THE UNIVERSITY OF SYDNEY

Faculty of Science

Science Summer Research Experience Program 2024 – 2025

Project List

The Science Summer Research Program is run full-time over 6 weeks during the Intensive February session.
Projects are arranged by the relevant school.
Please consult the prerequisites and other requirements carefully before nominating a project.

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School of Chemistry

CHEM01: Slippery liquid-like coatings applied on microstructured surfaces

Our group has recently discovered the mechanism that makes nanothin coatings super-slippery to liquids droplets. These molecularly thin coatings can be formed on silicon and other oxide substrates, and they turn the surface properties of glass into those of slippery Teflon, but without the use of any fluorine (which bioaccumulates, and therefore should be avoided). We have so far established the conditions of formation, stability and uniformity of these monolayers on smooth substrates, and we want to establish whether the coatings will be just as slippery when applied on microstructured substrates. In this project the Denison scholar will fabricate monolayers using polydimethylsiloxane layers self-assembled on solid microstructured substrates, made with laser ablation by our collaborators. The project will combine experimental procedures already established in the lab to produce new self-assembled monolayers which have anti-adhesive surface properties.

Supervisor(s): Chiara Neto
Prerequisites: Background in physical chemistry, nanoscience or physics is a bonus; interest in experimental work relating to surface science and nanoscience expected
Maximum number of places available: 1
Project Location: On site – F11 School of Chemistry, level 3, lab 319
Students are expected to conduct lab work in the School of Chemistry most of the week (9-5 pm) and will be supervised by a senior PhD student or postdoc during their time in the lab. Data analysis and report preparation will take about ½-1 day/week and can be undertaken remotely or in the office space provided in the School.
Final assessment: Project presentation, 5-10 minutes
Contact: chiara.neto@sydney.edu.au

CHEM02: New electrolyte additives for lithium-ion batteries

Sustainable lithium-ion batteries require new electrolytes to enable high performance and long-term stability. This project will focus on understanding the behaviour of new electrolyte additives in next-generation lithium-ion batteries, involving electrochemical cell testing and post-test analysis of materials using NMR spectroscopy and X-ray photoelectron spectroscopy.

Supervisor(s): Wesley Dose
Prerequisites: An interest in materials chemistry and hand on lab experience
Maximum number of places available: 2
Project Location: On site - School of Chemistry F11 340
Final assessment: Project presentation, 5-10 minutes
Contact: wesley.dose@sydney.edu.au

CHEM03: Volcanic lightning and the chemical origin of life

Could lightning storms have turned an inorganic Earth and its inert atmosphere into chemically reactive building blocks for early life to emerge, survive, and evolve? Our group tests the "Frankenstein" scenario, experimentally mimicking lightning strikes under a prebiotic Earth-like environment on the bench top. We explore reaction pathways uniquely enabled by plasma- and radical- chemistry, as well as the role of reactive interfaces (e.g., mineral surfaces in volcanic regions) in electrochemical synthesis, under geologically plausible conditions.

Supervisor(s): Haihui Joy Jiang
Prerequisites: Prerequisite knowledge: completion of first-year and second-year chemistry units with WAM >65. Preferred experience: completed units in physics, engineering, or a related STEM field; prior research experience is a bonus.
Maximum number of places available: 2
Project Location: On site at F11 School of Chemistry
This project has a strong focus on lab-based experiments and analysis; therefore, students will come on site on a full-time basis throughout the program. Please complete relevant safety trainings (e.g., school of chemistry induction) prior to the start of the program.
Final assessment: Project report, 1-2 pages
Contact: joy.jiang@sydney.edu.au

CHEM04: Zero-carbon polymers: Can functional materials be green and affordable?

Most everyday polymers, either natural or synthetic, are carbon-based materials. Combustion of carbon-based polymers emits CO2 into the atmosphere, accelerating climate change. Our group explores sustainable inorganic polymers that can be easily produced and fully recycled without waste. Functional zero-carbon polymers can be used for a wide range of applications, including insulating materials, anti-fire coatings, high temperature adhesives, slow-release fertilizers for agricultural use, and forming nanoreactors for chemical synthesis and heavy metal extraction.

Supervisor(s): Haihui Joy Jiang

Prerequisites: First-year chemistry units and hands-on lab experience are required; An interest in materials science is preferred.

Maximum number of places available: 1

Project Location: On site – F11 School of Chemistry

Please complete university and school of chemistry safety training (including online modules and in-person induction) prior to your project commencement. This is an experiment-focused project that requires student to be on site on a full-time basis.

Final assessment: Project report, 1-2 pages

Contact: joy.jiang@sydney.edu.au

CHEM05: Fuel cells

Fuel cells have developed as a potential technology in response to the growing need for environmentally friendly and clean energy sources. This research intends to minimize the use of fluorinated polymer membranes, such as Nafion (a polyfluorosulphonic acid membrane), in fuel cell applications. The goal is to synthesize and characterize a novel proton-conducting membrane for application in fuel cells.

Supervisor(s): Francois Aguey-Zinsou

Prerequisites: This project would involve the synthesis of a metal-organic framework/heteropolyacid anchored on a polymeric substrate. The student is expected to have experience working in a chemical lab.

Maximum number of places available: 1

Project Location: On site – F11 School of Chemistry

The student is expected to work offline at the university throughout the project.

Final assessment: Project presentation, 5-10 minutes

Contact: f.aguey@sydney.edu.au

CHEM06: Complex Structures in Materials: New Descriptions and Novel Properties

Between simple crystals (e.g.salts and metals) and disordered glasses there exists a broad class of partially disordered materials whose complex order remains a challenge to understand. In this project we use computer simulations of model materials to develop a new method of measuring structural complexity and to understand how the freezing transition is effected by the disorder. Experience in computer programming is useful but not essential.

Supervisor(s): Peter Harrowell
Prerequisites: Experience in running Python programs
Maximum number of places available: 1
Project Location: Hybrid
The project is computational and can be carried out on the student's laptop anywhere they choose. There will be ~2 hours of on-site meeting to get started and ~ 1 hr per week face-to-face to discuss progress.
Final assessment: Project report, 1-2 pages
Contact: peter.harrowell@sydney.edu.au

CHEM07: Virtual induction to the School of Chemistry Teaching Spaces

The first few weeks at university can be stressful time for students as they try to navigate their way around Campus and through buildings to find their first classes on time. Step-by-step navigation (eg Apple maps) and Google Street view are excellent tools to guide students to buildings but finding the classrooms once inside can still be a challenge. In this project, we aim to build an interactive "street-view" walkthrough using 3D photographs of the first-year teaching spaces in Chemistry (lecture rooms, tutorial rooms and laboratories). We aim to supplement these interactive views with multimedia (text, photos and videos) to communicate important and useful information to better prepare our first-year students for their first week of Chemistry on-campus. This project would benefit from student(s) that have experienced first-year chemistry but is not a requirement.

Supervisor(s): Shane Wilkinson
Prerequisites: Prefer first-year chemistry unit so their experience can be utilised in the design but not a prerequisite.
Maximum number of places available: 2
Project Location: Hybrid

Most of the project will involve designing the walkthrough map and resources to use within. Some visits to campus may be required to ensure virtual map is representative of the actual space and to get inspiration of the real environment. Meetings can be done in person or via zoom. Students will likely be using a program called Vista3D. No prior experience is required and we expect the first few weeks of the project will be training and becoming familiar with this program.

Final assessment: Project presentation, 5-10 minutes

Contact: shane.wilkinson@sydney.edu.au

CHEM08: Renewable Hydrogen Cycle

Hydrogen, an emerging green energy source, holds great promise for our sustainable future. Electrochemistry plays a pivotal role in the renewable hydrogen cycle. The electrochemical processes involved in the hydrogen cycle are highly sensitive to surface characteristics, with reaction paths diverging based on material elements and surface structures. In this project, you will utilise state-of-the-art scanning electrochemical probe microscopy techniques to directly unveil the structure-electrochemical activity of electrode surfaces, providing nanoscale electrochemical maps and movies. Additionally, you will investigate hydrogen production and consumption at the bulk scale, establishing a link between nanoscale behaviours and macroscopic phenomena.

Supervisor(s): Kaye Minkyung Kang

Prerequisites: an interest in surface science and nanoscience; hands on lab experience

Maximum number of places available: 2

Project Location: Hybrid - The majority of the work will be conducted on-site (<60% in F11 Rooms 113 and 148), with meetings and data analysis done online.

The Denison scholar will be expected to work during normal working hours (e.g., 9am-5pm on weekdays), either on-site (Chemistry Building, Rooms 113/148) or online. The majority of on-site work will involve laboratory activities in the School of Chemistry, under supervision to ensure safety. Over 60% of the work hours should be conducted on-site. Data analysis, literature review, and meetings can be arranged remotely. The candidate will be required to attend a one-day demonstration session for using equipment in the lab and to conduct a short literature review (2 research articles) prior to the Intensive February session.

Final assessment: Project presentation, 5-10 minutes

Contact: minkyung.kang@sydney.edu.au

CHEM09: Data Alchemy: Unveiling the Chemical World of Clean Energy Production

The clean energy industry is rapidly emerging as a critical component of our global energy landscape. However, its widespread adoption remains limited due to fundamental knowledge gaps in how materials function during operation. This project aims to bridge that gap by leveraging advanced data analysis techniques to extract meaningful insights from experimental data. The objectives are to develop a comprehensive understanding of how different materials behave during clean energy generation processes, utilize MATLAB or Python to create a codebase capable of processing and analysing complex datasets, and correlate experimental data with chemical and physical properties to draw meaningful conclusions.

Supervisor(s): Kaye Minkyung Kang
Prerequisites: Matlab and/or Python coding; Hands on lab experience
Maximum number of places available: 2
Project Location: Hybrid - 40% on site (lab work) and 60% remote working
The Denison scholar will be expected to work during normal working hours (e.g., 9am-5pm on weekdays), either on-site (Chemistry Building, Rooms 113/148) or online. Approximately 40% of the work will be conducted on-site, primarily involving laboratory activities in the School of Chemistry, under supervision to ensure safety. The remaining 60% of the work, including data analysis, literature review, and meetings, can be arranged remotely. The candidate will be required to attend a one-day demonstration session for using equipment in the lab and to conduct a short literature review (2 research articles) prior to the Intensive February session.
Final assessment: Project presentation, 5-10 minutes
Contact: minkyung.kang@sydney.edu.au

CHEM10: Designing device architectures for next generation light emitting devices

In this project you will is to design and simulate new device architectures for low-power driven organic light-emitting diodes (OLEDs) and lasers. The goal is to optimise their light emission efficiencies and dispersion. The device designs developed in this project will serve as a guide for the next steps in fabrication that will be undertaken by other group members.

Supervisor(s): Girish Lakhwani
Prerequisites: Secured credit or higher score in CHEM2521, has done mathematics at HSC level, and is comfortable with computer software and data analysis.
Maximum number of places available: 1

Project Location: On site, School of Chemistry (Bldg. F11)
Even though the project is based on computer simulations, the student is expected to work full-time on campus all days of the week. Responsibilities include conducting a literature review in the field of research, performing device simulations, analysing and presenting results, attending group meetings, and interacting and collaborating with other group members.
Final assessment: Project Report 1-2 pages
Contact: girish.lakhwani@sydney.edu.au

School of Geosciences

GEOS01: Lesson from coral reef systems on the edge: unlocking the potential of the Hawaiian & Great Barrier Reef International Ocean Discovery Program (IODP) Expeditions.

Future global climate change scenarios predict increases in sea-levels, temperatures, and ocean acidification by 2100. These changes may already be having profound effects on global climate, coastlines and the health of coral reefs around the world. To place these future challenges into an appropriate context, it is vital, now more than ever, to better constrain the nature and origin of past abrupt global sea-level and climate change events and crucially how coral reef systems will respond to these changes. This Denison project(s) investigates a globally unique sequence of drowned fossil reefs now preserved around the island of Hawaii between 100 m to 1500 m below present sea level, as well as another sequence of fossil reefs from the shelf edge of the Great Barrier Reef between 40 m to 120 m. These fossil reefs are ideal repositories for improving our understanding of the likely impacts of climate change on coral reefs systems as they record the response of reefs – both death and regeneration - to past environmental stresses not unlike future climate change scenarios (i.e. rising sea-levels, changing SST's, ocean acidity and declining water quality) over the past 500,000 years.

Supervisor(s): Jody Michael Webster
Prerequisites: undergraduate level experience in Geoscience UOS is desirable
Maximum number of places available: 2
Project Location: On site - Madsen building, GeoReef lab (room 206)
Student(s) will work closely with Professor Jody Webster, other members of the Geocoastal research group and relevant laboratory professional stuff. The majority of the work will take place on site in the School of Geosciences in a variety of lab spaces including the GeoReef

lab and other laboratories in the Madsen building. The successful student(s) will be expected to be on campus most days but at times will also be able to work remotely on a variety of digital datasets. The project will encompass a mixture of supervised and unsupervised research depending on the different analysis and measurements to be made.

Final assessment: Project presentation, 5-10 minutes

Contact: jody.webster@sydney.edu.au

GEOS02: Geological Mapping of Deep Australia

The geological interpretation of the geophysical datasets available for the Australian continent rely mostly on theoretical rather than observed physical properties. The thermal structure and composition of the lithospheric mantle are well-constrained, however, its structure and petrophysical properties are less well understood. Using X-ray microscopy data from a suite of xenoliths from southeast Australia, you will provide direct constraints on the deformation processes and structural heterogeneity of the lithospheric mantle.

Supervisor(s): Vasileios Chatzaras

Prerequisites: Comfortable with computers.

Maximum number of places available: 2

Project Location: On site - Madsen Building, 38 hours

The student will be using software available only on site, at Sydney Microscopy and Microanalysis (SMM). It is preferable that the student completes the required online training and paperwork for securing access to SMM prior to the start of the project. Guidance for the process will be provided. The student will receive all the training required for the successful completion of the research project and will be working closely with the supervisor and members of his research team. No fieldwork is involved. No travel, except commute to Madsen Building, is anticipated.

Final assessment: Project presentation, 5-10 minutes

Contact: Vasileios.chatzaras@sydney.edu.au

GEOS03: Coastal environmental livelihoods: a spatial analysis approach

Our coasts and oceans support biodiversity on which 3 billion people depend and are a critical sink of anthropogenic carbon, yet these environments also face considerable pressures. Marine Protected Areas (MPAs) are considered the cornerstone of global marine conservation providing an effective area-based management tool for safeguarding marine biodiversity and supporting environmental livelihoods. This project will involve a review of spatially-explicit frameworks for assessing the benefits of MPAs and the use of Geographic Information

Science (GIS)-based analysis methods for understanding coastal environmental-livelihood dynamics.

Supervisor(s): Eleanor Bruce
Prerequisites: Comfortable with spatial analysis methods and basic experience with GIS and/or remote sensing platforms (QGIS/ArcGIS Pro/Earth Engine) or an interest in learning.
Maximum number of places available: 2
Project Location: Hybrid - Student will have access to desk and computer in the Marine Studies Institute.
Project hours will vary throughout the project. Students will have access to desk space and computers in the Marine Studies Institute (Madsen Building, F09) but have the flexibility to complete tasks online. Students will meet regularly with the project supervisor and other project researchers and will be provided with feedback on any unsupervised research.
Final assessment: Project report, 1-2 pages
Contact: eleanor.bruce@sydney.edu.au

School of Life and Environmental Sciences

SOLE01: Assessing soil condition using field portable infrared spectroscopy

Assessment of soil condition for a range of functions and services is currently relatively slow and expensive. An alternative approach is required. This project will invesitgate the latest field deployable spectrometers combined with our previously developed chemometric approaches to estimate a range of soil properties directly. Field work will be around Narrabri and the lower Hunter valley.

Supervisor(s): Alex McBratney
Prerequisites: Some soil science background, computer and data analysis skills.
Maximum number of places available: 1
Project Location: Hybrid - C81 - associated lab and computer work. 10 days fieldwork at Narrabri - based at E12Z. No preparation necessary.
Final assessment: Project report, 1-2 pages
Contact: alex.mcbratney@sydney.edu.au

SOLE02: Nucleosome Positioning and Chromatin States in Model Organisms

This project aims to explore how nucleosome positioning correlates with different chromatin states across model organisms. By leveraging existing chromatin maps, students will analyze the relationship between nucleosome spacing, chromatin state, and gene regulation, focusing on quantifying nucleosome repeat lengths (NRLs) and investigating how they shift between active and inactive chromatin regions. Particular emphasis will be placed on understanding how chromatin looping events influence these shifts. The goal is to test our "beads on a looped spring" theoretical model of euchromatin formation within various biological systems. Through this project, students will gain valuable hands-on experience in integrated genomics and epigenetic regulation, deepening their understanding of chromatin architecture and its role in genetic regulation.

Supervisor(s): Andrew Johnston
Prerequisites: Experience (or strong desire to learn) operating in a command-line Linux environment. Ideally, a basic understanding of the Python programming language.
Maximum number of places available: 2
Project Location: Hybrid - D17 Charles Perkins Centre - Level 4E.
Work will be computational and can thus be performed at home. However, at least half the student's time should be spent on-site to allow adequate guidance on the project.
This project is computational in nature, working with genomics and bioinformatics software in a Linux environment. Students can perform some of the work off-site if they wish, but I would encourage them spend most of the time on the project on-site so they can receive support and guidance whenever they need.
Final assessment: Project report, 1-2 pages
Contact: andrew.johnston1@sydney.edu.au

SOLE03: The thermal ecology of native bee foraging: at what temperatures are native bees active?

Climate change will have a major impact on insect populations, including pollinating insects such as bees. Research on the thermal sensitivity of insects often focuses on their "lethal limits" i.e. the max and min temperatures that they can survive. However, populations will be impacted in various ways long before these lethal limits are reached. For example, bees must fly to forage and foraging activity is temperature sensitive. In this project you will search for native bee nests on campus (Camperdown) and nearby areas in Sydney, then collect data on the temperatures at which bees leave the nest to forage. This data will help us better understand the current thermal range at which native bees are active.

Supervisor(s): Ros Gloag
Prerequisites: comfortable with fieldwork and handling insects
Maximum number of places available: 1
Project Location: On site - beehouse A13, Science Rd and Camperdown campus and surrounding suburbs. Students are expected to be present on campus 9-5 each day if not raining. On days with rain, students will be able to undertake computer-based research in the LEES Building F22 to complement the field study. It is likely that the search area for locating wild bees will include public spaces in nearby suburbs (e..g Glebe parks etc), as well as on campus. There will be the option to visit other areas of Sydney to search for nests if the student choses (e.g. Kuringai Wildflower nursery parklands). In this case, the student would need to have a driver's license.
Final assessment: Project presentation, 5-10 minutes
Contact: ros.gloag@sydney.edu.au

SOLE04: Native bees and their mites: is it mutualism or parasitism?

Many mites form close ecological relationships with insects, that may span from mutualism to commensalism to parasitism. Native stingless bees (Tetragonula sp) are important pollinating insects in Australia's tropics and subtropics, and also the basis of an emerging agricultural industry. Yet we know little about the mites that live in their hives, or the impact of these mites on bee health. Depending on your interests, you may chose a lab-based or field-based (Camperdown campus) project investigating bee-mite interactions to determine whether mites are beneficial or costly to bees in this system.

Supervisor(s): Ros Gloag
Prerequisites: comfortable handling insects
Maximum number of places available: 1
Project Location: On site - LEES Building F22 and Science Rd A13, Camperdown Campus. Students will be generally expected to be on site either in our lab space (LEES Building) or beehouse (A13, Science Rd) during normal work hours each day (9-5). Please note that the Supervisor (Ros Gloag) works 4 days per week (not Wednesdays) but other staff and students in the lab will be around on wednesdays for support if needed. Some local day trips to Kuringai Wildflower nursery may be required to collect samples (another site with Tetragonula hives) so ideally the student has a driver's license.
Final assessment: Project presentation, 5-10 minutes
Contact: ros.gloag@sydney.edu.au

SOLE05: Sustainable feed and nutrition solutions to enhance chicken-meat production

This project is based at Camden campus where the Poultry Research Farm is located. The current projects include using locally available feed ingredients to replace imported material, precise energy and amino acid nutrition, and early nutrition. Interested student will need to have a meeting with the supervisor to fine-tune direction and research topic.

Supervisor(s): Sonia Liu
Prerequisites: Prefer to have biology or animal science background
Maximum number of places available: 2
Project Location: Hybrid - Depends on the final project, students may need to travel and spend time at Camden Campus.
Final assessment: Project report, 1-2 pages
Contact: sonia.liu@sydney.edu.au

SOLE06: Dissecting Insulin Action

Insulin is one of the most important hormones in biology by regulating metabolism. This project will explore the mechanism by which insulin regulates the release of fatty acids from adipocytes. It involves the study of 2 key regulatory molecules and may involve wet lab work as well as analysis of 3D protein structures.

Supervisor(s): David James
Prerequisites: Students with an interest in biochemistry will be preferred and any lab experience would be desirable. Students with an aptitude for protein structure are encouraged to apply
Maximum number of places available: 1
Project Location: On site - Charles Perkins Centre
Because this will be a wet lab project it will be entirely on site at the Charles Perkins Centre. It will occupy normal working hours (35 h/wk). Students will be initially taught how to perform certain lab tasks and then they will work independently.
Final assessment: Project presentation, 5-10 minutes
Contact: david.james@sydney.edu.au

SOLE07: Systems Biology of Metabolic Disease

Metabolic disease comprises a family of diseases like diabetes and cardiovascular disease that are caused by both genetic and environmental factors. We have collected a very large and rich data set that describes the emergence of metabolic disease across a vast genetic background and in response to different diets. We now endeavour to use Systems Biology analysis to identify causal drivers of disease from these data and test new discoveries in the laboratory.

Supervisor(s): David James
Prerequisites: Some course work in statistics and/or data science. Expertise in programming. An interest in learning biology
Maximum number of places available: 3
Project Location: On site - Charles Perkins Centre
It might be helpful if students could complete some reading prior to commencement.
The majority of work will be done on site but because it is an analytical project some work could be performed at home but this is not the preferred option in terms of supervision.
Final assessment: Project presentation, 5-10 minutes
Contact: david.james@sydney.edu.au

SOLE08: Effectiveness of interventions on FCR/P in people with HNC: A systematic review and meta-analysis

This project systematically reviews and analyzes the effectiveness of interventions aimed at reducing fear of cancer recurrence/progression (FCR/P) in people with head and neck cancer (HNC). It synthesizes existing evidence to identify the most effective strategies. The findings will inform clinical practice and guide future research in managing FCR/P in HNC patients.

Supervisor(s): Poorva Pradhan
Prerequisites: DESIRABLE SKILLS: 1) Previous experience in cancer survivorship research. 2) Previous experience in conducting/assisting in systematic literature reviews
Maximum number of places available: 1
Project Location: Hybrid - face to face weekly progress meetings
The project can be completed online by the student supervised by Dr Poorva Pradhan. However, if feasible a few progress meetings will be held face to face.
Final assessment: Project report, 1-2 pages
Contact: poorva.pradhan@sydney.edu.au

SOLE09: Exploring Urbanisation's Effects on Moths and Christmas Beetles

In this project, we will investigate the impacts of urbanisation on nocturnal insects such as moths and Christmas beetles using light traps.

Supervisor(s): Tanya Latty
Prerequisites: Must be comfortable handling insects. Must be comfortable and willing to work outdoors at night.
Maximum number of places available: 3
Project Location: on location - Fieldwork in green spaces around the Sydney.
Student must be able to work at night (9pm-midnight) at sites around Sydney (accesible by public transit). You will not be working alone. Remaining work hours can be done either in the lab or remotely, depending on student preference.
Final assessment: Project presentation, 5-10 minutes
Contact: tanya.latty@sydney.edu.au

SOLE10: Investigating the flower preference of native bees

We will design and use artificial flowers to test the floral preferences of native bees. Additionally, we will investigate their natural preferences through field surveys in local green spaces and by analysing data from the biodiversity platform 'iNaturalist'.

Supervisor(s): Tanya Latty
Prerequisites: Must be comfortable working with insects; not suitable for anyone with an allergy to bee stings; must be comfortable working outdoors
Maximum number of places available: 4
Project Location: On location - Fieldwork in Sydney green spaces
Students will conduct fieldwork on sunny warm days, approximatey 3-4 days per week. Non-field days can be done remotely or on campus, depending on student preferences.
Final assessment: Project presentation, 5-10 minutes
Contact: tanya.latty@sydney.edu.au

SOLE11: Revealing the potential toxic secondary metabolites in chlorophyll d- containing cyanobacteria

Acaryochloris marina is a unique cyanobacterium that uses chlorophyll d as the main pigment in photosynthesis. However. We do not know whether Acaryovchloris spp produce toxic secondary metabolites along with their photosynthetic activities to thrive different environments. Student will revive and define the possible secondary pathways based on Acaryochloris genome analysis. Using the known transcriptomic data (public repositories and in-house) the transcriptional regulation of secondary metabolites will be examined and verified by PCRs.

Supervisor(s): Min Chen
Prerequisites: Comfortable with computers and statistical analysis, general knowledge about bioinformatics. Successful student(s) will need to complete the basic lab introduction and training prior to commencing the project.
Maximum number of places available: 2
Project Location: Hybrid - Online analysis and on-site experiments (F22 Level 5)
Final assessment: Project report (~ 2 pages, 800-1,000 words)
Contact: Min.chen@sydney.edu.au

SOLE12: Raspberry punnets: paper vs. plastic

Investigate the technical feasibility of replacing plastic punnets with paper-based punnets in the retail of fresh raspberry fruit. This project will involve shelf-life studies of raspberries packaged in different types of punnets and stored in conditions relevant to postharvest distribution and household consumption. This project is in collaboration with OpalANZ, a leading paper and fibre packaging company. We may investigate other fruit, depending on the number of students participating in the project.

Supervisor(s): Kim-Yen Phan-Thien
Prerequisites: No prerequisite, as the analytical methods we will use are fairly easy to learn. Having said that, knowledge/experience in postharvest biology (understanding of fruit) or materials science (understanding of the packaging) would be advantageous.
Maximum number of places available: 3
Project Location: On site - Food Science Lab, Biomedical Building C81, Australian Technology Park. Students would need to attend the Food Science Lab on a daily basis during shelf-life experiments (5 days) in order to assess fruit. The assessment may take a few hours. Students would be supervised initially. Once trained and confident, they may be allowed to work independently (with staff nearby or contactable). No travel or field work necessary. We are likely to purchase fruit from Sydney Markets, so this would be an optional excursion if students are interested. Other activities (e.g. data analysis, writing) could be done from home, with guidance provided in online meetings.
Final assessment: Project report, 1-2 pages
Contact: kim-yen.phan-thien@sydney.edu.au

SOLE13: Machine learning to quantify biomass from multispectral Drone imagery.

This project focuses on using unmanned aerial vehicles (UAVs) to collect high-resolution multispectral data for predicting biomass, addressing gaps in fine-scale remote sensing. The aim is to develop machine learning models that utilize this data, generating vegetation indices and exploring the potential to relate UAV data to satellite products for broader application. The ideal candidate should have experience working with large datasets in Python and some knowledge of machine learning techniques. Key outcomes include a predictive model for biomass and practical experience in data acquisition, multispectral sensors, and agricultural applications.

Supervisor(s): Willem Rutger Vervoort
Prerequisites: Ability to code in R or python and some understanding about machine learning techniques
Maximum number of places available: 2
Project Location: Hybrid - Weekly work schedule can be discussed with both online and hybrid working. The project will be guided by a post-doctoral research fellow and myself. Students will be given the research idea and will be given guidance on how to start. Student will be encouraged to be creative and find solutions of their own to reach the objectives.
Final assessment: Project presentation, 5-10 minutes
Contact: willem.vervoort@sydney.edu.au

SOLE14: The ecology of corals in subtropical regions in Japan and Australia

Subtropical reefs are home to corals at their poleward distributional limits and are already experiencing the effects of climate change. You will work with underwater photographs from reef areas in subtropical regions in Japan and Australia to determine spatial dynamics of corals on the seafloor. You will learn to identify corals and use specialised software to annotate corals on large-area underwater photographic maps of the seafloor (orthomosaics) to determine size-based patterns for different species, and the incidence of coral bleaching in response to heat stress. This will help understand the ecology of these dynamic systems that are already being transformed by warming and associated changes in species distributions and interactions.

Supervisor(s): Brigitte Sommer

Prerequisites: Students should be comfortable with computers and learning to use new software and technology. No prerequisite experience needed as tasks will be explained at the start of the project with ongoing help available. An interest in marine ecology is helpful.
Maximum number of places available: 2
Project Location: On site - Building A11, Edgeworth David Building, Science Road, Camperdown. Full time (ca 35 hours per week)
Photo annotations are done on state-of-the art Wacom creative pen display tablets and specialised software available on workstations in the marine ecology lab in Edgeworth David Building (A11), Camperdown. On-site attendance is thus required for this project, approximately 35 hours per week.
Final assessment: Project presentation, 5-10 minutes
Contact: Brigitte.sommer@sydney.edu.au

School of Mathematics and Statistics

MATH01: Petitions as Data

Several countries allow citizens to submit electronic petitions that are considered by the government if they receive enough public support. In the spirit of "text as data", in this project we will consider the publicly available information on these petitions to evaluate the main political topics appearing in these petitions and how they relate to the success of the petitions in gathering signatures. Different machine learning and data science techniques will be employed to collect data, perform text analysis, and characterize the fat-tailed distribution of success of the petitions.

Supervisor(s): Eduardo Altmann
Prerequisites: First year statistics or data science. Comfortable with a programing languages.
Maximum number of places available: 2
Project Location: Hybrid - Regular attendance to our Camperdown Campus is expected, but some of the meetings can take place online (including an initial meeting in January).
Final assessment: Project presentation, 5-10 minutes
Contact: eduardo.altmann@sydney.edu.au

MATH02: Discovering a q-analog of circular arc polygons

A beautiful result of 19th century mathematics says that, if you take a second order ordinary differential equation that is Fuchsian, then the ratio of two linearly independent solutions maps the real line onto a circular-arc polygon. The aim of the project is to discover an analog of this result where `differential equation' is replaced by `q-difference equation'. In particular, this could lead to the discovery of a q-analog of circular arc polygons.

Supervisor(s): Pieter Roffelsen
Prerequisites: Previous exposure to differential equations and familiarity with (complex) analysis or geometry will be helpful, e.g. through MATH2023: Analysis or MATH3061: Geometry and Topology
Maximum number of places available: 4
Project Location: On site - Carslaw Building, one or two meetings per week
We meet one or two times a week, to discuss and do research.
Final assessment: Project report, 1-2 pages
Contact: pieter.roffelsen@sydney.edu.au

MATH03: Capturing Riemann surfaces through ODEs

An almost forgotten theory by Elfving and Nevanlinna from the 1930s, relates certain linear ODEs with a single singularity to a very special class of non-compact Riemann surfaces. The aim of the project is to bring this theory to life numerically with the end goal of obtaining images of these Riemann surfaces. The pathway to achieve this goal will involve cohesive use of complex analysis, the theory of ODEs and numerics. Given the richness of these Riemann surfaces, the images are expected to be very intricate and dramatic and may lead to new insights.

Supervisor(s): Pieter Roffelsen
Prerequisites: Familiarity with complex analysis is necessary, for example through MATH2023/2923
Maximum number of places available: 2
Project Location: On site - Carslaw Building F07. We will meet about one or two times a week to discuss and do research.
Final assessment: Project report, 1-2 pages
Contact: pieter.roffelsen@sydney.edu.au

MATH04: New data science approaches for single cell spatial genomics

Recent developments in single cell RNA-sequencing and spatially resolved genomics (e.g. seqFISH, 10X Visium) have resulted in immense datasets corresponding to hundreds of thousands of observed cells and thousands of measured features. The overarching goal is to understand these data and develop new data science approaches to addressing questions in biology. There are opportunities to build capacity in terms of computational modelling, effective data visualisation and interaction, and software scalability.

Supervisor(s): Shila Ghazanfar
Prerequisites: DATA2902 or DATA2002 or equivalent. Please ensure you have the latest version of R installed.
Maximum number of places available: 2
Project Location: On site - Carslaw and Charles Perkins Centre
Final assessment: Project presentation, 5-10 minutes
Contact: shila.ghazanfar@sydney.edu.au

MATH05: Assigning significance with the three-parameter Gamma null

Summary: The three-parameter Gamma distribution (3-Gamma for short) adds a location parameter to the usual shape and scale/rate parameters that define the canonical Gamma distribution. The 3-Gamma is a flexible family of distributions that was empirically found to offer excellent fits to the null distribution of various maximization problems. We are interested in exploring some ideas on how to assign significance to an observed result assuming the underlying null distribution is the 3-Gamma.

Supervisor(s): Uri Keich
Prerequisites: STAT2911, comfortable with R
Maximum number of places available: 2
Project Location: Hybrid - We will have about two meetings per week (could be on zoom) but most of the project will be done by the students on their own.
Final assessment: Project report, 1-2 pages
Contact: uri.keich@sydney.edu.au

MATH06: FDR in mass spectrometry

In a shotgun proteomics experiment tandem mass spectrometry is used to identify the proteins in a sample. The identification begins with associating with each of the thousands of the generated peptide fragmentation spectra an optimal matching peptide among all peptides in a candidate database. Unfortunately, the resulting list of optimal peptide-spectrum matches contains many incorrect, random matches. Thus, we are faced with a formidable statistical problem of estimating the rate of false discoveries in say the top 1000 matches from that list. The problem gets even more complicated when we try to estimate the rate of false discoveries in the candidate proteins which are inferred from the matches to the peptides. We will look at some of these interesting statistical questions that are critical to correct analysis of the promising technology of shotgun proteomics. Consider this project if you are not averse to computational analysis of large datasets.

Supervisor(s): Uri Keich
Prerequisites: STAT2911 or equivalent, comfortable with R and/or python
Maximum number of places available: 2
Project Location: Hybrid - Flexible.
We will have about two meetings per week (could be on zoom) but most of the project will be done by the students on their own.
Final assessment: Project report, 1-2 pages
Contact: uri.keich@sydney.edu.au

MATH07: Accurately predicting long-term behaviour of chaotic systems

Chaotic systems are hard to predict the future behaviour of, but they have long-term "ergodic" properties that give us a good probabilistic understanding of how they behave in the long term, such as long-term average distributions, or even the fractal dimension of their limiting sets. In this project, we will look at some in theory very simple (but practically very complex and varied) chaotic systems like the logistic map, and build new computational algorithms that allow us to estimate their ergodic properties very accurately.

Supervisor(s): Caroline Wormell
Prerequisites: Second year linear algebra, familiar with at least one scientific programming language (e.g. Julia, Python, MATLAB, C)
Maximum number of places available: 4
Project Location: Hybrid - regular (e.g. weekly) meetings in person on campus.
Students will want to meet in person at least weekly, but most of the work will be coding (or figuring out what to code), which can be done anywhere.

Final assessment: Project presentation, 5-10 minutes

Contact: caroline.wormell@sydney.edu.au

MATH08: Topics in geometric topology

The basic objects of geometric topology are curves and surfaces. This project studies them using techniques from geometry, algebra or combinatorics. Some basic questions that may be addressed are: How do you tell two knots apart? How do you tell two surfaces apart? What geometric structures can you put on a given surface?

Supervisor(s): Stephan Tillmann

Prerequisites: Useful knowledge: Second year linear algebra, some combinatorics, a passing knowledge of geometry or topology.

Maximum number of places available: 5

Project Location: On site - Carslaw

Introductory, hands-on sessions with the supervisor give students an overview of the objects and methods of the project. Students will then learn and discuss background material and conduct research together, with a daily catch-up with the supervisor.

Final assessment: Project report, 1-2 pages

Contact: stephan.tillmann@sydney.edu.au

MATH09: How large is this knot?

A knot is a curve in space that is closed (in other words, it stops where it began) and never passes through itself. The study of knots is a branch of topology, and a knot is best understood by thinking about the 3-dimensional space around the knot (the complement of the knot). A 3-dimensional space, however, is best understood via interesting surfaces in it. This project studies surfaces in the complements of knots (and other 3-dimensional spaces) which are closed (have no boundary) and are essential (cannot be reduced to a simpler surface). Such surfaces are at the core of most algorithms in 3-dimensional topology.

The study of surfaces in 3-dimensional spaces can be reduced to linear algebra and polytope theory via the theory of normal surfaces. Some vertices of the "normal surface polytope" correspond to essential surfaces. Algorithms are implemented in the software package Regina that can be used to compute the polytope and check which vertices correspond to essential surfaces.

Aim: This project will undertake a systematic study of the set of all essential normal surfaces in the space of all normal surfaces, with the aim of finding answers to questions such as: Is a simplest essential surface always amongst the vertex surfaces? What is the dimension of a top-dimensional subpolytope that entirely carries essential surfaces? Does the set of essential vertex surfaces span a connected graph in the boundary of the normal surface polytope?

Methods: The participant(s) will learn some basic 3-manifold theory and linear programming, and to use Regina and Polymake to compute and analyse the normal surface polytope.

Supervisor(s): Stephan Tillmann

Prerequisites: Useful background knowledge is second year linear algebra and discrete mathematics. It would also be of benefit if at least one of the participants is comfortable with basic coding in python.

Maximum number of places available: 5

Project Location: On site - Carslaw

The first week features some hands-on introductory sessions with the supervisor. After this, students will learn and discuss background material and conduct research together, with a daily catch-up session with the supervisor.

Final assessment: Project report, 1-2 pages

Contact: stephan.tillmann@sydney.edu.au

MATH10: Replacement decisions on implantable cardioverter defibrillator generator

This project aims to optimize the replacement decisions for implantable cardioverter defibrillator generator for patient health. We'll use dynamic programming and/or reinforcement learning to find the solution maximizing the expected patient lifetime.

Supervisor(s): Qiuzhuang Sun

Prerequisites: Comfortable with computers, optimization, and data analysis; familiarity with R or Python; better to know dynamic programming but not strictly required

Maximum number of places available: 3

Project Location: Hybrid - The main task is coding, either online or on-site.

Final assessment: Project report, 1-2 pages

Contact: qiuzhuang.sun@sydney.edu.au

MATH11: Mill degradation prediction with big industrial data

This project aims to use the abundant in-field data to predict degradation of a mill machine. Some covariates for prediction are sampled with extremely high frequency. We'll try both machine learning and statistics tools to analyze the data.

Supervisor(s): Qiuzhuang Sun
Prerequisites: Comfortable with computers and statistical analysis; familiarity with R or Python.
Maximum number of places available: 3
Project Location: Hybrid - The main task is coding, either on-site or online.
Final assessment: Project report, 1-2 pages
Contact: qiuzhuang.sun@sydney.edu.au

MATH12: Geometric Phase, Torsion, and the Magnetic Confinement of Charged Particles

The torsion of a curve in Euclidean space quantifies how much the curve twists. Geometric phase is a phenomenon that can explain how a cat falling with no angular momentum can still land on its feet. This project will investigate the relationship between the torsion of a curve and the concept of geometric phase to bring insight into how a magnetic field can be shaped to confine a charged particle in a fixed domain of Euclidean space. This has applications to the design of potential fusion reactors called stellarators.

Supervisor(s): Nathan Duignan
Prerequisites: First year core Maths, Second year core Maths. It is necessary to have a strong understanding of differential equations and vector calculus. Taking any of (and ideally all of) MATH3977, MATH3X63, or MATH3968 would greatly help, but is not required.
Maximum number of places available: 2
Project Location: Hybrid - Weekly meeting on campus in Carslaw at least 2 days of a week. Online otherwise.
Students will be required to meet in person in Carslaw at least 2 days a week. Otherwise, the students will be able to conduct research from anywhere. Most of the research is unsupervised with self-guided learning. If there is more than one student, they will work together to understand and implement mathematical theory while guided by the supervisor.
Final assessment: Project report, 1-2 pages
Contact: nathan.duignan@sydney.edu.au

MATH13: From data to diagnosis: shaping the future of medicine with data-driven approaches

Explore the cutting-edge intersection of statistics, data science and biomedical research by helping my group evaluate data-driven approaches for constructing individual reference intervals for use in personalised medicine. This project offers hands-on experience with R package development, as well as exposure to large-scale, high-dimensional biomedical datasets. Students will engage with domain experts to understand the importance and difficulties of translating complex biological data into actionable insights, all while enhancing their skills in statistical modelling and data visualisation. This opportunity is perfect for those looking to apply their statistics training in real-world medical contexts and make a tangible impact on healthcare.

Supervisor(s): Ellis Patrick
Prerequisites: Comfortable with data analysis and moderate experience with R
Maximum number of places available: 2
Project Location: Hybrid. It is expected that students nominating this project will be committed to extending themselves and actively want to learn from those around them. They will have the opportunity to work online while also interacting with members of the Sydney Precision Data Science Centre in the Carslaw Building, The Charles Perkins Centre and The Westmead Institute for Medical Research.
Final assessment: Project presentation, 5-10 minutes
Contact: ellis.patrick@sydney.edu.au

MATH14: Post-quantum cryptography

When quantum computers are operational, intruders are expected to be able to use them to easily break systems that currently protect online transactions and national secrets. This project explores mathematical ideas to protect against this looming problem.

Supervisor(s): Nalini Joshi
Prerequisites: Advanced third-year courses in mathematics. They should be comfortable using LaTeX and a symbolic algebra program.
Maximum number of places available: 2
Project Location: On site - F07 Carslaw building
I will provide preliminary reading material in December. I'd like to meet students weekly for an hour and interact online on a collaborative website (called overleaf). I expect to be away for a week in each of January and February.
Final assessment: Project report, 1-2 pages
Contact: nalini.joshi@sydney.edu.au

MATH15: Quantum integrable systems

Quantum integrable systems can be classified in simple situations (tori and semi-toric systems). However, most quantum integrable systems are more complicated. The aim of the project is to study examples that go beyond the currently known classification theory.

Supervisor(s): Holger Dullin
Prerequisites: excellent results in MATH3977/4077, comfortable to do some numerics (computation of joint spectrum), probably using Mathematica.
Maximum number of places available: 1
Project Location: Hybrid - mix of in-person meetings and the occasional Zoom meeting. Starting with some reading / preparations at the end of the semester in November would be good.
Final assessment: Project report, 1-2 pages
Contact: holger@dullins.de

Computer Science

COMP01: AI / NLP – Developing AI resilient systems

AI is being widely deployed today, but in many cases, users are unable to see and change the choices AI models make for them. For example, how can you know whether a ChatGPT summary contains all the correct information you need? You could read the entire document to check, but then you don't need the summary. This project will explore AI-resilient systems, where the AI model and user interface are designed to give users the information they need to make more informed choices. A few applications are possible: (1) An advisor for the board game Diplomacy, (2) Helping people find patterns in text data, (3) Programming aides, (4) Other applications proposed by students.
Supervisor(s): Jonathan K Kummerfeld
Prerequisites: Programming skills, at least a Distinction in first and second-year Computer Science subjects
Maximum number of places available: 2
Project Location: Hybrid - At least 3 days a week in-person on the Camperdown campus.
Final assessment: Project report, 1-2 pages
Contact: jonathan.kummerfeld@sydney.edu.au

COMP02: AI / NLP - Generating actionable, tailored, and objective feedback on the complexity of health information

When doctors and other clinicians write, they usually provide information that is too complex for the general population. To address this issue, the USyd Health Literacy Lab has developed the Health Literacy Editor, a web app that helps doctors and other medical staff to revise their writing to be more easily understood. The Editor is currently being rolled out to health staff across NSW. This project seeks to develop new NLP-based components that provide meaningful and actionable feedback to help end-users simplify health information. The project will involve extensive programming and learning about a range of NLP technologies.

Supervisor(s): Jonathan K Kummerfeld
Prerequisites: Programming skills, at least a Distinction in first and second-year Computer Science subjects
Maximum number of places available: 2
Project Location: Hybrid - At least 3 days a week in person on the Camperdown campus
Final assessment: Project report, 1-2 pages
Contact: jonathan.kummerfeld@sydney.edu.au

School of Physics

PHYS01: The fine-grained structure of dark matter

Dark matter is one of the most important outstanding problems facing physics and astronomy today. There is now a widespread, global campaign of experiments searching for this mysterious substance. Yet major theoretical issues remain if we are to have a hope of detecting it, in particular what is the nature of the fine-grained structure of the dark matter distribution around us in the galaxy. This project will aim to calculate this structure for certain dark matter models, using a mixture of mathematical modelling and simulations.

Supervisor(s): Ciaran O'Hare
Prerequisites: Comfortable in a programming language, preferably Python.
Maximum number of places available: 2
Project Location: On site - A28. Students will be given a desk to work in the HDR student offices, but office hours are flexible.
Final assessment: Project presentation, 5-10 minutes
Contact: ciaran.ohare@sydney.edu.au

PHYS02: A (High Mass) Star is Born - accretion events in high-mass star-forming regions

In this project you will use data from Australia's iconic radio telescope Murriyang - the 64m Dish at Parkes - to identify and study the violent mass accretion events thought to be responsible for making the very biggest stars. Observations of the changes in brightness of hydroxyl masers - natural lasers - in regions of high mass star formation activity can identify the explosive after-effects of massive accretion events, and help us to understand how these most massive stars are able to get so big.

Supervisor(s): Anita Hafner
Prerequisites: Familiarity with python, familiarity with command line/terminal, first-year astronomy/astrophysics, first-year physics
Maximum number of places available: 2
Project Location: Hybrid - This project could be completed completely online as most of the work will be to analyse existing data using python. Regular meetings will be essential and can take place in person or online.
Final assessment: Project presentation, 5-10 minutes
Contact: anita.hafner@sydney.edu.au

PHYS03: Self-similar optical pulses with partial derivatives

Many natural phenomena exhibit self-similarity, reproducing themselves on different temporal and/or spatial scales. In optics, self-similar pulses can be observed in systems with dispersion, nonlinearity and gain. Mathematically, the effect of the dispersion of order n is described by an nth order derivative of the electric field, with respect to time, where n = 2, 4, 6, 8 . . .is an even integer. In this project you will investigate theoretically and numerically a new type of self-similar optical pulses when the dispersion order n is not an integer.

Supervisor(s): Antoine Runge
Prerequisites: Project is on optics, and nonlinear wave physics. Project suitable for all students that completed first year physics core units.
Maximum number of places available: 1
Project Location: On site with Hybrid option - Physics building A28 / Camperdown campus. Most of the work will be numerical and can be done from home with resources provided to students by the University (Matlab, mathematica). Meetings (at least once a week) will be preferably in person. Workspace can also be provided in the School of Physics if required.
Final assessment: Project report, 1-2 pages
Contact: antoine.runge@sydney.edu.au

PHYS04: Electromagnetic optimization of passive cooling textiles

It has been shown in the last decade that the thermal properties of objects, namely their wavelength-dependent reflection, transmission and absorption of thermal radiation, can be manipulated by nanostructuring. In this way it is possible to create materials that spontaneously cool by radiating heat into space (even in full sun!), and textiles that keep you cool in summer or warm in winter. This project will run full electromagnetic simulations to optimize fibres suitable for cooling. Working knowledge of Python, a taste for numerical physics and having completed PHYS3x35 are essential.

Supervisor(s): Boris Kuhlmey
Prerequisites: working knowledge of python and electromagnetism are necessary
Maximum number of places available: 2
Project Location: Hybrid - WFH possible most days - but on average minimum 1 day a week on campus (School of Physics) expected.
Work will be done using python libraries, on student's own computers or cloud services.
Final assessment: Project report, 1-2 pages
Contact: boris.kuhlmey@sydney.edu.au

PHYS05: The complex relationship between dark and light driving galaxy morphology

This is a case of "which came first...?" Do small structures in the dark matter component of galaxies cause baryonic structure to form into the galaxies with bars and spiral arms regularly observed in the Universe today, or does the gravitational potential impact of these over-dense regions, in bars and spiral arms also drive the dark matter in those areas to condense into similar structures? In this project, we will attempt to find which comes first in an isolated galaxy disk simulation which is unaffected by the overall large-scale structures of the universe.

Supervisor(s): Elizabeth Iles
Prerequisites: Must be at least comfortable with a computer and know or be willing to learn some coding skills (i.e. python, matlab etc.). The project can be tailored to the level of computing experience/expertise, if students with higher competency in this area wish to challenge themselves in this way.
Maximum number of places available: 1
Project Location: On Site - A28 Physics Building.
During the project students will be required to be present for in person meetings to discuss the project ~1-1.5 hour pw + ~1 hours of other group activities (such as journal club discussions

etc). The project work itself can be completed on site or online, so long as the student has access to a computer and the internet.

Final assessment: Project report, 1-2 pages

Contact: elizabeth.iles@sydney.edu.au

PHYS06: The physics of deep learning in artificial intelligence

Deep learning networks, widely employed in artificial intelligence, can be trained to effectively address a variety of real-world problems, including speech recognition, object detection, and drug discovery. However, our understanding of why they are so effective remains incomplete. Recently, we have discovered that the learning processes within deep learning networks exhibit complex diffusion dynamics, in contrast to the conventional assumption of a normal diffusion process (i.e., Brownian motion). These complex dynamics involve intermittent large jumps that prevent the learning process from becoming trapped in local minima, thus enabling the attainment of optimal solutions. This finding provides a new explanation for the effectiveness of deep learning networks. This project will entail further investigations into the physical mechanisms that underlie these complex learning dynamics. Specifically, the project will involve studying how the fractal, self-similar geometrical structures of loss function landscapes within deep learning networks interact with gradient descent to give rise to these intricate learning dynamics. Students participating in this project will have the opportunity to learn essential models and algorithms used in the field of artificial intelligence.

Supervisor(s): Pulin Gong

Prerequisites: Comfortable with programming

Maximum number of places available: 2

Project Location: Hybrid - This project can be undertaken in a hybrid format.

Students are required to come to campus one day per week for a meeting with the supervisory team. On other days, they may choose to work either on campus or from home, as per their preference.

Final assessment: Project report, 1-2 pages

Contact: pulin.gong@sydney.edu.au

PHYS07: How does the brain compute? Distributed dynamical computation in neural circuits

One of the most fundamental questions regarding the brain is how it carries out computation. To answer this question, we have formulated a concept of distributed dynamical computation (DDC), in which neural computation and information processing occur through interactions of propagating wave packets. DDC serves as a bridge that integrates the previously disjointed perspectives of brain dynamics and computation. Recently, we have demonstrated that within the framework of DDC, wave packets can efficiently implement sampling-based probabilistic computations [Qi and Gong, Nature Communications 2022; Chen and Gong, Science Advances 2022; Wardak and Gong, Phys Rev Lett 2022]. The project will involve establishing further connections between neural dynamics and computations, which will include an in-depth study of the neural circuit models developed by our research group. The goal of this exploration is to unveil the underlying physical principles governing crucial brain functions, such as visual processing and attention.

Supervisor(s): Pulin Gong
Prerequisites: Comfortable with programming
Maximum number of places available: 2
Project Location: Hybrid
This project can be undertaken in a hybrid format. Students are required to come to campus one day per week for a meeting with the supervisory team. On other days, they may choose to work either on campus or from home, as per their preference.
Final assessment: Project report, 1-2 pages
Contact: pulin.gong@sydney.edu.au

PHYS08: Quantifying dynamical processes by analyzing the response of driven physical systems

Methods to understand the dynamical structure of time-varying systems are important for applications across science, from understanding communication patterns in brain to detecting animal species from microphones embedded in a forest. We have recently developed a range of useful methods for quantifying time-series structure by driving a physical system and analyzing its response. In this project, the student will develop the theory and applications of this method, which is likely to yield powerful new methods for diverse scientific applications. The student should have an interest in numerical simulation, data science, and machine learning.

Supervisor(s): Ben Fulcher

Prerequisites: The student should have a basic coding ability and an interest in numerical simulation, data science, and machine learning.
Maximum number of places available: 2
Project Location: Hybrid - I am flexible to a hybrid mix between on-site and remote work. The project is computational so it allows this flexibility, but the student would benefit from group meetings and one-on-one supervision meetings being performed in-person.
Final assessment: Project presentation, 5-10 minutes
Contact: ben.fulcher@sydney.edu.au

PHYS09: Halide Perovskites for X-ray Detectors

X-ray detectors are widely used in medical diagnostics and therapy, safety screen and inspection, and scientific equipment. Halide perovskites are the potential game changer due to their (i) strong X-ray attenuation, (ii) exceptional optoelectronic properties, and (iii) low-cost raw materials and crystal growth. The commercialisation is currently hindered by three challenges: (i) large dark current, (ii) integration with read-out circuitry, and (iii) poor stability. This project aims to solve all the main challenges simultaneously by direct epitaxial growth of all inorganic halide perovskite single crystal films on read-out circuitry. The outcomes from this project could lead to the replacement of existing X-ray detection technologies.

Supervisor(s): Rongkun Zheng
Prerequisites: genuine interest in research and experiments.
Maximum number of places available: 2
Project Location: Hybrid - It is expected that the student(s) will carry out lab experiments on site 2-3 day per week. The rest time will be for result analysis, reading, and writing, which can be done off site.
Final assessment: Project report, 1-2 pages
Contact: rongkun.zheng@sydney.edu.au

PHYS10: New materials for optically addressable solid-state qubits

Erbium atoms in solids are an appealing system from which to build technologies that are important for quantum computing, sensing and communication. Students will work with the Quantum Integration Laboratory team to measure the energy levels of erbium atoms in novel materials like CaF2, Si and SiC, and benchmark their properties against other host crystals. Students will gain experience in laser spectroscopy at cryogenic temperatures and gain an understanding about the field of quantum technologies. This will be an experimental project but offers opportunities for students to get experience in the theory and simulation or atomic systems in solids.

Supervisor(s): John Bartholomew
Prerequisites: A background in physics would be an advantage but we are happy to tailor the project to the student's interests, skills or skills they would like to learn. *Prior to commencing the project, students will need to complete the safety inductions and training, and be granted building access.*
Maximum number of places available: 1
Project Location: On site. Sydney Nanoscience Hub. . To make the most of the opportunity, we would encourage the student to work with the team on-site everyday during the February intensive. We are also happy to tailor the program to the students' interest. Our plan would be for the student to be supervised by a member of our group, but if sufficient expertise is demonstrated during the project we would look for opportunities for the student to work more independently.
Final assessment: Project presentation, 5-10 minutes
Contact: john.bartholomew@sydney.edu.au

PHYS11: Quantifying the tactics of influence

Despite the rise of social media, mainstream media organisations continue to have a major influence on the nature of public debate. We have been collecting headlines from organisations (Australian and US) over the last year and the responses of the consumers of this media, through YouTube comments. This project seeks to quantify the nature of the response of these large organisations to external events (political, climate, social etc.) and the tactics used to shape public debate in a way favourable to the goals of the organisation. This project has multiple facets, depending on your interest. You may be engaged in time series analysis; the use of large language models for quantifying the nature of text; the manual coding and interpretation of textual data; and the development of models to help explain the observed dynamics.

Supervisor(s): Tristram Alexander
Prerequisites: As detailed in the project description, there are multiple elements so the project can be customised to skill set. Experience with programming and/or data analysis is necessary for the quantitative analysis of data. Manual coding and interpretation of the data does not require programming skills.
Maximum number of places available: 3

Project Location: Hybrid - Meeting in the Physics building (Camperdown campus) and online. Elements can be completed online, however a meeting in person at least once a week is recommended.
Final assessment: Project report, 1-2 pages
Contact: tristram.alexander@sydney.edu.au

PHYS12: Large-scale quantum simulation with trapped ions

The controlled simulation of dynamics in quantum-many body systems is of central interest in furthering our understanding of phenomena such as superconductivity and quantum magnetism. Specially designed Penning traps enable experimental investigations into these topics using hundreds of ions trapped simultaneously inside a large, superconducting magnet. We have recently brought online the first and only such system in Australia at the Sydney Nanoscience Hub, and now routinely trap large crystals of beryllium ions. Possible summer student projects involve characterising coupling between the ions using a custom UV laser system, hardware-software interfacing, hardware development, and trap operation. These topics involve experimental work in the laboratory and complementary numerical simulations and will adapt based on starting date and current needs.

Supervisor(s): Robert Wolf
Prerequisites: Python programming basics of advantage but not required.
Maximum number of places available: 2
Project Location: On site - A31. Students are expected to be on-site for experimental work. Other work like simulations, data analysis, etc. can also be done remotely.
Final assessment: Project presentation, 5-10 minutes
Contact: robert.wolf@sydney.edu.au

School of Psychology

PSYC01: Forensic Psychology: Memory and Repeated Abuse in Criminal Investigations

This project offers students the opportunity to engage in research focused on memory for repeated events, particularly in the context of criminal investigations involving repeated abuse (e.g., domestic violence, child sexual abuse, workplace bullying). Students may assist with tasks such as literature reviews, ethics applications, qualitative data coding, and analysing inter-rater reliability. The research aims to uncover important implications for understanding memory in these contexts and improving justice processes for victims of repeated abuse. This is a valuable opportunity to contribute to ongoing research while gaining a variety of research skills.

Supervisor(s): Helen Paterson
Prerequisites: First-year Psychology units
Maximum number of places available: 6
Project Location: Hybrid - At least 3 days/week on campus (Brennan MacCallum Building). 2 days/week from home, if desired.
Students will be expected to work on campus at least 3 days per week, but can work from home the other 2 days/week.
Final assessment: Project report, 1-2 pages
Contact: helen.paterson@sydney.edu.au

PSYC02: What makes a good liar?

In the "what makes a good liar" project, we have collected video footage of people trying to convince another person they have made particular choice in a strategy game or looked at a particular picture. Some of the people are lying about the choice they made, and some are not. The scholars would be involved in watching and attempting to identify the truth-tellers and liars. The scholars may also be involved in behavioural coding (i.e., using Noldus to examine facial expressions) and conducting literature reviews of deception ability.

Supervisor(s): Helen Paterson
Prerequisites: First-year psychology
Maximum number of places available: 2
Project Location: Hybrid - At least 3 days/week on campus (Brennan MacCallum Building). 2 days/week from home, if desired.

We are flexible, but we anticipate that studenets will be on campus 3 days/ week and they can work from home on the other days

Final assessment: Project report, 1-2 pages

Contact: helen.paterson@sydney.edu.au

PSYC03: Getting into a good headspace: Benefits of offering a eating disorder prevention program within an Australian youth mental health service

The aim of this project is to investigate the benefits and feasibility of a brief evidence-based eating disorder (ED) prevention program delivered within a youth mental health service, headspace Camperdown. Based in the Inner West of Sydney this centre services a diverse cohort of young people seeking help with a range of mental and physical health concerns. The prevalence and impact of EDs and body image concerns is increasing amongst young Australians. As Australia's National Youth Mental Health Foundation with over 150 youth and LGBTIQA+ friendly mental health services across Australia, headspace centres are uniquely placed to offer an accessible early intervention for EDs to those most vulnerable to developing an ED.

The Denison scholars would assist the research team with participant recruitment, data collection and be offered the opportunity to conduct their own independent research project (systematic literature review) on a related topic during the course of the Science Summer Research Program.

Supervisor(s): Maree Abbott

Prerequisites: Project ideally suited to a third or fourth year student enrolled in either a psychology or other health-related degree. Best suited to students interested in a career in mental health research and practice. A valid working with children check will be required for this opportunity. We require students with demonstrated knowledge of basic research methods and statistical analysis.

Maximum number of places available: 2

Project Location: Hybrid - This is a hybrid opportunity where scholars will be expected to attend on-site at headspace Camperdown for 2 or 3 days per week during the course of the program. Other days can be worked remotely from home or from the library (for your independent research project). Exact dates/days/times to be negotiated to best suit the needs of the project and also the students availability.

Final assessment: Project report, 1-2 pages

Contact: maree.abbott@sydney.edu.au

PSYC04: Interpretations and memory of repeated ambiguous relationship interactions

Intimate partner violence (IPV) is a prominent issue in Australia. While historically receiving far less research attention, non-physical abuse (e.g., emotional abuse) appears to be more widespread than physical or sexual IPV with 1 in 4 women and 1 in 6 men having experienced emotional abuse by a partner, compared to 1 in 6 women and 1 in 16 men who have experienced sexual or physical IPV.
However, nonphysical IPV behaviours, are less likely to be recognised as violence compared to physical behaviours, by the victim, by eyewitnesses, and even within the legal system. This project will investigate how people remember and interpret nonphysical IPV behaviours, and how we can ensure they are recognised as abuse.

Supervisor(s): Celine van Golde
Prerequisites: Introductory Psycholgy courses, comfortable with computers and basic statistics
Maximum number of places available: 4
Project Location: On site - Brennan MacCallum (A18 and Griffith Taylor (A19)
You will be expected to be on site as you will be testing participants for this study. You will help with data analysis and writing up of your findings
Final assessment: Project report, 1-2 pages
Contact: celine.vangolde@sydney.edu.au

PSYC05: Translating Research Outcomes into Real-World Tools to Prevent Gambling Harms

Problematic gambling is an important public health problem. Research outcomes are often only shared in scientific journals and do not always reach those who need the most help. This project will look for effective methods of translating research findings into innovative and interactive resources that can minimise gambling harms. This may include the creation of videos, animations, infographics, and other creative content based on clinical and scientific knowledge. You will work within the Gambling Treatment & Research Clinic (GTRC) and collaborate with clinicians and researchers.

Supervisor(s): Robert Heirene and Sally Gainsbury
Prerequisites: An interest in gambling/addiction and enthusiasm to make positive change in the world! Skills/experience in media, graphic design, communications, psychology, or marketing would be great but are not a requirement.

Maximum number of places available: 4

Project Location: Hybrid - Three days per week in office at Brain & Mind Centre, Mallet Street.

You will be expected to work at the GTRC with the rest of the team three days per week (likely Tuesday-Thursday), with some minor flexibility to accommodate existing schedules. The remaining two days can be completed remotely or on-site, depending on preference. You will work as part of a group with other Denison and non-Denison interns. Travel beyond the GTRC is not anticipate, but may be required on occasion (e.g., to interview health or social care professionals).

Final assessment: Project presentation, 5-10 minutes

Contacts: robert.heirene@sydney.edu.au & sally.gainsbury@sydney.edu.au

PSYC06: Teacher social status: Is teaching an attractive profession?

The social status of the teaching profession is a critical aspect that influences not only aspects of teachers' professional lives (e.g., job satisfaction) but also the profession (e.g., willingness of individuals to enter and stay in the teaching profession). Understanding the factors that contribute to the social status of teachers can provide valuable insights into the dynamics of the educational system and help in formulating policies that enhance the teaching profession.

This project, in collaboration with Professor Nicole Mockler (Sydney School of Education and Social Work), aims to explore the factors associated with teacher status using knowledge and approaches from psychology, education, and sociology. Students will be involved in activities such coducting a systematic review, designing research studies, preparing ethics applications and creating resources.

Supervisor(s): Lisa Kim

Prerequisites: Studying/studied psychology, education and/or sociology. Ability to work in a team and independently. Attention to detail -- e.g., ability to decode characteristics of research studies. Interest in the topics of teacher social status and teacher shortage.

Maximum number of places available: 4

Project Location: Hybrid -around 3 days on-campus and 2 days online

Given the importance of frequent communication between team members, there will be an expectation that students will be working from the Camperdown campus for a minimum of 3 days per week. Meetings are planned to be held at least once a week and in-person (on campus).

Final assessment: Project report, 1-2 pages

Contact: lisa.kim@sydney.edu.au

PSYC07: What makes a great teacher and school leader?

Teachers and school leaders are the cornerstones of educational systems, playing a pivotal role in shaping the minds and futures of students. The quest now is to identify the qualities, practices, and strategies of teachers and school leaders that contribute to their wellbeing and effectiveness. To uncover these, students will be involved in activities such coducting a systematic review, designing research studies, preparing ethics applications and creating resources.

Supervisor(s): Lisa Kim
Prerequisites: Studying/studied psychology and/or business. Ability to work in a team and independently. Attention to detail -- e.g., ability to decode characteristics of research studies. Familiar with or is willing to learn about the NSW education system.
Maximum number of places available: 4
Project Location: Hybrid - around 3 days on-campus and 2 days online
Given the importance of frequent communication between team members, there will be an expectation that students will be working from the Camperdown campus for a minimum of 3 days per week. Meetings are planned to be held at least once a week and in-person (on campus).
Final assessment: Project report, 1-2 pages
Contact: lisa.kim@sydney.edu.au

PSYC08: Reading minds: Decoding human brain activity

This project aims to study how information about the world is represented in human brains. To achieve this, we will use modern machine learning algorithms to decode the brain activity of human participants, measured using electroencephalography (EEG), while they view a series of images on a computer screen. Methods will include behavioural measurements, EEG, eye tracking and pupillometry, and neural decoding.

Supervisor(s): Reuben Rideaux
Prerequisites: No prerequisites. Desireable knowledge include psychology or neuroscience units; desireable skills include experience with programming and statistical analysis.
Maximum number of places available: 2
Project Location: On site - All work will be conducted on-site in the Griffith-Taylor building (Camperdown); no travel or fieldwork necessary. Students will be expected to learn how to conduct the research without supervision.
Final assessment: Project presentation, 5-10 minutes
Contact: reuben.rideaux@sydney.edu.au

PSYC09: How thinking develops across the lifespan

This project examines how human thinking changes from childhood into adulthood in several domains (e.g., how we solve problems, make decisions, and form preferences for cultural and artistic products). The project uses a variety of psychological and data-scientific research methods that students should have some experience with, but also show willingness to learn. This involves some in-person data collection, interacting with research participants, but much of the work can also be done remotely.

Supervisor(s): Micah Goldwater
Prerequisites: Ideally participants will have a working-with children check, and some experience working with children. Preference for people with experience with R, Python, or other computer programming languages, but this is not mandatory
Maximum number of places available: 3
Project Location: Hybrid - There is flexibility between working remotely, and working with research participants, ideally both on campus and on some sites around Sydney. This is flexible and can be negotiated based on specifics with each student. Much of the work can be done remotely. Before the February intensive session, students should be in touch so we can set them up with access to the lab (keys and their ID cards), so that doesn't need to delay activities once the session begins.
Final assessment: Project presentation, 5-10 minutes
Contact: micah.goldwater@sydney.edu.au

PYCH10: Predictive learning and transcranial magnetic stimulation

The brain is a prediction machine—learning about the relationships between events in the world, and making predictions about future consequences. Predictive learning allows us to anticipate the trajectory of a ball, the next note in a melody, and the enjoyment of eating our favourite food. Impairments in predictive learning are also associated with psychological conditions such as mood disorders and schizophrenia. This project will use transcranial magnetic stimulation, a non-invasive brain stimulation technique, to help understand how the brain represents predictable and unpredictable information.

Supervisor(s): Dominic Tran
Prerequisites: NA
Maximum number of places available: 2
Project Location: Hybrid - 3-4 days in lab on campus

Students will be required to be on site when collecting data and lab meetings, but most other tasks (e.g., supervisor meetings, reading, writing) can be completed from anywhere. Students will usually give a proposal presentation before starting data collection, and can choose to submit a report or give another presentation for the final assessment.

Final assessment: Project report, 1-2 pages

Contact: minh.d.tran@sydney.edu.au

PSYC11: Researching emotion regulation strategies in romantic couples

In this project you will work in pairs or small groups recruiting couples in public settings (e.g., parks) to take part in an experiment. You will help to run the experiment where one member of the couple faces a challenge, and the other is instructed to help them. We are interested in how partners regulate each other's emotions in this situation. This study will involve fieldwork (working off-campus) and interacting with the public. You will be jointly supervised by both Dr Rebecca Pinkus and Prof Carolyn MacCann. As a secondary focus, this project may involve coding video footage from prior studies, preparing ethics applications, conducting literature reviews or assisting with systematic review and meta-analysis projects.

Supervisor(s): Carolyn Maccann

Prerequisites: Good interpersonal skills (comfortable interacting with the public and working in small groups)

Maximum number of places available: 6

Project Location: Hybrid - Mix of Camperdown campus + fieldwork + remote work from home.

Pre-work/Preparation: You will need to be added to the human research application in November/December (as soon as you accept the internship) which involves a small amount of online paperwork.

Fieldwork: You will need to be recruiting members of the public (couples) from public places like parks and markets and will work in pairs or groups with other students to do this. This would likely be ~2 days per week, and much of it will be unsupervised. You will also need to practice and prepare for this with your team members (in person, in labs at the Camperdown campus).

In-lab or at-home work: You will also work on background writing and reports, which you can do either in a shared working space in the school of psychology (likely Brennan MacCallum building) or remotely. There is scope for flexibility around short (~ 1 week) holiday plans as it is understood that families often plan holidays during this time.

Final assessment: Project report, 1-2 pages

Contact: carolyn.maccann@sydney.edu.au

PYCH12: Perfectly Calibrated: Reducing Overconfidence

Overconfidence is one of the most persistent findings in all of psychology. When humans are overconfident in their judgements and forecasts, they fail to prepare for errors, account for risk, and perform worse. Consequently, overconfidence is one of the most costly, pervasive, and intractable challenges facing society. This project aims to better understand how to reduce overconfidence and help people to make more realistic decisions.

Supervisor(s): Kit Double
Prerequisites: Good data management skills and attention to detail are expected. Students should be conformable with statistics (to a 2nd-year level) and some knowledge of R would be ideal (though not required).
Maximum number of places available: 3
Project Location: Hybrid ~ 3 days per week in the lab (Brennan MaCallum Building A18)
Students will work in a hybrid fashion with approximately 3 days spend on campus per week. Regular meetings with the supervisor will be held but the expectation is that students will complete the bulk of the research independently
Final assessment: Project presentation, 5-10 minutes
Contact: kit.double@sydney.edu.au

PSYC13: Improving social media for body image

The project focuses ways to improve social media for body image via individuals, social groups, parents, influencers, and policy initiatives. The project uses both qualitative and quantitative research methods. Students will contribute to literature reviews, data collection, and data cleaning. They will work with Dr Fardouly and a team of PhD students and research assistants.

Supervisor(s): Jasmine Fardouly
Prerequisites: Undergraduate level experience in psychology or a related field.
Maximum number of places available: 3
Project Location: Hybrid - Three days on site (A18) and two days online.
Students will be asked to work on site (building A18/A19) three days per week and can work online for two days per week. They will have weekly meetings with Dr Fardouly and attend weekly lab meetings.
Final assessment: Project presentation, 5-10 minutes
Contact: jasmine.fardouly@sydney.edu.au

PSYC14: Exercise during treatment for cancer

Exercise for people receiving treatment for cancer helps to reduce and manage many physical and psychosocial side effects related to cancer and its treatment. However, people with cancer generally do not meet recommended exercise guidelines, and getting them to engage in exercise has a number of challenges. This project will explore the experiences and perceptions of exercise in people receiving cancer treatment. Students will gain valuable skills in qualitative analysis and content knowledge.

Supervisor(s): Haryana Dhillon
Prerequisites: There are no pre-requisite skills, however interest in exercise, cancer, and qualitative data analysis would be beneficial.
Maximum number of places available: 4
Project Location: Hybrid - Flexible working options are available, with meetings on Camperdown campus as required.
Students will need to be added to the ethics approval for the project. To do this a CV and some online training will be required.
Final assessment: Project presentation, 5-10 minutes
Contact: haryana.dhillon@sydney.edu.au

PSYC15: Abortion experiences in Australia

Help analyse open-text responses to surveys about abortion in Australia. The project aims to describe content and identify patterns in responses, and validate new models of abortion stigma. Results will provide insight into peoples' experiences and perspectives of abortion and completing abortion-related surveys. You will gain skills in qualitative analysis and data validation.

Supervisor(s): Haryana Dhillon
Prerequisites: No required knowledge or skills. Desirable to have sound Microsoft office skills, comfort working in online/shared documents, forms, and platforms, and good communication skills and initiative. Students will need to be added to the ethics approvals for this project and will need to provide a CV and complete some online training in advance.
Maximum number of places available: 4
Project Location: Hybrid attendance and flexible working hours possible. Desirable for a minimum of 2days/week on Camperdown campus.
Final assessment: Project presentation, 5-10 minutes
Contact: haryana.dhillon@sydney.edu.au

PSYC16: Adapting and evaluating evidence-based online therapies and self-monitoring tools for eating disorders

The InsideOut Institute has opened Australia's first digital platform for eating disorders. This platform delivers evidence-based online therapies and self-monitoring tools for people experiencing symptoms of an eating disorder. This project will involve research activities related to the development of a child-friendly adaptation of the existing digital therapies and evaluating specific components of these therapies. The tasks involved in this project will include organising focus groups, working with experienced psychologists and dietitians to improve the treatment packages, and setting up research foundations for clinical trials.

Supervisor(s): Sarah Barakat
Prerequisites: Familiarity with RedCAP & have interest & skills in speaking with people with experiences of mental ill health.
Maximum number of places available: 2
Project Location: Hybrid - at least 50% in office (Charles Perkins Centre Camperdown campus).
Students will be required to attend 50% of the time in office (based at Charles Perkins Centre, Camperdown campus), days flexible. They will be supervised for the entire research project.
Final assessment: Project report, 1-2 pages
Contact: sarah.barakat@sydney.edu.au

PSYC17: Visual attention in young and old

We rely on the perceptual part of our brains to parse the world into meaningful events and to keep track of them, particularly in busy scenes such as when driving a car or crossing the street. Certain aspects of these functions remain mysterious, especially since the discovery that the two cerebral hemispheres (left and right) have independent abilities to keep track of moving objects (here is a short book on the topic: https://tracking.whatanimalssee.com/). One behavioral index of the two hemispheres' tracking ability has been reported to decline precipitously with age. In this project you will test young and old people in the task. The results will probe spatial and temporal sensory interference to illuminate normal visual cognition and provide insights into the decline with age.

Supervisor(s): Alex Holcombe
Prerequisites: Comfortable with computers and interacting with people (because you'll be involved in testing them).
Maximum number of places available: 2

Project Location: Hybrid - Mostly in-person on Camperdown campus, while some meetings will be online. Mostly on campus, comfortable with computers and interacting with people (because you'll be involved in testing them). Option to participate in data analysis in R.
Final assessment: Project presentation, 5-10 minutes
Contact: alex.holcombe@sydney.edu.au

PSYC18: Social comparisons in romantic relationships

How does it feel to find out that your partner has outperformed you on an important task? Nearly 70 years of social comparison research has focused on contrast reactions (i.e., feel bad after being outperformed, feel good after outperforming someone else), with limited research on assimilation reactions (i.e., feel good after being outperformed, feel bad after outperforming someone else). Importantly, most of the research concerns (self-reported) reactions to comparisons between strangers, acquaintances, or friends. An emerging literature is identifying the circumstances under which these different reactions occur, and couples in romantic relationships are a key focus. This project investigates the continuum of possible behavioural reactions by analysing videos of couples recorded in an experiment where one member outperformed the other, and evaluating whether the reactions link to relationship outcomes.

Supervisor(s): Rebecca Pinkus
Prerequisites: Completed either of the PSYC1 units and preferably PSYC2017/PSYC3017. Interest in learning how to code and analyse videorecorded interactions.
Maximum number of places available: 2
Project Location: Hybrid - At least 2 days/week on campus (Griffith Taylor Building) and the rest of the days from home, if desired. The videos must be coded on site within a lab in Griffith Taylor using specialised software. Students will work together to research various existing coding schemes before coding the videos. Once coding is underway, students will alternate their time between coding and conducting other tasks such as literature reviews or assisting with systematic reviews and meta-analysis projects.
Final assessment: Project report, 1-2 pages
Contact: rebecca.pinkus@sydney.edu.au

PSYC19: Abortion in Australia - what does the evidence tell us?

This project involves systematically identifying, reviewing, synthesing, and assessing abortion literature to provide evidence-based recommendations for future research, practice, and policy. Literature to be reviewed will cover abortion experiences and abortion discourse. Results will provide insight into patterns and gaps in evidence and media. Students will gain valuable research and graduate skills in the systematic identification, collection, and assessment of evidence.

Supervisor(s): Sarah Ratcliffe
Prerequisites: No prerequisite skills are needed. Experience and/or interest in critical appraisal skill development, organised and collaborative work, and/or reproductive healthcare is desirable. Desirable to have sound Microsoft office skills, comfort working in online/shared documents, forms, and platforms, and good communication skills and initiative.
Maximum number of places available: 7
Project Location: Hybrid - Griffith Taylor (14-35 hours) and online (remaining hours). Flexible start and finish times available.
This project is hybrid. Students are asked to be available on Camperdown campus a minimum of 2days/week.
Final assessment: Project presentation, 5-10 minutes
Contact: sarah.ratcliffe@sydney.edu.au

Contact

Faculty of Science, Admissions, Pathways, Projects

science.specialprojects@sydney.edu.au

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