55	Designing the properties of carbon solids	This project will be involved in a currently funded research project on bio-carbon materials. It will evaluate the impact of biopitch content on mechanical and electrical properties after thermochemcial conversion.	Rohan Stanger rohan.stanger@newcastle.edu.au	PRC for Frontier Energy Technologies and Utilisation	Chemical Engineering	SENG
58	Student perceptions and engagement with non-traditional teaching platforms	Courses across the school of engineering have seen huge engagement and buy in from students with non-traditional teaching platforms (e.g. Discord Discussion Boards, YouTube video hosting). This project will explore student perceptions of and engagement with these platforms compared to 'traditional' approaches, and develop strategies for disseminating learnings from/deployment of these tools more broadly. Students from within the school of engineering are encouraged to apply - particularly if they've had firsthand experience using these platforms in their courses. Students from MECH/MCHA/AERO/MED who are due to begin their Final-Year Project in S1-2022 would be ideally-placed, as FYP works can be scoped to follow on from this research.	Alexander Gregg alexander.gregg@newcastle.edu.au	Engineering Education Research Group	Mechanical Engineering	SENG
60	Quantifying the Interactions between Ions and Polymers	Specific ion effects are ubiquitous phenomena where the behaviour of a system is dependent not just on the concentration of salt present but also its identity; for example, sodium chloride is used in medical saline drips whereas injecting potassium chloride is lethal. The successful summer scholar will investigate the interactions between a range of salts and temperature sensitive polymers, whose solubility in water and non-aqueous solvents are dependent on temperature. Understanding these fundamental interactions are critical to the development of the next-generation of smart surfaces such as lab-on-a-chip and biosensors, cell culture media or polymer membranes for heavy metal decontamination.	Grant Webber grant.webber@newcastle.edu.au 02 4033 9067	Centre of Excellence for Enabling Eco-Efficient Beneficiation of Minerals	Chemical Engineering	SENG
61	Development of Plant-Based	The extraction and processing of critical rare earth minerals is vital to modern society. Separation of valuable material from waste with ever-increasing efficiency, while minimising water and energy use, is a	Grant Webber grant.webber@newcastle.edu.au 02 4033 9067	Centre of Excellence for Enabling Eco-	Chemical Engineering	SENG

	Emulsions for Minerals Processing	great challenge. The successful summer scholar will work within the Centre of Excellence for Minerals developing a new method of capturing hydrophobic particles using emulsions stabilised by plant-based solids; such as cellulose and lycopodium. The project will use fundamental physical chemistry principles to overcome this complex engineering problem.		Efficient Beneficiation of Minerals		
62	Heat transfer modelling of a high temperature molten metal droplet impacting on a solid surface	Globally 60% of steel production involves Basic Oxygen Steelmaking furnaces which involves blowing pure oxygen into molten iron at high temperature (~1700 oC). Due to harsh chemical environment, wearing of internal furnace lining is a common issue which significantly decreases the useful life of the equipment. Replacement of furnace lining has a serious cost implication and is often avoided. An economic option is to coat the furnace walls with the residual slag remaining in the system which provides a protective layer against the chemical attack. To achieve this, an inert gas e.g., nitrogen jet can be blown into the retained slag pool at the furnace floor. This results in slag splashing ejecting numerous droplets from the liquid surface which collide with the surrounding walls. Due to temperature difference between the slag and furnace walls, impacting droplets immediately solidify and form a protective coating. This project aims to look at a simplified version of this problem involving impingement dynamics of a molten metal droplet on a flat surface. A numerical model will be developed in MATLAB framework to predict the temporal deformation of the droplet and associated heat transfer. The model will predict temperature distribution within the droplet at different droplet impact velocity and surface temperature. Depending on the progress and interest of the student, there will be also an opportunity to perform (computational fluid dynamics) CFD modelling using well regarded commercial code Ansys Fluent. This project would provide an exposure to a very relevant problem in steelmaking industry and offer hands on experience in a niche area like numerical modelling of complex practical problems which has great demands in research and design based high-end engineering jobs.	Subhasish Mitra subhasish.mitra@newcastle.edu.au	Centre of Excellence for Enabling Eco-Efficient Beneficiation of Minerals	Chemical Engineering	SENG
63	Synthesis of Electrodes for electrochemical reactions	Material science project creating electrodes. Electrochemical processes are paving the way for renewable in many fields from carbon capture, hydrogen generation and green Al production. However the conditions inside an electrolytic cell are hazardous to most materials, combining high temperatures, corrosive electrolytes, and electrical charge. This project is centred around synthesising electrodes for these reactions and understanding what parts of the manufacturing process contribute to their performance. The project will involve significant experimental, testing and analysis processes. You will be inducted into various labs across the university and able to create your own samples, test and analyse them to determine their	Dylan Cuskelly dylan.cuskelly@newcastle.edu.au		Mechanical, Mechatronics and Aerospace	SENG

		success. Additionally you will be able to collaborate with other active research groups. This project is targeted towards students who have completed some materials science subjects in Mech/Mecha/Aero, Chem Eng/Renewable Eng/Chemistry, or Physics. Other students are welcome to apply but the learning curve may be steep.				
66	GPS remote sensing of environment	This project is to develop novel solutions to sensing our environment using Global Positioning System (GPS). GPS is a satellite system originally designed for positioning and navigation, however, GPS signals are also being used to sense different environmental conditions including water (sea) level and moisture in soils. This project explores various sensing capabilities including field experiments.	Shin-Chan Han shin-chan.han@newcastle.edu.au 02 4921 5432		Civil, Surveying, & Env.	SENG
68	A network coding game	This project develops a simple computer game targeting high-school students. The game introduces high-school students to the concept of network coding in communication systems. In the game, the player will attempt to combine data packets to increase the efficiency of communication. The student working on this project will familiarise themself with network coding and caching, as well as how to program a game.	Lawrence Ong lawrence.ong@newcastle.edu.au 02 4921 5385	Centre for Secure and Reliable Communications	Electrical, Computer Systems and Medical Engineering	SENG
70	Selective capture of electrostatically charged particles	This project is part of a larger research program studying particle recovery, separation and beneficiation techniques appropriate to extraterrestrial environments such as the Moon and asteroids, as well as arid areas of Earth. In all of these, use of water must be minimised or eliminated entirely. On the other hand, these environments are ideal for electrostatic particle handling and separation processes. The project will study the capture of electrostatically-charged particles from an air-fluidised bed by a stationary liquid droplet, focusing in particular on the potential to capture some particles and not capture others (selectivity, critical for particle separation). The work will involve bench-scale experiments if circumstances allow, with numerical modelling as an alternative	Peter Ireland Peter.Ireland@newcastle.edu.au 02 4921 5653	PRC Advanced Particle Processing and Transport	Chemical Engineering	SENG
72	Utilisation of hydrogen reduction for green ironmaking	The Centre for Ironmaking Materials Research (CIMR) is working with industrial partner BHP to investigate the impact of hydrogen addition to ironmaking to reduce greenhouse gas emissions. Australian iron ore lump is mixed with sinter as input to the blast furnace, and it has been proven that the degree of reduction is an important variable controlling the interaction between the two materials. The addition of hydgogen is expected to amplify this effect. This project involves experimental work to test the chemical interaction between 'real' lump textures and sinter samples with the addition of hydrogen to the reducing gas, combined with theoretical analysis using FactSage (a thermodynamic software and database package).	Thomas Honeyands tom.a.honeyands@newcastle.edu.au	Centre for Ironmaking Materials Research	Chemical Engineering	SENG

75	Hydrogen production from natural gas	While most hydrogen conventionally is produced from natural gas, it is normally made by steam reforming with significant energy and CO2 footprint. It is thus proposed to make hydrogen from natural gas in a different way (without oxidation), with the added benefit of a valuable feedstock as a byproduct and carbon monoxide free hydrogen. In this project we will develop a fundamental understanding to a single step catalytic process that can utilise natural gas to make BTX and solid carbon in a controlled manner. A single step process for hydrogen production utilising natural gas but also waste green-house gases (such as biogas) is expected to be of great benefit to the Australian economy, environment and energy security.	Michael Stockenhuber michael.stockenhuber@newcastle.edu.au	Catalysis and Processes	Chemical Engineering	SENG
77	Catalytic butadiene synthesis from C3 and C2 oxygenates	Butadiene is an important monomer, which is industrially manufactured via the Lebedev process. This involves the coupling of a C2, typically ethanol, to form the C4 butadiene via dehydration and dehydrogenation over a catalyst. This project will examine catalytic coupling of C1 and C3 chemicals, with a view to produce butadiene from potential waste streams.	Michael Stockenhuber michael.stockenhuber@newcastle.edu.au	Catalysis and processes group	Chemical Engineering	SENG
78	Methane reforming for the production of hydrogen	Catalytic methane reforming offers a process to produce hydrogen, a potential fuel source which could reduce the reliance on fossil fuels, from a potent greenhouse gas. The proposed project will examine the reaction conditions to modify the desired products, both via combined dry and steam reforming conditions and potential in situ regeneration procedures.	Michael Stockenhuber michael.stockenhuber@newcastle.edu.au	Catalysis and processes group	Chemical Engineering	SENG
80	Selective oxidation of methane to value added products.	Recently a process has been developed to utilise metahnol for selective olefins production. The commercial viability of this process hinges on crude oil price and raw material cost. Methanol feedstock for MTG can be produced by selective oxidation of methane. However, yields and selectivity for the oxidation step is generally rather poor. Recently, Cu catalysts were reported to be an excellent catalyst for selective hydrocarbon oxidation. A methane feedstock was also reported to yield good selectivities to methanol, yet not in a continuous process. This part of the project is concerned with catalyst preparation and developing optimal operating conditions for the selective oxidation of a methane feedstock to methanol. The operating conditions and kinetics of the oxidation will help understand the oxidation process and aid in the development of processes utilising environmentally friendly fuels. The project is mainly experimental.	Michael Stockenhuber michael.stockenhuber@newcastle.edu.au	Catalysis and processes group	Chemical Engineering	SENG
82	The catalytic conversion of waste plastics – a contribution to the circular economy of polymers.	Reduction in feedstock levels and the environmental impact of polymer waste has triggered significant interest in upcycling waste plastics to polymer feedstsock. In this project, catalysts and processes to waste polymer feesdstsock will be explored. The project incolves catalyst development, characterisation and catalytic microreactor	Michael Stockenhuber michael.stockenhuber@newcastle.edu.au	Catalysis and processes group	Chemical Engineering	SENG

		studies to develop an understanding of the challenges involved in upcycling of waste plastics to valuable polymers.				
86	Future forecasting of NEM demand	The objective of this project is to develop a statistical model to forecast future behaviour of the National Energy Market using historical demand data in the form of time series. This project will involve an in-depth introduction to the field of time series forecasting, focusing on advanced models currently used throughout industry, and an exploration and comparison of these different models in terms of forecasting an appropriate synthetic time series.	Samuel Evans samuel.evans@newcastle.edu.au		Aerospace Systems, Mechanical and Mechatronics Engineering	SENG
91	Calibration of Terrestrial Laser Scanners using Baselines	Calibration of terrestrial laser scanners is important if they are going to be used for legal surveys, such as boundary or cadastral surveys under the Surveying and Spatial Information Act (NSW). This project aims to investigate if existing EDM calibration infrastructure in the State of NSW can be used to provide calibration information for terrestrial laser scanners. The project will involve literature review, data capture planning, instrumentation familiarisation, field work on the University baseline, and analysis and reporting.	Lloyd Pilgrim lloyd.pilgrim@newcastle.edu.au		Surveying, in Discipline of Civil, surveying and Environmental Engineering	SENG
98	Analysing Stent Graft Designs for the Management of Abdominal Aortic Aneurysms	Abdominal Aortic Aneurysms is a condition affecting the aorta usually in its infrarenal segment and involves the abnormal dilatation of this artery. The infrarenal aorta is a site predisposed to aneurysmal widening. The cyclic stress caused by the pulse wave in conjunction with factors which decrease the strength of the wall may lead to dilatation and ultimately to rupture. Treating an abdominal aortic aneurysm with a stent graft inserted in the aortic wall is a key technology in isolating flow fields. This project aims to analyse the performance of existing stent graft designs in isolating flow fields and reducing wall pressure. A Computational Fluid Dynamics (CFD) model of an abdominal aortic aneurysm will be built in ANSYS to study the hemodynamic loads. Pressure on the aneurysm sac wall, flow, and wall shear stress will be studied and compared for cases with and without a stent graft inserted. The expected outcomes of this project include a working CFD model with defined boundary conditions; and analysis of stent grafts and their effectiveness on treating abdominal aortic aneurysms based on metrics such as wall pressure, flow and shear stress.	Yuen Kuan Yong yuenkuan.yong@newcastle.edu.au 02 4921 6438	Precision Mechatronics Laboratory	Electrical, Computer Systems and Medical Engineering	SENG
100	Implementation of embedded control algorithms for dynamic systems	In many applications, mechatronics systems require the implementation of control algorithms in embedded platforms. The research in control theory focuses primarily on the development of control design techniques and the analysis of their theoretical properties. However, the implementation and experimental tests have received, in general, less attention. In this project, we propose the implementation of control algorithms for the dynamics systems available in our lab: the Quanser Qube and Aero systems. The control algorithms will be designed using both standard linear techniques and	Alejandro Donaire alejandro.donaire@newcastle.edu.au 02 4985 4934		Mechatronics	SENG

		advanced nonlinear methods. The project will focus on the embedded implementation and testing of control algorithms. However, the successful applicant and the supervisor will discuss the theoretical aspects of the control, which will provide the opportunity for developing research skills and experience working in a research environment. The development of nonlinear methods for the control of dynamic systems is a topic of research of the supervisor, and the summer scholarship will provide the successful applicant with the opportunity to work in a research project, which might result in a publication. Also, the project outcomes will be beneficial for courses in engineering programs as it will provide a student-friendly and easy-to-use platform for students to test and implement their control algorithms developed during the course assignments and labs.				
103	Science and Engineering Challenge Activity Development Scoping Study and Proof of Concept Design	Students will gain 8 weeks of Industry Experience as they research and develop new educational activities for the Science and Engineering Challenge. Areas of particular interest are environmental sustainability and renewable energy, though projects are open to any discipline of science and engineering. Students may build on current Challenge activities, look to revitalise old Challenge activities, or create something entirely new. Activities are heavily constrained by the limits of the program. They must be exploratory and open-ended, but also workable in the Challenge Day format, affordable, scalable and transportable. At the end of the project, students will present their findings to the current Science and Engineering Challenge team in a short 5-10 minute pitch, along with a proof of concept design. The main focus of the project is on the research phase of development and the creation of a rough prototype. There may be opportunities for future employment with the program should the idea prove strong enough to warrant further pursuit.	Steven Weller steven.weller@newcastle.edu.au 02 492 16089	Director, Science and Engineering Challenge	Electrical Engineering	SENG
106	Rockfall structural analysis for virtual reality (VR) rockfall simulation	This project will involve the collection and preparation of detailed geostructural and rockfall data set for the development of a virtual reality (VR) simulation of rockfall dynamics in a commercial game engine. The project will identify the best suited data set of rockfall parameters to be incorporated in a fit for purpose collision model for rockfall. Rock surface data, geo structural data and rebound parameters will be analysed to prepare the programming suite. The project will be based at the University's Priority Research Centre for Geotechnical and conducted in collaboration with the the i3 Lab's immersive technology labs and equipment. Knowledge required for the project include rock mass geostructural characterisation, rock mechanics and imaging analyses.	Anna Giacomini Anna.Giacomini@newcastle.edu.au 02 4921 6254	Priority Research Centre for Geotechnical Science and Engineering	Engineering	SENG
107	Anomaly Detection of Spacecraft Telemetry Data	With the increasing amount of telemetry data from spacecrafts, an automatic anomaly detection system plays a key role to meet two objectives: 1) Lessen the monitoring burden placed on operation	Duy Ngo duy.ngo@newcastle.edu.au 02 4921 8947		Electrical, Computer Systems and	SENG

	using Machine Learning	engineers and 2) Reduce the operational risks. Machine Learning (ML) approaches have emerged as potential candidates for automation of satellite characterisation for Space Situational Awareness (SSA) and Space Domain Awareness (SDA). Unsupervised learning techniques provide insight into satellite characterisation by geospatial location and detection of anomalous behaviour and manoeuvres. A deep learning method based on a recurrent neural network model, called Long Short-Term Memory (LSTM), is used for predicting orbital patterns and detecting anomalies from TLE satellite datasets. This project will investigate the suitability of LSTM for a wider range of signal types, including PSD data, and in the context of Australia. It will also propose to improve the dynamic threshold design to maximise the performance of anomaly detection.			Medical Engineering	
112	Capacity and behaviour of unreinforced masonry walls subject to in-plane shear forces	The behaviour of unreinforced masonry (URM) walls that are subject to in-plane shear forces as not well understood. As a part of this project, the shear capacity and failure mode of URM shear walls will be examined through the experimental testing of half-storey masonry wall specimens. Interpretation of the failure mode through the application of DIC imaging will be applied, and the measured capacity of the specimens shall be examined and compared to current Australian and international code equations for shear capacity. This will further our understanding of the response of these structures, as well as helping to quantify errors in our current masonry design equations.	Mark Masia mark.masia@newcastle.edu.au	Centre for Infrastructure Performance and Reliability	Discipline of Civil, Surveying and Environmental Engineering (specifically Civil Engineering)	SENG
116	Fragmentation of rocks upon impact	This project falls into a large research project on rock fragmentation upon impact during rockfall. A simple model was recently developed by a team of UoN research to predict the likelihood of fragmentation upon impact of brittle spheres given their strength. The model was validated using mortar and research is needed to assess how applicable it is to natural materials. The project will consists of sourcing blocks of three different rock types (sandstone, limestone, mudrock) and conducting several series of Brazilian tests, compression tests and hopefully drop tests on specimens of different diameters in order to validate the model. Such validation will constitute a significant step forward towards better engineering practice when it comes to rockfall protection.	Olivier Buzzi olivier.buzzi@newcatle.edu.au 02 4921 5454	PRC Geotechnical Science and Engineering	Civil Surveying Environmental Engineering	SENG
118	The use of electrical and hydrogen power in marine vehicle applications	Decarbonisation of transportation has been identified as an industry challenge for the next 50 years. Marine transport industry is particularly strong in Australia. The majority of small and medium size boats are produced internally. Recently, collaboration between The University of Newcastle, Ampcontrol and Steber resulted in a pioneering development of a hybrid boat prototype, with an onboard microgrid. In line with global trends, the next step is to incorporate hydrogen power. This project will include literature review, market	Galina Mirzaeva galina.mirzaeva@newcastle.edu.au 49216083	Power Electronics	Electrical Engineering	SENG

		appraisal, as well as participation in technical development and trials (if the industry schedule allows) of the hybrid boat technology.				
119	Transonic shock buffet onset sensitivity to gust perturbations	Transonic shock buffet is an aerodynamic instability involving the interaction between oscillating shock waves and intermittently separated shear layers. These aerodynamic oscillations induce significant loading fluctuations that are detrimental to aircraft handling and structural fatigue life. While substantial research efforts have been devoted to classifying the physics of shock buffet onset in rigid aircraft structures, the interactions with an elastic structure are not so well understood. The goal of this project is to explore the sensitivity of elastic aircraft structures in the presence of a shock buffeting flow to various gust profiles. The project will involve research into appropriate gust modelling approaches and implementation within a high-fidelity fluid-structure interaction simulation framework.	Nicholas Giannelis nicholas.giannelis@newcastle.edu.au		Aerospace Systems, Mechanical and Mechatronics Engineering	SENG
122	Design and fabrication of filter for removing reaction oxygen species in fluid flow	Biomedical applications of cerium oxide nanoparticles – 'nanoceria' has observed a burgeoning interest from its first reported use in 2005. Since then it has been used as a novel antioxidant that mimics the function of Reactive Oxygen Species (ROS) scavenging enzymes such as superoxide dismutase, catalase, and glutathione etc. and maintain redox homeostasis. The antioxidant property has been exploited in prevention and treatment of multiple diseases mediated by oxidative stress. The ability to reversibly switch its oxidation state between Ce3+ and Ce4+ is fundamental to these applications. High surface energy in nanoceria leads to creation of surface oxygen vacancies that promote the enzymatic activity by increasing Ce3+ concentration. Oxidation state of cerium ions and its reversibility was found to be more important for its antioxidant activity as compared to oxygen vacancies. This projects aims at extending the use of cerium oxide nanoparticles for scavenging free radicals in a dynamic liquid flow medium. The project involves the immobilization of cerium oxide nanoparticles on high surface area ordered mesoporous carbons and their use as a filter for removing free radicals from liquid medium	Ajay Karakoti ajay.karakoti@newcastle.edu.au	Global Innovative Centre for Advanced Nanomaterials	Materials Science and Engineering	SENG
124	Evaluating a Novel Energy Based Detection Approach for Nerve Signals	Nerve cells in the brain communicate using complex signals that are significantly impacted by noise. Detecting these signals remains a key challenge for neuroscientists. This project evaluates a novel neural signal processing algorithm applied to nerve cell recordings. Specifically, we are interested in unsupervised action potential detection in a low signal-to-noise ratio environment. A multiresolution Teager energy operator (MTEO) detector will be evaluated against a commonly used derivative threshold detection method.	James Welsh james.welsh@newcastle.edu.au 02 4921 6087	Medical Engineering Research	Electrical, Computer Systems and Medical Engineering	SENG
128	Intelligent and scaleable renewable energy	The project looks at the application of the intergrid concept to allow isolated microgrids in remote communities to be interconnected in a manner that makes engineering, enviromental and economic sense.	Terrence Summers terry.summers@newcastle.edu.au	Priority Research Centre for Complex	Electrical, Computer and	SENG

	integration for remote communities	Cuurently isolated communities that have off-grid power systems are usually centally controlled but this leads to inefficiencies in terms of underutilisation of equipment, resources and increases in cost. The project involves renewable energy integration, modelling and control, power electronics, optimisation and power systems.		Dynamic Systems and Control	Medical Engineering	
135	Understanding and predicting recovery in patients undergoing total knee replacement	Most people make an excellent recovery after knee replacement, thanks to advances in surgical methods. Still, some people get back into life quickly with their new knee, whilst others recover more slowly. This project will apply a machine learning model to predict patient outcomes following knee surgery. Partnered with the Hunter Medical Research Institute and Ramsay Healthcare, we're currently following the recovery of 1000 adults having total knee replacement surgery. Machine learning models developed from this data will guide the development of the tailored, precision-rehabilitation methods of the future. The tool will take the guess-work out of deciding which, how much and what kinds of rehabilitation will be the most useful for each patient.	Sarah Johnson sarah.johnson@newcastle.edu.au 02 4921 6028	Center for Rehab Innovations	Electrical Engineering	SENG
136	Novel gold recovery from sulfides ores in Australia	A novel two stage process has been developed at UON in conjunciton with EcoTech Mining to recovery gold and other valuable precious metals from hard to treat sulphide ores. This project will involve both experimental work and modelling of the novel process to improve gold and other precious metal recovery and minimise the carbon footprint of the process.	Priscilla Tremain priscilla.tremain@newcastle.edu.au	PRC Frontier Energy Technologies	Chemical Engineering	SENG

School of Information & Physical Sciences:

TOPIC NO.	TITLE OF RESEARCH TOPIC	DESCRIPTION OF RESEARCH PROJECT	PRINCIPAL SUPERVISOR CONTACT DETAILS	RESEARCH GROUP/ CENTRE	DISCIPLINE	SCHOOL
2	The stray magnetic field above a skyrmion	Skyrmions are tiny swirls in the magnetization of a thin magnetic film that are only a few nanometers wide. They are of great interest as a way of storing computer information at unprecedented densities. The magnetic stray field that they produce above the field gives an indication of their size and shape. However, a theory that predicts this stray field is currently missing! In this project, analytic calculations for magnetic skyrmions will be used to develop simple expressions for the stray field. This will enable researchers to probe skyrmions in new ways.	Karen Livesey Karen.Livesey@newcastle.edu.au		Physics	SIPS
4	Salt effects on the electrochemical properties of organic redox couples	This project looks at the performance of organic redox couples in redox flow batteries. Different types of salts modify the electrochemical properties of these redox couples and thus the resulting batteries. The aim of the project is to find optimum pairings of salts and redox couples to achieve maximum battery performance. The ideal candidate has some fundamental understanding of electrochemistry.	Thomas Nann thomas.nann@newcastle.edu.au	Nanomaterials for Energy Storage	Physical Chemistry	SIPS
5	Contrast Studies in Scanning Helium Microscopy	Scanning helium microscopy images sample surfaces via an atom beam; exploiting the inherent properties of the probe particles (inert, low polarisability, no net spin, and a de Broglie wavelength of the order of typical crystallographic dimensions at milli-electron volt energies) and thus making it ideal for materials typically degraded under the energetic probes of other microscopies. As the probe cannot penetrate into the bulk at all, the micrograph generated is exclusively of the surface under investigation. This project will study the nature of the atom-surface interaction that dictates the contrast mechanisms available to the generated micrographs.	Paul Dastoor Paul.Dastoor@newcastle.edu.au 02 4921 5426	Organic Electronics	Physics	SIPS
18	Generalised Fast Marching Method for Image Segmentation	Image segmentation is a very important technique to analyse images. In this project, a generalised fast marching method for image segmentation is implemented in MATLAB. Then this segmentation technique will be tested for several images. The technique will be also compared with other segmentation techniques implemented in MATLAB.	Bishnu Lamichhane bishnu.lamichhane@newcastle.edu.au	CARMA	Mathematics	SIPS
21	Evolutionary Algorithms for crafting adversarial examples for malware classifiers	In this project Evolutionary Algorithms (EAs) will be used for detecting and analysing security vulnerabilities of DNN-based (Deep Neural Network) malware classifiers that knowledge will be valuable in designing robust DNNs. EAs have shown success in designing adversarial examples in the image domain however, little is known about such vulnerability in DNN-based malware classifiers. EA will	Nasimul Noman Nasimul.Noman@newcastle.edu.au	Advanced Cyber Security Engineering Research Centre	Computing and Information Technology	SIPS

		used for crafting adversarial examples for uncovering any weakness in current malware classification techniques.				
24	Modelling the shape of red blood cells	The Helfrich model is a mathematical model for the biconcave shape of red blood cells. It contains several parameters that influence the shapes predicted by the model, shapes which are observed in practice. For example, with the disease spherocytosis, blood cells have a spherical shape leading to serious health problems. This project is a scoping study to seek out how much is known about how environmental factors, drugs and diet influence the parameters in the Helfrich model and possibly obtain better understanding of these relationships through analysis of existing data. The understanding will also be relevant to other health conditions including diabetes.	James McCoy James.McCoy@newcastle.edu.au 02 4033 9633	CARMA	Mathematics	SIPS
28	3D interaction with large datasets in virtual reality	This project will be based in the i3Lab Research group and will explore importing, displaying and manipulating large datasets (e.g. climate predications, virus propagation or network traffic data) in 3D virtual environments. The i3Lab has wireless HTC Vive Pro and Oculus head-mounted displays (HMDs) and the project will involve defining and testing a data pipeline from static and real-time data sources into HMDs via game engine reuse (either Unreal Engine and/or Unity3D).	Shamus Smith Shamus.Smith@newcastle.edu.au 02 4921 6175		Computer Science and Software Engineering	SIPS
32	Creating and analysing a library of universal groups	Mathematicians study the intuitive notion of 'symmetry' through the algebraic notion of a 'group'. The symmetry 'groups' of infinite networks, or graphs, constitute a current research frontier and the 'universal groups' appearing in the title form an important class of examples. An existing computational package written in GAP provides methods to find and store universal groups. The goal of this project is to exhaust the capabilities of this package by running its methods on the university's high performance computing grid, organise the results into a library and, time permitting, analyse and visualise this library. Programming experience and basic knowledge of graph theory, combinatorics or linear algebra are essential. Knowledge of algebra (group theory) is desirable.	Stephan Tornier stephan.tornier@newcastle.edu.au 02 4921 6280	CARMA	Mathematics	SIPS
37	Development and Evaluation of a Feedback Tool for hands-on Activities in Networks and Systems Administration	In Computing and IT, gaining knowledge and skills in practical hands-on activities is crucial especially in systems-level courses such as Systems and Network Administration, Cybersecurity and others. This project aims to finalise the development of a feedback tool that provides students in INFT2031 with feedback on practical hands-on activities. The feedback tool is planned to deployed and evaluated for impact in large courses in both on-campus and online settings.	Rukshan Athauda Rukshan.Athauda@newcastle.edu.au 02 4985 4507		Computing and IT	SIPS
42	Fieldline detection in Robot Soccer	We aim at developing a very fast method for detecting field lines that can run on a low-powered device. The lines will be used for localisation on the robot. The project will be conducted as part of the NUbot competition team preparation for RoboCup 2022.	Stephan Chalup Stephan.Chalup@newcastle.edu.au	CARMA, IMLRG, Newcastle Robotics Lab	Data Science	SIPS

47	Deep Learning-based Analysis of System Logs	Software systems often record runtime information by printing console logs through functions such as “printf” and “System.out.println”. Log data is usually unstructured text messages, which can help engineers understand the system’s internal status and facilitate system monitoring and troubleshooting. However, a large and complex system could produce a massive amount of logs, thus manually checking log data is time-consuming and error-prone. Recently, Deep Learning has been driving advances in artificial intelligence that are changing our world. In this summer project, we will train deep learning models (such as LSTM and Transformers) to automatically analyze log data. We will also apply the trained deep learning models to some real-world log data such as Hadoop data.	Hongyu Zhang hongyu.zhang@newcastle.edu.au		Computing and Information Technology	SIPS
49	Flare Forecasting	Solar flares are enormous explosions of energy in the Sun’s outer atmosphere associated with regions of strong magnetic fields on the surface of the Sun. The physical conditions necessary for a solar flare to occur is poorly understood, and so flare forecasting for space weather is not yet a reality. Machine learning has been used to identify the properties of magnetic fields that are most closely associated with flare occurrence (Bobra et al. 2014). In this project, we will extend this work to explore the dependence of the time evolution of these properties for flare occurrence, in an effort to improve flare forecasting. The student will use state-of-the-art data analysis from NASA’s Solar Dynamics Observatory, GOES X-ray explorer and correlation analysis and/or machine learning in python.	Hannah Schunker hannah.schunker@newcastle.edu.au 02 4925 3484	Space Science Centre	Physics	SIPS
59	Advanced Malware Analysis	Advanced Malware is a sophisticated code block that is more robust, stealthier, and persistent than normal Malware. They are crafted to achieve many goals. For instance, they not only have the capabilities to infect multiple devices (creating zombies) and maintain communication with C & C but also hide in network and move laterally within an organization domain. They can also be used for data exfiltration/payload execution and avoiding firewalls and AV systems in place. They use various types of obfuscation techniques to hide within a system and in the Network Domain. In this project, we will focus on techniques to extract features from Advanced Malware binaries.	Vijay Varadharajan vijay.varadharajan@newcastle.edu.au 02 4921 8687	Advanced Cyber Security Engineering Research Centre	Computing and Software Engineering	SIPS
65	Predicting optical properties of materials	Most metals are shiny and reflective, but colourless. There are some exceptions such as gold and copper. But there are a range of more unusual metallic compounds, such as AuAl2, CoSi2 and TiAlN that can show a range of colours from violet, deep blue, bright yellow and everything in between. Oxide and ceramic materials can also take on a range of colours depending on slight variations in their composition. The purpose of this project will be to use advanced quantum mechanical calculations to understand how these colours arise.	Vicki Keast vicki.keast@newcastle.edu.au 02 4921 6653		Physics	SIPS

83	Investigating the transport mechanism in a novel class of multidrug efflux pumps	Resistance to antibiotics in human pathogens is one of the major challenges facing humanity in the 21st century. One of the major contributors to antibiotic resistance in pathogens are a unique class of proteins known as multidrug efflux pumps. These pumps sit in the bacterial membrane and facilitate the movement of antimicrobials out of the cell. Our group recently discovered an entirely new family of multidrug efflux pumps encoded by some of the most drug resistant hospital pathogens. This project will seek to study uncharacterised efflux pumps at the molecular level. This information will help develop new drug types that could be used to block transport by multidrug efflux pumps.	Varsha Naidu Varsha.Naidu@newcastle.edu.au 02 4921 5808	Bacterial Regulation and Transport Laboratory	Molecular Microbiology Group	SIPS
84	Introspection based analysis of cyber security attacks	Host based security tools have good visibility into the monitored systems and can efficiently detect the attacks. However, since these security tools are implemented in the monitored host they are also vulnerable to the attacks. When the attackers find any vulnerability in the monitored system, they are primarily targeting attacks on the host based security tool and disabling these tools before performing any malicious activity. This makes it extremely difficult for the security administrators to detect such attacks. In this project we make use of introspection based security tools for analysing the security attacks on host based security tools that are implemented in the virtual machines. The student should have ability/willingness to work with software binary codes and do system programming. Project Outcome: Report and Demonstration of Introspection based attack analysis.	Udaya Tupakula uday.tupakula@newcastle.edu.au 02 4921 6803	Advanced Cyber Security Engineering Research Centre	CIT	SIPS
88	Localisation and Odometry for a robotic platform	The student will work on the integration of a SLAM (Simultaneous Localisation and Mapping) method to the NUbots codebase and make it communicate properly with the other modules of the system.	Alexandre Mendes Alexandre.Mendes@newcastle.edu.au 02 4921 6172	NUbots	Computing and Information Technology	SIPS
90	Exploring the origin of super-heated magnetic loops in the Sun's atmosphere	Observations of the Sun reveal that its outer atmosphere ("corona") is around 1000 times hotter than its surface, a fact that has defied explanation since it was first realised nearly 80 years ago. Recent promising results suggest a resolution to this problem, involving tangling/braiding of the magnetic field lines in the corona by plasma flows on the surface. These lead to the appearance of bright "loop" structures in the atmosphere where the plasma temperature can reach many millions of degrees. The aim of this project it to use computer simulations and/or satellite observations of the Sun's atmosphere to explore the process that creates these hot loops. This project would be suitable for a student with experience in physics, mathematical modelling, and/or coding and data analysis.	David Pontin david.pontin@newcastle.edu.au	Centre for Space Physics	Physics	SIPS
93	Using Mobile and Wearable Devices to Monitor Mental Health	De-identified social media data and wearable data, such as heart-rate and steps, will be used to detect the early signs of a relapse in mental health for people diagnosed with, or at risk of, a mental illness. We will use artificial intelligence/machine learning algorithms that previous analyses have shown can discriminate between people	Raymond Chiong Raymond.Chiong@newcastle.edu.au 02 4921 7367		Data Science & Statistics	SIPS

		diagnosed with depression and those who have not. Proven technologies will also be used to detect changes in wearable data that may be precursors of a change in mental health status. Whereas social media text requires user intervention, wearable measures such as heart-rate can be recorded continuously.				
99	Joining dots to see groups from trees	The project involves finding alternative ways of visualising self-similar permutation groups that improve our ability to see patterns among them. Several thousand of these groups, which act on binary trees, have been generated by computer searches. However, the action on the tree is often not illuminating and we seek geometric actions that convey more visual information. For example, given certain permutations of four points, our understanding of the permutations is greatly enhanced if we see that the four points are in fact the vertices of a square and the permutations come from rotations and reflections of the square. Our goal is to `join the dots' and see geometric patterns in the computer generated cases we have found currently. The approach will again use a computer search. Knowledge of a second-year linear algebra or third-year algebra course is assumed, and knowledge of computing is desirable. Students will learn more algebra and also gain experience working with computer algebra systems. It is possible that work from this project will eventually be included in publicly available computer algebra packages. The project contributes to a much larger one that aims to understand symmetry groups of infinite networks, and students will also learn about this larger project.	George Willis george.willis@newcastle.edu.au 02 4921 5666	CARMA	Mathematics	SIPS
105	VR Simulation of Rockfall Dynamics in Games Engines Using Advanced Physics Models	This project will involve the development of a virtual reality (VR) simulation of rockfall dynamics in a commercial game engine. Key to the project will be the incorporation of advanced physics models developed by collaborators in the University's Priority Research Centre for Geotechnical and Materials Modelling. You will have access to the i3 Lab's immersive technology labs and equipment for the project. Skills/knowledge required for the project include programming and software development (C# advantageous), game development (Unity or Unreal preferred), and physics.	Karen Blackmore karen.blackmore@newcastle.edu.au 02 4921 5206	i3 Lab	Computing and IT	SIPS
113	Online Source Code Plagarism Detection Tool	Source Code Plagiarism is a big issue in Computer Science education, often requiring a large effort to review and assess submissions for indications of plagiarism. There is lack of reliable tools for source code plagiarism detection. Source code plagiarism can be suspected when one program shares a large subset of code with another. A plagiarising person may attempt to hide the act of plagiarism to evade detection, this is by modifying the source code, known as Obfuscation, causing the program to appear superficially distinct, for example, renaming the variable or object, changing the order of the statement. Typically, a Source Code Plagiarism Detection Tool (SCPDT) analyses a pair of	Yuqing Lin yuqing.lin@newcastle.edu.au 02 4921 6076	CARMA	Discipline of Computing and Information Technology	SIPS

		submissions to evaluate the similarity of the pairs by measuring specific aspects of source code. The measured aspects of source code are SCPDT-dependent, and possibly missing other important characteristics of the source code. With a recent graduated PhD of Dr. Lin, we have proposed another approach that measures the similarity of the behaviour of programs, with the understanding that obfuscations are mostly cosmetic, changing the behaviour of a program requires significant effort contradicting to the purpose of the plagiarism. The behaviour-based detection has demonstrated improvements in terms of accuracy and robustness and similarity scores are more clustered which are strong indications of plagiarism. In this project, we would like to migrate the approach to a cloud platform, aiming at publishing the tools for public use. The students participate in the project are expected to have good skills in Web/Cloud programming and Compiler design.				
115	LiDAR visualization	The project entails operation and data collection from a 355nm LiDAR system and subsequent analysis of the data.	John Holdsworth John.Holdsworth@newcastle.edu.au 02 4921 5436		Physics	SIPS
125	Development of a Virtual Patient for Acute Pain assessment in Unity	This summer scholarship is intended for a student who has skills in ASP.NET C#, the Unity game engine and SQL Server. You will work on part of an ongoing multi-disciplinary project involving UoN, the University of Tasmania (UTAS), the University of South Australia (UniSA), John Hunter hospital (JHH), and Le Havre-Normandy University (France) [1][2]. Background: In 2009, a virtual patient (VP) for training and assessment of Pharmacy students interview and diagnostic skills was created at the UoN, and implemented at 3 other Australian universities [3]. A short YouTube video demonstration of a pharmacy student interaction with the VP was presented at ACIS'2009, the 20th Australasian Conference on Information Systems [4]: https://youtu.be/MwfPFMvsk70 The VP framework was designed to be scalable and to be capable of translating to other domains [4][5][6]. In addition to the conversational student Q&A interview interface in the ACIS 2009 video, the VP Java implementation had administration interfaces for tutors and lecturers to manage and report on both class and individual student assessment sessions. An administrator interface was also designed to allow creation of new health domain ontologies and VP responses. The Problem: The original VP was implemented as a file-server, with Java software interacting with SQL Server. In addition, much of the software, especially the imaging and speech components [7], used in the development of the 2009 VP is now obsolete. The Task: The current summer project is to replicate the software functionality required to implement a new VP in a new health domain (acute pain assessment and management) using a contemporary software web platform (C# and Unity, with SQL	Peter Summons peter.summons@newcastle.edu.au 02 4126 83273	Hunter Medical Research Institute	Computing and IT	SIPS

		server as the database/knowledgebase). As indicated earlier, your work will be on a part of an ongoing current research project being conducted by computing academics at the UoN, UTAS, and the IDEES laboratory in Le-Havre, and nursing and health academics at the UoN, UniSA, and JHH. Academics and project students from the UTAS and UoN created a VP image scenario for a patient using the Unity game engine, which will be used for the current project work. The domain knowledge base will be implemented in SQL Server interfaced to the Unity engine. We will initially test using the existing original Pharmacy patient VP knowledge base, however new domain knowledge will be created in conjunction with Nursing academics at UoN and UTAS, who will also provide testing and feedback of the efficacy of the VP in the new acute pain health domain. The functionality of the existing java software for administration will also be translated into web-based C# software modules external to the Unity environment. Your work will contribute to an exciting future research project that will evaluate the transferability of the VP Framework to new health domains, and the extent to which a foundation ontology can be utilised across multiple health domains. This work promises to shorten the development and increase the efficiency of future VPs in multiple new health domains [1]. Contact: Dr Peter Summons Phone: 0412683273 Email: Peter.Summons@newcastle.edu.au References [1] Summons, P, Harmon, J, Park, M, Colloc, J, Yeom, S, Pitt, V & Inder, K. (2021) 'Development of a Framework for Problem Domain Transference in Health-Related Problem Based Learning and Assessment', eJournal of Problem Based Learning, vol. 0. https://www.ejpbl.org/journal/view.php?doi=10.24313/jpbl.2021.00066 [2] Harmon, J, Pitt, V, Summons, P & Inder, KJ. (2021) 'Use of artificial intelligence and virtual reality within clinical simulation for nursing pain education: A scoping review', Nurse Education Today, vol. 97, 2021/02/01/, p. 104700. https://doi.org/10.1016/j.nedt.2020.104700 [3] Newby D, Jin J, Summons P, Athauda R, Park M, Schneider J, Xu R. (2011). 'Development of a Computer-generated Digital Patient for Teaching and Assessment in Pharmacy : Final Report', The University of Newcastle				
127	Developing an Aluminium Sulfur battery with high energy density	The work will involve constructing aluminium sulfur full cells and subsequent testing. Goals of the project are optimising the ionic liquid electrolyte along with carbonaceous scaffolding in order to maximize sulfur utilisation and performance	Nicolo Canever nicolo.canever@newcastle.edu.au	Nanomaterials research group (Thomas Nann)	Physics	SIPS
134	Colour image processing	Colour images are generally composed of three ``channels'' -- red, green and blue. Traditional methods of processing have treated the channels as separate entities, thus ignoring potentially important correlations between the channels. Recently, new techniques using	Jeffrey Hogan jeff.hogan@newcastle.edu.au 02 4921 7235	CARMA	Mathematics	SIPS

		the algebra of quaternions have been developed to treat colour images as single entities. In this project, the student will learn the theory of quaternionic image processing and apply quaternionic wavelet transforms to real images. Knowledge of MATLAB and/or python would be an advantage.				
137	Improving Blockchain Throughput with Online-Offline Rewriting	Blockchains have received tremendous attention from research communities and industries in recent years. A blockchain, as an append-only data structure combined with a consensus algorithm, was first introduced in the context of Bitcoin, where all payment transactions are appended to a public ledger, and each transaction is verified by network nodes in a peer-to-peer manner. The blockchain throughput (transactions per second) is an essential indicator of blockchain usability. In the existing blockchain systems, the throughput is usually fixed regardless of the time points. However, in many scenarios (e.g., healthcare-related applications), the data generation rate is unstable, that it forms a peak and off-peak patterns. There may be overwhelming transactions that the blockchain cannot handle immediately in the peak time, while in the off-peak time, it may waste the blockchain resources. This research aims to develop a blockchain system that allows users to save the surplus of blockchain transaction handling capabilities from off-peak time and spend it during the peak time whenever demanded. It can improve the blockchain throughput at a particular time with a minimized overhead.	Nan Li nan.li@newcastle.edu.au 02 4921 6503	Advanced Cyber Security Engineering Research Centre	Computing and IT	SIPS
138	Tuneable Electrodeposition of Metal Nanostructures onto Conductive Graphene Strips for Biosensor Applications	Electrodeposition is an easy and fast way to fabricate metal nanocrystals. The crystal sizes, shapes and number densities can be controlled by different parameters of electrodeposition. This project is to explore the deposition parameters that determine the physical properties of the copper, nickel and cobalt nanocrystals on a highly conductive graphene strips for biosensor applications.	Xiaojing Zhou xiaojing.zhou@newcastle.edu.au 02 4921 6732	Priority Centre for Organics Electronics	Physics	SIPS

School of Psychological Sciences:

TOPIC NO.	TITLE OF RESEARCH TOPIC	DESCRIPTION OF RESEARCH PROJECT	PRINCIPAL SUPERVISOR CONTACT DETAILS	RESEARCH GROUP/ CENTRE	DISCIPLINE	SCHOOL
6	Biomedical Engineering-Novel Non-Invasive Imaging of the Eye	In Vision Sciences, one of our interests is developing a novel treatment for high myopia. High myopia is a leading cause of blindness and will afflict 1 Billion people by 2050, having reached these epidemic prevalence rates within one generation. In high myopia, the skin of the eyeball becomes very thin and weak, causing cracks, bulges, retinal detachment and blindness. As part of this larger project, we are using novel ways to bioengineer and fix the weakened tissue and building novel instruments to take high resolution images of the outer layers of the eyeball. We have several projects in this area that can be shaped depending on the background and interests of the student. A background in any of computer science, physics, engineering, chemistry and/or maths is desirable.	Sally McFadden sally.mcfadden@newcastle.edu.au 02 4921 5634	Centre for Brain and Mental Health Research	Psychology	PSYC
10	Stroke and brain injury	The ACTIVate Project is investigating how different lifestyle patterns affect thinking ability and brain function in older adults aged 60-70. This project will follow these older adults over the course of three years to determine how lifestyle factors such as diet, physical activity, and sleep impact risk for dementia.	Montana Hunter montana.hunter@newcastle.edu.au 02 4921 5607	ACTIVate Project	Psychology	PSYC
11	The Arteries, Brains, and Cognition (ABC) Project	The ABC Project is investigating the effect of cognitive training on brain health in older adults. This study aims to determine whether Lumosity brain training can change brain arterial health, and brain structure and function.	Frini Karayanidis frini.karyanidis@newcastle.edu.au 02 4921 5457	Stroke and brain injury	Psychology	PSYC
12	Eyewitness memory: How do we measure it in research studies?	This project involves conducting the initial stages of a systematic review looking at coding schemes in eyewitness memory research. The student will conduct a preliminary search and engage in screening of studies for eligibility in the systematic review. Time dependent, they will also help with synthesising the review findings and writing the systematic review.	Hayley Cullen hayley.cullen@newcastle.edu.au	Applied Psychology Lab, Cognitive Psychology Lab, Social and Organisational Psychology Research Group	Psychology - Forensic Psychology	PSYC
26	Toddlers' Screen Time and Sleep and Development	This is an online study investigating toddlers' screen exposure, the types of content they are exposed to at various times of the day and associated sleep and developmental measures. The project will involve a literature review on the topic, collection of online data, assistance in analysis of data, and helping to set up a future study for face-to-face testing.	Emma Axelsson emma.axelsson@newcastle.edu.au	Family Interactions & Neurodevelopmental Lab	Developmental Psychology	PSYC
81	Maternal attachment-shaping behaviours in the first few months of an infant's life	The project involves observational ratings of maternal and infant behaviour in video recorded dyadic interactions.	Linda Campbell linda.e.campbell@newcastle.edu.au	GrowUpWell	Clinical/ Developmental Psychology	PSYC

87	Competitive and collaborative group performance	Many tasks in the modern world are too complex for any single individual to complete successfully. We use cognitive modeling tools to study team performance, and how it is affected by increased workload	Ami Eidels ami.eidels@newcastle.edu.au 02 4921 7089	CBMHR	Human Cognition	PSYC
101	Decisions between complex options	Every day we make tens or hundreds of decisions about complex stimuli - what to wear, where to eat, what consumer products to purchase, and which treatments to seek. Such complex choices require people to compare and contrast the multiple features that comprise the available options, yet how people make these tradeoffs is still poorly understood. In this project we will develop a well-controlled database of complex stimuli to investigate the processes people use to make these decisions. This database will be used to inform future studies that investigate the different ways in which people psychologically represent and process complex sets of information to inform upcoming decisions.	Guy Hawkins guy.hawkins@newcastle.edu.au 02 4985 4493	CBMHR	Human Cognition	PSYC
114	The healthy ageing brain and hearing loss: brain imaging before and after cochlear implant surgery.	This study is a multimodal longitudinal project being run at HMRI Imaging Centre. We have a collaborative team of neuroscientists, psychologists, ENT surgeons and computational scientists working together to run a world-first study using MRI to quantify how brain function, and health, might change following cochlear implant surgery. A Summer Scholar joining the lab group will be able to observe all aspects of the MRI data collection, and some basic data management. Some preliminary data would be collected during the summer that would be the basis for a report, with a range of options available to focus the topic on what interests the student most: functional/structural brain imaging, eye-tracking, neuropsychological/cognitive assessments, literature on healthy ageing vs Dementia, or other options open to discussion with the supervisor.	Megan Campbell megan.campbell@newcastle.edu.au	CBMHR, HMRI	Cognitive & Computational Neurosciences	PSYC
129	Supporting community mental health clinicians to address client health risk behaviours and prevent chronic disease ('Health SNAP').	The reduced life expectancy of 12-16 years for Australians who have a mental health condition is due largely to preventable cardiovascular disease and other chronic diseases, and lifestyle risks including tobacco Smoking, poor Nutrition, harmful Alcohol consumption and lack of Physical activity (SNAP). While the need to integrate 'preventive care' for these risks into mental health settings to support heathy lifestyle change for consumers is acknowledged; mental health services and clinicians face a number of challenges to doing so as a part of routine practice. The PHiMI research team (Physical Health in Mental Illness) is currently working with community mental health services to co-develop, implement and evaluate the effectiveness of strategies to support them in providing preventive care. This collaborative project will enable the successful applicant to assist the team in co-developing strategies... such as the content and format of materials to be used in training (eg motivational interviewing)… and	Jennifer Bowman jenny.bowman@newcastle.edu.au	PRC Health Behaviour; HMRI Public Health / Population Health program	Health Psychology	PSYC

		with piloting and seeking feedback from clinicians as materials are developed. It will also enable insight into the implementation of the larger intervention trial, a cluster randomised trial being undertaken with 12 services across three NSW local health districts, including opportunity to contribute to project working groups.				
140	Co-development of a pilot intervention to support mental health Community Managed Organisations to address consumer lifestyle risks	Australians who have a mental health condition have a life expectancy of 12-16 years less than those without, primarily due to chronic physical health conditions such as cardiovascular disease. Lifestyle risks such as smoking, poor nutrition and lack of physical activity are major contributors; and guidelines and policies recommend that health services providing support to people with a mental health condition integrate 'preventive care' to support consumers to make positive lifestyle changes into routine delivery. Community Managed Organisations (CMOs) have been identified as particularly relevant for preventive care provision, given the holistic nature of services provided. However, multiple barriers experienced by services and staff make routine provision challenging. The PHiMI research team (Physical Health in Mental Illness) has been working closely with CMOs across NSW to understand the unique barriers faced by CMO services and staff, and are commencing a pilot intervention trial that will test the acceptability and feasibility of strategies to support CMO staff to provide preventive care to improve lifestyle risks. The successful applicant will assist with the development of intervention materials, such as training materials, tools and reminders for care provision, and information resources for staff and consumers. The intervention is being co-developed with a local CMO, so the successful applicant will gain insight into working with external partners, including gaining feedback from CMO staff as materials are developed.	Kate Bartlem Kate.Bartlem@newcastle.edu.au 02 4033 9608	PRC Health Behaviour	Health Psychology	PSYC