UROS 2020
PROJECT SHOWCASE

UNIVERSITY OF LINCOLN
Lincoln Academy of Learning and Teaching

Undergraduate Research Opportunities Scheme

FOREWORD

The Undergraduate Research Opportunities Scheme (UROS) is a well-established initiative at the University of Lincoln. Following the Student as Producer ethos, this scheme encourages students to be curious and active in creating new knowledge by developing their research projects under the supervision of members of academic staff.

This scheme has proved very effective in engaging students from across the University in hands on summer research activities. Previous participants have highlighted how it has given them new research experiences and skills. Project activities culminate in an annual exhibition showcase event in which participating students share their knowledge and demonstrate student voice in research to the wider academic community.

Having taken part in previous UROS showcase events, I am delighted with the range of applications for UROS bursaries from across our increasingly diverse learning community and I look forward to seeing what skills and new experiences students gain from working with staff and other participants through their project activities this year.

Jasper Shotts
(Dean)
Lincoln Academy of Learning and Teaching

Contents

Applying for a UROS bursary

The Undergraduate Research Opportunities Scheme (UROS) is designed to encourage undergraduates to become actively involved in the research work of the University.

UROS embodies the principle of 'Student as Producer', which underpins the Lincoln approach to teaching, learning and student engagement.

UROS offers a unique opportunity for students to work alongside academic researchers to engage and gain hands-on research experience on projects covering all disciplines across the University.

Successful projects are awarded a bursary of up to £1000 to support students with their research projects which would normally be completed during the summer break. Students taking part in the scheme are required to produce a blog report and poster to showcase their research at an exhibition event.

Applications are invited from both academic schools and professional services departments for stand-alone projects or form a subsidiary part of larger scale research work, that could be completed by an undergraduate student working under the supervision of a member of academic staff. The completed application form must be submitted collaboratively by the staff and students participating in the project.

Eligibility

All first and second year undergraduate students are eligible to apply for the scheme. Final year students would not normally be eligible because they will have become graduates at the point when UROS project starts, however, exceptions may be made in special circumstances e.g. where the final year student intend to pursue a higher degree when they graduate.

What's involved

Expectations of Staff

All projects require an academic member of staff in the role of research project supervisor, who must ensure that the student researcher is fully supported throughout the whole project, e.g. an induction, supervision and regular progress review meetings, training and assisting with the written reports and dissemination on research, and keep the LALT Engagement Team updated with project progress.

Expectations of Students

Students are expected to understand the nature of the research required prior to accepting scholarship, work professionally with others, and develop and apply skills to deliver reliable project outcomes. Student researchers are expected to keep the LALT Engagement Team updated with project progress, and to produce a poster display, 500-word blog report and a 300-word synopsis showing the results of the completed research project.

Support Sessions

The Lincoln Academy of Learning and Teaching Engagement Team provides a range of workshops throughout the UROS programme, including Presentation Skills, Blog Writing and Poster Design workshops specifically designed to support students undertaking research projects.

Sharing your research

The UROS showcase is held to give UROS participants the chance to share their research and learning journey with other students and staff at the University. Written reports will be published on the LALT blog, where they can be shared with the wider community.

We encourage all UROS participants to attend research events to share their research experience as widely as possible and many participants go on to attend external conferences and contribute to published papers.

How to apply

The application window for UROS opens each year on the 1st September and closes on the 31st January.

Applications are invited from both academic schools and professional services departments for stand-alone projects and be separate from curriculum work. Applications should be jointly completed by the supervising academic and collaborating research student.

As a competitive programme, all applications will be scored by reviewers against key criteria, and successful applicants will be notified in March.

Find out more:

lncn.ac/UROS
@UoL_LALT
uros@lincoln.ac.uk

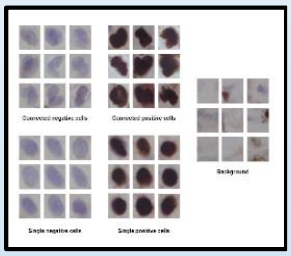
Detection of proliferation indices from microscopic image for tumour progression analysis

by Qing Xu (BSc (Hons) Computer Science) // Supervised by Dr Wenting Duan & Prof Xujiong Ye

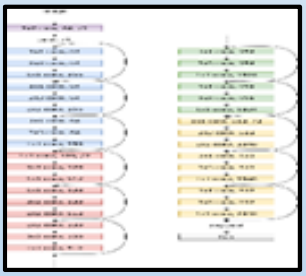
Glioblastoma multiforme (GBM) is one of severe brain tumours. It is characterized by high mortality and median survival time of patients is one year. Manual analysis of histopathology images is regarded as a traditional method to identify disease stage. However, it has some shortages such as different evolution criteria of experts and long wait for result.

In this project, an approach combined with deep learning and image processing has been proposed. It shows powerful ability to detect and classify different cells as well as provides a result of proliferation index to aid clinician's diagnosis.

During this project, one of challenges we faced is that some of popular neural networks, such as Faster-RNN and FCN, could not achieve expected performance due to the given small datasets that includes only 22 original images. In order to extend datasets, we decided to extract various cells from each image and used multiple image augmentation. In this way, we got considerable samples and successfully trained an efficient network using ResNet50 at the end.



I had two supervisors who supported me during this project. Both Dr Wenting Duan and Prof Xujiong Ye were happy to answer any questions or concerns I had and welcomed my input to the project. Although it was difficult to meet up face-to-face due to the outbreak of the Covid-19, both supervisors were able to provide regular constructive progress updates either by email or other methods. I cannot thank Wenting and Xujiong enough for this experience.



UROS has provided me with the opportunity to gain a high-level research experience and further aiding my understanding of the whole research process. This research has helped to direct me to the area which I am interested in and want to study in the future. Based on the experience of this project, I have decided to continue the research of medical images processing that combined with deep learning in my further Masters degree.

Diversity by Design, Inclusive Representation

by Charlie Wootton, Josh Haynes, Lauren Glass and Wiktoria Rabij (BA (Hons) Interior Architecture & Design) // Supervised by Dr Rosie Elvin & Dr Kirsten McKenzie

In our project, students were tasked with producing a collection of figures focussed on principles of Equality, Diversity, and Inclusivity (EDI); to improve visual representation and diversity of underrepresented population groups within architectural visuals. Each student focussed on specific protected characteristics so to create a variety of figures to be used in future visuals. The project aimed to establish EDI and unconscious bias as important principles for consideration within visual media.

Having four students focusing on different characteristics resulted in individual challenges to overcome throughout the production process. For all of us, the biggest challenge was deciding on what figures to create considering different aspects of diversity without making them stereotypical or obvious. We challenged ourselves to think outside the box to create the most appropriate and unique figures.

Throughout their production, designs were reviewed by supervisors to assess their suitability in representing their intended characteristics. This process allowed for any inaccuracies or unintentional connotations to be queried and/or removed before completion. Each student successfully produced a collection of 25-30 figures of varied characteristics in their own respective artistic styles.

This project provided us with a greater awareness of issues of misrepresentation and lack of diversity, and its direct relevance within the architectural design field. Becoming aware of our own unconscious bias has altered our perspective on how to approach user representation in future design projects.

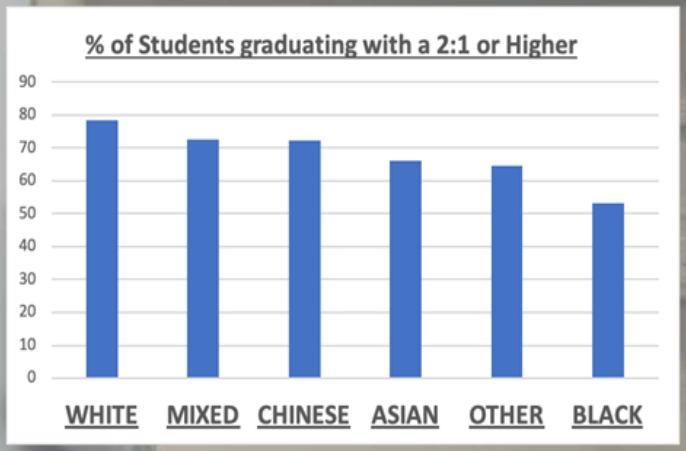
Furthermore, importance must be placed in undertaking future research to assess the figures' effectiveness in informing end-users (prospective students and designers) of EDI and unconscious bias; evaluating how successful the produced material is in informing greater diversity and representation of population groups in future architectural visuals. Expansion of this collection by future designers would aid to further enrich and diversify contemporary catalogues of accessible human figures. Participating in this project has been a unique and interesting experience for us all, and has allowed us to view our area of specialty from a different perspective.

Understanding students' perception of assessment fairness and its impact on attainment

by Charles Wilson (BA (Hons) Education) // Supervised by Dr Xiaotong Zhu & Dr Helen Childerhouse

Over the past few months, I have been researching how fair students perceive various assessment types to be and if there is a relationship between this perceived fairness and their actual performance and nationwide attainment gaps. As I am also working in partnership with the Lincoln Equality in Attainment Project (LEAP), I have looked at historical attainment gaps for certain groups of students and then put a focus on these groups in my own project, such as disabled and BAME students. The population consists of undergraduate students from the School of Education (SoE), such as myself, and then this project will be used to re-examine current assessment policy and practice in the SoE.

This project has been an incredibly enjoyable and informative experience, it has at times been very challenging as the COVID-19 pandemic has in some way impacted all areas of my research. The first set of challenges were changes to my research methodology, moving to online data collection didn't allow me to engage with participants as much. Furthermore, due to restrictions placed on the university, I was unable to attain specific student data from central systems in time.



HE Attainment Gap, ECU (2017)

This opportunity has also allowed me to collaborate with my research supervisor who has expertise in research methods and my research field of interest. They have guided me through this project offering advice and support while pushing me to continuously improve my range of skills as an educational researcher. My goal is to continue my passion for higher education research and to study a masters in the subject with the aim to continue an academic career in higher education research. This UROS experience has been invaluable in helping me progress as a researcher and give me a head start in my future career.

Understanding transitional challenges and their impact on student attainment and mental health: Does ethnicity make a difference?

by Ciera McKenzie & Isabella Chu (BSc Education & Psychology) //
Supervised by Dr Xiaotong Zhu & Cate Neal


"Understanding transitional challenges and their impact on student attainment and mental health: does ethnicity make a difference?"

Undoubtedly, beginning university and moving away from home is a huge change and is likely to encompass a whole host of new challenges that students may not have faced before. It would make sense that exposure to such challenges, such as homesickness, may potentially impact both the attainment and mental health of a student, thus encouraging us to research this. Unlike existing research in this field, we explored whether student ethnicity impacted the type and magnitude of challenge experienced. Dr Xiaotong Zhu's interest in ethnic inequality within university also inspired us to take this approach.

We designed a questionnaire to collect data from 99 Undergraduate Social Science students at the university, however in the light of the Coronavirus Pandemic, we had to rely on Qualtrics and email to distribute it. We also had to quickly become familiar with Microsoft Teams, as we were no longer allowed to meet with our research partners and supervisors in person. Furthermore, with no access to library resources, we also became more confident with accessing online research journals and using other findings to guide our research.

This research involved both qualitative and quantitative analysis, allowing us to further our understanding of both SPSS and Nvivo software. Thorough understanding of both programmes will be a crucial element of our third-year dissertations, as well as within postgraduate research. Working together under a time constraint has allowed us to develop both our teamwork and time management skills, which are desirable in any place of employment.

Finally, we would like to thank the UROS Team and our supervisors, Dr Xiaotong Zhu and Cate Neal, for their continued support and swift feedback throughout the project!

Fantastical Bodies and How to Wear Them

by Kai Speed (BA Fine Art) // Supervised by Dr Steve Klee, Dr Kirsten McKenzie & Heather Sunderland

For this project, I worked in collaboration with my supervisors Dr Steve Klee and Dr Kirsten McKenzie, as well as co-researcher Heather Sunderland to generate data concerning the psychology behind body image.

Dr Klee and I were tasked with creating a series of ‘fantastical bodies’ ranging from humanoid to anthropomorphic, alongside a relevant landscape and contextual descriptor.

These bodies would then be presented to experimental subjects, who would be asked to choose which body they felt would survive best in the given landscape, as well as which they would choose to inhabit.

Throughout the project, we faced a lot of challenges that we had previously not considered, such as the influence of differing art styles between Dr Klee and I, as well as the influence of small details such as facial expressions within these art styles, which lead to issues regarding diversity and inclusivity.

Overall, this project has helped me a lot, as it had given me a lot of confidence in areas of working outside of my course and studies, as well as confidence in the value of my own artwork and ideas.

A study of cranial shape variation across breeds of domesticated and wild dogs

by Charlotte Page (BSc Zoology) // Supervised by Dr Marcelle Ruta

Dogs are one of the most diverse species on the planet, a feature that is largely due to domestication and human intervention with breeding. Humans have engineered an astonishing variety of dogs with many different traits: this project focused on brachycephaly, an extreme shortening of the canine snout. In addition to examining cranial shape changes, the study aimed to determine how evolutionary constraints on modularity (the degree to which different regions of the skull vary) affect changes brought on by domestication.

This research has applications in evolutionary and veterinary fields. Dogs provide an ideal model for further research into cranial shape change and the effects of artificial selection on modularity. There are also implications for animal welfare, as brachycephaly is associated with a number of canine health conditions, and the increasing popularity of brachycephalic dogs is a growing concern for many.

Despite challenges throughout the course of the project, such as the limitations of sourcing skulls image online and the restrictions on the breed types available, UROS has been a fantastic experience that has offered me a chance to partake in research into a subject that I find intensely interesting. The help of my supervisor Dr Marcello Ruta has proven invaluable, as I learnt and gained skills throughout the process.

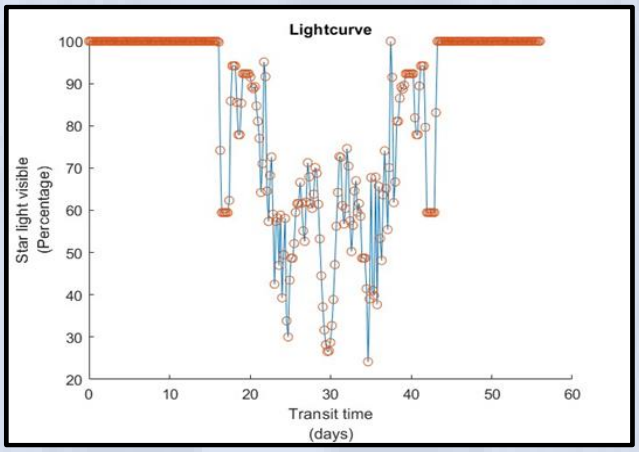
The knowledge I have acquired during UROS will help me as I progress into third year, particularly in preparation for my dissertation. It has also aided me in the small dog training business that I run alongside my studies, as my project has given me a greater anatomical understanding of the variety of breeds I work with.

Development of a simple transit simulator for planetary rings

by Brayden Albery (BSc Mathematics & Physics) // Supervised by Dr Phil Sutton

This project aimed to develop a computer program prototype that can simulate the change in perceived light (the light curve) from the transit of a planetary ring system in front of its parent star.

The program was tailored to the specifics of the V1400 Centauri system, which contains exo-planet J1407b. The planet has a huge ring system with a diameter 640 times larger than the rings of Saturn. An exo-moon is theorised to be contained within the ring system. The long-term goal of this project is to continue to develop the light curve simulator over subsequent summers until it is advanced enough to directly contribute to academic research.



The program works by generating a series of ring shapes, each with a different optical depth value. Then, over a series of frames, these rings are passed in front of a circle with a brightness value of 100%, and the corresponding change in brightness for each frame is calculated.

I found being a part of UROS extremely useful. Not only was I able to have direct experience in conducting research but I now have the building blocks in place to continue future research down the road. I aspire to be a part of further research throughout my degree to give me the best chance of securing employment in academia in the future.

Mathematical modelling of polymer capsules in solution

by Henry Macpherson (MPhys Physics) // Supervised by Dr Martin Greenall

The aim of the project was to explore the effect of including interdigitation in an existing model for the size selection of vesicles. Vesicles are shapes formed from a bilayer of amphiphiles (such as lipids and copolymers) which are often roughly spherical and can be used to house substances. Interdigitation is where the hydrophobic parts of both inner and outer layers are mixed. Vesicles can be potentially used for drug transportation in the body, if we know in what conditions a vesicle will assemble and break down. Knowing the preferred size of a vesicle in different conditions is key in determining how much of a material it could contain and could be used to control dosage in drug transportation.

Most of the time spent on the project involved using c++ to run code with various parameters and using the output data to explore the nature of the vesicles (or absence of vesicles) produced. Sometimes this involved plotting a graph and looking at its shape and sometimes this meant scouring test files for non-physical values. There were a few lines in the code that had to be tweaked to get accurate results, and this presented a real challenge to me early on. By the end, however, I felt confident in diagnosing issues and finding the right adjustments.

The project has given me a real insight into this area of research and given me a great amount of experience in independent working. It has also led me to discover the environments in which I am most productive. This is knowledge which I'm sure will be a massive help in my further university studies and beyond.

Using an Equation for Changing the angle between planes to find and evaluate planetary rings

by Jake Browning (BSc Mathematics) // Supervised by Dr Phil Sutton

The first ever exo-ring was found by NASA and Dr Phil Sutton has been evaluating the ring and producing models to compare them against the ring data that NASA found. I developed an equation that could change the angle between the x-y plane. I used that in collaboration with my supervisor's models to take line profiles of the models and try to manipulate the data so the ring could be analysed in different ways.

I started using my own equation and then moved onto making other transformations. I also went from analysing just the position of the particles in the ring, to analysing their velocities as well.

Due to the Coronavirus outbreak, that I am sure everyone is aware of, the project became slightly more taxing. I couldn't use the computers on campus, so I needed to download all the software needed myself. This included Ubuntu, GDL and SPLASH. Once I had done that, I was also faced with the challenge of learning and using a new operating system and two new pieces of software all at the same time.

Although coding (and computers in general) is not my area of expertise, I managed to use it all and developed my coding skills even further than I thought I could. I learnt how rings develop and how they are analysed; I learnt how to program the equation I developed myself on computers; and I learnt how academic research worked.

As I would one day like to be a lecturer and a researcher, I really found this experience useful and I found out about the things needed from a researcher to make the research work. The project helped me find a passion for coding that I didn't know I had. One that will help me with the rest of my course and my future career.

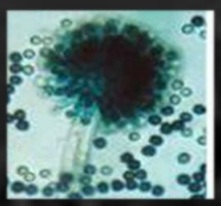
Synthesis of 5α-andrstan-3,16-dione and its biocatalysis by the fungus Mucor circinelloides

by Przemyslaw Jerzy Stepien (BSc (Hons) Pharmaceutical Science) //
Supervised by Christy Hunter

Synthesis of complex molecules, large or small, can be time and resources consuming, to synthesise the 5α-andrstan-3,16-dione can take 7 steps to simply reach the desired molecular structure.

Our goal is the synthesis of 5α-andrstan-3,16-dione and its biocatalysis by the *Corynespora cassiicola* as it is expected to make a change to the 5α-andrstan-3,16-dione yet not possible to execute in a generic laboratory or too costly for standard step by step synthesis. The formed metabolites are to be analysed and fully characterised to determine the effect of different steroidal structural architecture on the initiation of the biocatalytic reactions and from the transformation will also reveal important information about the metabolic pathways in this organism.

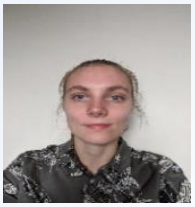
As everyone had to face the pandemic, as a student in progress to start research, I was waiting for everything to unveil whilst keeping in constant contact with Dr Hunter for the arrival of good news. The only way we could overcome this is to remain safe and patient; making sure we keep ourselves safe. When the time came to go back to the laboratory, we took every procuration so that we may safely start the research and complete it.



By completing the second year as a pharmaceutical science student, I have already been exposed to analytical equipment and working in a general laboratory with a range of chemicals, substances, living and non-living organisms. Anything as part of the module is just scratching the surface of the subject. Working in a laboratory alongside Dr Hunter had allowed me to fully gain the proper use of all the analytical equipment as well as working with all standard equipment when setting up the synthesis reactions. As well as skills, the knowledge and carrying out the synthesis are skill sets that I am happy to have gained as not many students would have had such an opportunity.

Mental Toughness, Sport-Related Wellbeing and Mental Health Stigma among National Collegiate Athletic Association Division I Student-Athletesa

By Eadie Simons (BSc Sport & Exercise Science) // Supervised by Dr Matthew Bird



Mental toughness (MT) is a desirable psychological attribute that can help athletes produce consistently high levels of performance and sustain goal-directed behaviour, despite everyday challenges and stressors. Research suggests that the qualities associated with MT such as perseverance and buoyancy could promote wellbeing by enabling athletes to overcome adversity, as well as hindering support seeking due to the fear of being viewed as weak. This project to investigate the relationships between mental toughness, sport-related wellbeing and stigma towards mental health and help-seeking.

One of the biggest challenges for this project was the recruitment process. We spent the first two weeks working on the crucial but tedious task of compiling a database of contact details for the head coaches of National Collegiate Athletic Association (NCAA) Division I teams for a select number of sports. After sending our initial contact email, we only received a small number of completed surveys. Although this was quite disheartening, we were soon able to recruit additional participants after deciding to widen the number of sports we reached out to. This made me realise the importance of remaining open-minded and adaptable especially when faced with setbacks.

Participating in UROS has been an invaluable opportunity to gain first-hand experience of research outside of my degree. The support and guidance from my supervisor throughout the whole process made it a lot less daunting.

This experience will not only be beneficial for moving forward with my dissertation this year, having improved my academic writing and research skills, but has also given me ideas for research should I decide to take on a master's or PhD in the future.

AWARDS

Dean's Award for Outstanding Research

*

People's Choice Winner

*

People's Choice Runner-Up

*

People's Choice Runner-Up

(* To be announced after the showcase event)

Undergraduate Research Opportunities Scheme

UNIVERSITY OF LINCOLN

Lincoln Academy of Learning and Teaching

Find out more:

lncn.ac/UROS

@UoL_LALT

uros@lincoln.ac