

SUMMER RESEARCH

PROGRAME



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The University of Liverpool was founded in 1881, and was one of the founding members of the Russell Group, an elite group of British research universities. Our unique Summer Research Programme allows students the opportunity to undertake a research project in their field alongside one of our world-leading academics.

Students will be enrolled in a 15-credit module that is entirely research-based. At the conclusion of the programme, students will participate in a mini-conference where they will present their research alongside their peers across all areas of research.

All of the available projects are listed in this brochure. You may apply for up to 3 projects, which will be indicated in order of preference on the application form.

THE DATES

Students may study for 4, 8, or 12 weeks. Each project has specific dates noted. All students must arrive in time for the official start of their session, as this is when the mandatory on-site orientation will take place.

Start Date	4-Week End Date	8-Week End Date	12-Week End Date
Session 1: June 1, 2020	June 26, 2020	July 24, 2020	August 21, 2020
Session 2: June 29, 2020	July 24, 2020	August 21, 2020	n/a
Session 3: July 27, 2020	August 21, 2020	n/a	n/a

There will be three mini-conferences held during the summer; all students must present their research on one of these dates as a part of their assessment. Which of these dates can be agreed upon with the supervisor of the project. The mini-conference dates are as follows:

- •Wednesday, June 24
- •Wednesday, July 22
- •Wednesday, August 19

ACCOMMODATION

Students will have the option of on-campus housing at Melville Grove, a University hall of residence, in single rooms during the Summer Research Programme. Students will be required to pay a £150 booking fee (non-refundable) to confirm their place in housing after being accepted to the programme. All students will be able to move in on the Sunday before their start date during all sessions.

Students attending the first session from June 1 who opt for university accommodation will be housed off campus until June 14 at the Sleep Eat Love hostel in a private, en-suite room.

> Housing prices for Summer 2020 are as follows: Session 1 (May 31-June 27, 2020): £696.92 Session 2 (June 28-July 25, 2020): £553.84 Session 3 (July 26-August 21, 2020): £553.84



EXPLORING LIVERPOOL & THE UK

Studying abroad isn't just about studying! We want you to spend your free time enjoying Liverpool and its surroundings to the fullest, which is why we've prepared some activities for you to get to know the Northwest of England! Students will have the opportunity to participate in day trips over the weekend to places like Snowdonia National Park, Chester, or York for a small extra fee. There will also be opportunities to explore Liverpool through various activities offered by the University for its students.

The University of Liverpool is located within 45 minutes to two major airports, providing links to most European destinations within a matter of hours! London is only about 2 hours away by train, and other major British cities like Manchester or Edinburgh are also easily accessible. While you're completing your research with us, why not take the opportunity to explore other parts of Europe and the UK in your free time? Liverpool is perfectly located for such an opportunity.

HOW TO APPLY

Nominations and applications will open on January 15. Students who are applying from a partner university on an exchange basis should wait to receive an e-mail following the nomination from their home university. Students applying as a visiting, fee-paying student may apply directly online through our general application <u>link</u>.

The deadline to apply for projects is March 1.

When applying, students should note the specific project(s) they are applying for, and should write their personal statement(s) with that project and supervisor in mind. When selecting modules, students should note the module code as listed in this guide, as well as the project title. All projects are worth 15 University of Liverpool credits.

The application criteria are as follows:

3.0 Cumulative GPA or equivalent
Must meet our English language requirements if not a native speaker
Must fulfill any special requirements noted on the project detail pages

Students must submit:

University transcript

Proof of English language qualifications (if required)
 Personal statement detailing why you're interested in the project, what experience you have related to the project, and how you fulfill any of the specific requirements noted in the project details

Students will be notified by the end of April if they've been successful in their application. Note that this is a competitive programme, and while we will endeavour to place students on their preferred project,

admission is not guaranteed.

Questions? Contact us at erasmus@liverpool.ac.uk

Arts



GULF ARCHITECTURE PROJECT

SUPERVISOR DR GIAMILA QUATTRONE



Trained and registered as an architect in Italy, Dr Giamila Quattrone is Lecturer in Architecture at the University of Liverpool, where she has been recently appointed Faculty Lead of the Digital Heritage Sub-Theme. Previously she held numerous teaching and research positions in Italy at Università degli Studi Mediterranea di Reggio Calabria, in UK at Nottingham Trent University and Manchester Metropolitan University, and in Australia at The University of Newcastle and The University of New South Wales. In 2012 she established, with Prof Soumyen Bandyopadhyay and other colleagues, the ArCHIAM Centre (Study of Architecture and Cultural Heritage of India, Arabia and the Maghreb), which she has been since working heritage coordinating, documentation, on management and development in Oman and Morocco, through consultancy, research and design projects as well as capacity building and public engagement initiatives. Her research revolves around three main strands: settlement, architectural and construction patterns of traditional oasis settlements of Oman, Morocco and Tunisia, with a focus on their spatial and technological transformation as a result of socio-cultural and economic change; the work of Australian architect Glenn Murcutt; urban recycling and building adaptive reuse.

EMAIL: giamilaq@liverpool.ac.uk SCHOOL: Arts DEPARTMENT: Architecture MODULE CODE: SOTA350 SUITABLE FOR STUDENTS OF:



GULF ARCHITECTURE PROJECT

PROJECT DESCRIPTION

The Gulf Architecture Project (GAP), a collaborative undertaking between the University of Liverpool and the Qatar National Library, seeks to provide an exciting and unique history of architectural identity and associated socio-cultural and economic commentary on Qatar and the Gulf region through the story of its architectural heritage, focusing on houses, their associated material culture, social customs, and history from the 1700s to 1960s.

The project aims to create a cohesive and comprehensive "digital knowledge platform" on the architectural heritage of Qatar and its region, hosted by the Qatar Digital Library (QDL). This is done by synthesising the existing bodies of literature, audio/video recordings and visual material (photographs, maps, drawings, historical imagery, etc.) of vernacular buildings towards creating a central digital archive in order to establish the "big picture" of Gulf Arab housing and material culture.

ADDITIONAL REQUIREMENTS

EXPERIENCE

- Literature review and use of reference manager software (eg., Mendeley).

• Use of desktop publishing and graphic design software, i.e, Photoshop, InDedesign, Illustrator.

• Use of CAD software, i.e, AutoCAD, 3D Studio Max, Rhinoceros, Revit.

SKILLS, GENERAL AND SPECIAL KNOWLEDGE

• Good interpersonal skills and excellent communication both verbally and in written format.

- Good time management and organizational skills.
- Ability to plan and undertake activities, prioritising work independently and as part of a team, in order to deliver individual and team objectives.
- Ability to co-ordinate own work with that of others to avoid conflict or duplication of effort.
- Proactive and self-motivated.
- Flexible and enthusiastic attitude to work.
- Able to absorb new information and apply new knowledge quickly.
- Able to use initiative, creativity and judgement to tackle issues.
- Excellent attention to detail and accuracy.

PROJECT DATES

START DATE(S):	Session 1 (June 1, 2020)
END DATE(S):	July 24, 2020 August 21, 2020
LENGTH:	8 or 12 weeks

Electrical Engineering, Electronics, and Computer Science



I/O-EFFICIENT ALGORITHMS FOR EXPLORING BIG GRAPHS

SUPERVISOR DR KONSTANTINOS TSAKALIDIS



Dr Konstantinos Tsakalidis is a Lecturer in the Department of Computer Science at the School of Electric Engineering, Electronics and Computer Science of the University of Liverpool. His research interests are in algorithms & data structures, graph algorithms, computational geometry and Big Data engineering.

EMAIL: K.Tsakalidis@liverpool.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Computer Science

MODULE CODE: COMP298

SUITABLE FOR STUDENTS OF: Algorithms & Data Structures



I/O-EFFICIENT ALGORITHMS FOR EXPLORING BIG GRAPHS

PROJECT DESCRIPTION

Implement one of the following algorithms for exploring a graph stored on disk: breadth-first search, depth-first search, single source shortest paths, A* heuristic.

The project's objectives are (i) to evaluate the I/O-performance of different implementations of basic priority queue data structures, and (ii) to apply the most efficient priority queue in the chosen exploration algorithm.

ADDITIONAL REQUIREMENTS

The student should have good to excellent knowledge about Linux, bash scripting and C++. The student should have interest for software engineering, graph algorithms, big data analytics.

PROJECT DATES

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S):

July 24, 2020 August 21, 2020

LENGTH:

8 or 12 weeks

IMPLANTABLE SENSOR FOR KNEE MOVEMENT MONITORING DURING REHABILITATION

SUPERVISOR DR ROBERTO FERRERO



Dr Roberto Ferrero is a Senior Lecturer in the Department of Electrical Engineering and Electronics at the University of Liverpool. His expertise is in the area of instrumentation and measurement, including sensors, signal processing and data analysis. Applications include power systems and healthcare technologies. Dr Ferrero is also a Senior Member of the IEEE and an Associate Editor of the IEEE Trans. on Instrumentation and Measurement.

EMAIL: ferreror@liverpool.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Electrical Engineering and Electronics

MODULE CODE: ELEC298

SUITABLE FOR STUDENTS OF: Electrical/Electronic Engineering Mechanical Engineering Biomedical Engineering

IMPLANTABLE SENSOR FOR KNEE MOVEMENT MONITORING DURING REHABILITATION

PROJECT DESCRIPTION

This project is in collaboration with a company that has developed an innovative screw to use in Anterior Cruciate Ligament (ACL) reconstruction, a surgical procedure that is commonly carried out in case of knee injury. An effective rehabilitation plays a fundamental role to ensure a positive outcome of the procedure, but presently the rehabilitation suffers from a lack of data about the knee condition. The idea explored in this project is to add an accelerometer inside the screw, to be able to accurately monitor the movement of the knee in the gait cycle. This project is a preliminary feasibility analysis, which aims at building an initial prototype (not implantable) to test the sensor and its power supply.

ADDITIONAL REQUIREMENTS

Programming skills in C and/or Matlab; ideally, experience with the design of electronic circuits.

PROJECT DATES

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

 Initial
 July 24, 2020

 END DATE(S):
 August 21, 2020

LENGTH: 8 or 12 weeks

MODULARITY IN PLANAR NETWORKS

SUPERVISOR DR MICHELE ZITO



Dr. Michele Zito is a lecturer in the Department of Computer Science of the University of Liverpool. He obtained a Ph.D. in Computer Science from the University of Warwick (UK), after completing his undergraduate studies in Italy, and an M.Sc. in Edinburgh. Author of more than 80 publications including articles on prestigious journals such as Theoretical **Computer** Science (Elsevier) and Algorithmica (Springer) and conferences including the ACM Symposium on Discrete Algorithms, his main research interests are the design and analysis of efficient algorithms, particularly related to Graph Theory, and the study of Random Structures. Over the past five years he became involved in a number of projects related to Complex Networks, and Domestic

Renewable Energy Management.

EMAIL: michele@liverpool.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Computer Science

MODULE CODE: COMP298

SUITABLE FOR
STUDENTS OF:Degree programmes including
Algorithm Design and Analysis or
the study of Networks

PLACES AVAILABLE: 1

MODULARITY IN PLANAR NETWORKS

PROJECT DESCRIPTION

The project is in the area of complex network analysis, an area of great importance in an age in which sensors and electronic devices make large amount of data easily accessible. The assortativity of a large network with respect to a given classification of the network nodes measures ``the tendency for vertices in networks to be connected to other vertices that are like or unlike them according to the given classification." Network modularity describes the maximum assortativity of a the given network. Planar networks (i.e. networks that can be drawn on a 2-dimensional surface without line crossing) tend to have high modularity, whereas networks generated by placing edges at random have low modularity. We plan to study computationally the modularity of so called Empire Networks, that somehow lay in between Planar and arbitrary random networks.

ADDITIONAL REQUIREMENTS

Knowledge of Python will be beneficial.

PROJECT DATES

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

 Initial
 July 24, 2020

 END DATE(S):
 August 21, 2020

LENGTH: 8 or 12 weeks

MUSIC SELECTIONS FOR PHYSICAL EXERCISE

SUPERVISOR DR EDUARDO COUTINHO



Dr Eduardo Coutinho is a Lecturer in Music Psychology at the Department of Music from the University of Liverpool and the Director of the APPLIED MUSIC Research Lab. he works in the interdisciplinary fields of Music Psychology and Affective Computing, where his expertise is in the study of emotional expression, perception and induction through music. He has contributed significantly to a broader understanding of the emotional impact of music on listeners, namely on the link between music structure and emotion, the types of emotions induced by music, and individual and contextual factors that mediate the relationships between music and listeners. Currently, his work focuses on the application of music in everyday life

EMAIL: E.Coutinho@liverpool.ac.uk

SCHOOL: Arts

DEPARTMENT: Music

MODULE CODE: SOTA350

SUITABLE FOR
STUDENTS OF:Computer Sciences
Healthcare Informatics
Music Psychology
Affective Sciences



MUSIC SELECTIONS FOR PHYSICAL EXERCISE

PROJECT DESCRIPTION

Listening to music whilst exercising (e.g., running) can be a motivational booster as well as an performance enhancer. In this project, we aim at developing a software (website/mobile app) that helps people making the right music selections for specific types of exercise.

ADDITIONAL REQUIREMENTS

Students are expected to be experienced software developers (ideally with experience in mobile app development) and willing to engage with Music Psychology research.

PROJECT DATES

START DATE(S): Session 1 (June 1, 2020)

END DATE(S):

June 26, 2020 (4 weeks) July 24, 2020 (8 weeks)

LENGTH:

4 or 8 weeks

MUSIC SELECTIONS FOR REDUCING BLOOD PRESSURE

SUPERVISOR DR EDUARDO COUTINHO



Dr Eduardo Coutinho is a Lecturer in Music Psychology at the Department of Music from the University of Liverpool and the Director of the APPLIED MUSIC Research Lab. he works in the interdisciplinary fields of Music Psychology and Affective Computing, where his expertise is in the study of emotional expression, perception and induction through music. He has contributed significantly to a broader understanding of the emotional impact of music on listeners, namely on the link between music structure and emotion, the types of emotions induced by music, and individual and contextual factors that mediate the relationships between music and listeners. Currently, his work focuses on the application of music in everyday life

EMAIL: E.Coutinho@liverpool.ac.uk

SCHOOL: Arts

DEPARTMENT: Music

MODULE CODE: SOTA350

Computer Sciences SUITABLE FOR Healthcare Informatics **STUDENTS OF:** Music Psychology **Affective Sciences**

PLACES AVAILABLE: 2

MUSIC SELECTIONS FOR REDUCING BLOOD PRESSURE

PROJECT DESCRIPTION

Listening to certain types of music can lower blood pressure, but those effects depend of the characteristics of music that is listened to. In this project, we aim at developing a software (webpage or mobile app) that can generate music selections with the potential of lowering blood pressure. The ultimate aim is to apply this tool to help suffering from diseases such as hypertension and heart failure, which can have major implications in their quality of life.

ADDITIONAL REQUIREMENTS

Students are expected to be experienced software developers (ideally with experience in mobile app development) and willing to engage with Music Psychology research.

PROJECT DATES

START DATE(S): Session 1 (June 1, 2020)

END DATE(S):

June 26, 2020 (4 weeks) July 24, 2020 (8 weeks)

LENGTH:

4 or 8 weeks

NETWORK TOMOGRAPHY

SUPERVISOR DR MICHELE ZITO



Dr. Michele Zito is a lecturer in the Department of Computer Science of the University of Liverpool. He obtained a Ph.D. in Computer Science from the University of Warwick (UK), after completing his undergraduate studies in Italy, and an M.Sc. in Edinburgh. Author of more than 80 publications including articles on prestigious journals such as Theoretical **Computer** Science (Elsevier) and Algorithmica (Springer) and conferences including the ACM Symposium on Discrete Algorithms, his main research interests are the design and analysis of efficient algorithms, particularly related to Graph Theory, and the study of Random Structures. Over the past five years he became involved in a number of projects related to Complex Networks, and Domestic

Renewable Energy Management.

EMAIL: michele@liverpool.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Computer Science

MODULE CODE: COMP298

SUITABLE FOR
STUDENTS OF:Degree programmes including
Algorithm Design and Analysis or
the study of Networks

PLACES AVAILABLE: 2

NETWORK TOMOGRAPHY

PROJECT DESCRIPTION

A central issue in communication networks is to ensure that the given structure works reliably. Network Tomography is a family of distributed failure detection algorithms based on the spreading of end-to-end measurements rather than directly measuring individual network components. Typically a network is given as a graph along with a collection of paths in it and the goal is to take measurements along such paths to infer properties of the given network. Quoting Duffield (2003) ``A key advantage of tomographic methods is that they require no participation from network elements other than the usual forwarding of packets. This distinguishes them from well-known tools such as traceroute or ping, that require ICMP responses to function. [..] Another feature of tomography is that probing and the recovery of probe data may be embedded within transport protocols, thus co-opting suitably enabled hosts to form impromptu measurement infrastructures". In early work we have studied tomographicalgorithms on various network topologies, including, grids, randomnetworks, and hypercubes. The aim of this project is to runexperiments to test the effectiveness of such algorithms in detectingnode failure, as well as different traffic loads.

ADDITIONAL REQUIREMENTS

Knowledge of Combinatorics and Graph theory would help, but also interest in programming (Python) would be beneficial.

PROJECT DATES

START DATE(S):	Session 1 (June 1, 2020) Session 2 (June 29, 2020)
END DATE(S):	July 24, 2020 August 21, 2020
LENGTH:	8 or 12 weeks

SELF TRACKING USING PERSUASIVE TECHNOLOGY

SUPERVISOR DR FLORIANA GRASSO



I am co-Editor in Chief of Argument and Computation. I am a lecturer in the Department of Computer Science, at the University of Liverpool, UK, where I am a member of the Agent ART research group. I am Deputy Director of the on-line MSc programmes in Computing, fully delivered over the Internet. Other admin tasks include departmental European Liaison Officer, coordinating exchange student programmes, and departmental e-Learning specialist.

EMAIL: floriana@liverpool.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Computer Science

MODULE CODE: COMP298

SUITABLE FOR Computer Science Al STUDENTS OF: Persuasive Technology

SELF TRACKING USING PERSUASIVE TECHNOLOGY

PROJECT DESCRIPTION

Persuasive technology is a relatively recent area which studies the impact that digital interventions can have on people's behaviour or beliefs.

A widely used set of guidelines to identify what persuades are the "6 Cialdini's Principles" (you can find a quick animated video introduction here: http://www.youtube.com/watch?v=cFdCzN7RYbw

You are invited to think of self tracking/self monitoring behaviour (e.g. walk more, cut on sugar/vape etc., control your use of socials, turn off your phone, etc.) and create an app based on one or more of the Cialdini's principles.

PROJECT DATES

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020) Session 3 (July 27, 2020)

> June 26, 2020 July 24, 2020 August 21, 2020

LENGTH:

END DATE(S):

4, 8, or 12 weeks

STYLOMETRIC ANALYSIS OF TWEETS

SUPERVISOR DR FLORIANA GRASSO



I am co-Editor in Chief of Argument and Computation. I am a lecturer in the Department of Computer Science, at the University of Liverpool, UK, where I am a member of the Agent ART research group. I am Deputy Director of the on-line MSc programmes in Computing, fully delivered over the Internet. Other admin tasks include departmental European Liaison Officer, coordinating exchange student programmes, and departmental e-Learning specialist.

EMAIL: floriana@liverpool.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Computer Science

MODULE CODE: COMP298

SUITABLE FOR Computer Science Al STUDENTS OF: Persuasive Technology



STYLOMETRIC ANALYSIS OF TWEETS

PROJECT DESCRIPTION

"Stylometry" is the study of features related to literary style through computational methods, based on the assumption that authors write in a consistent way. A quick intro is here:

https://programminghistorian.org/en/lessons/introduction-tostylometry-with-python

The project will look at devising appropriate stylometry techniques to analyse a data set of social media content (such as the ICWSM Spinn3r dataset).

ADDITIONAL REQUIREMENTS

Some knowledge of machine learning techniques would be preferred, but not essential.

PROJECT DATES

START DATE(S):	Session 1 (June 1, 2020)
	Session 2 (June 29, 2020)
	Session 3 (July 27, 2020)

END DATE(S):

June 26, 2020 July 24, 2020 August 21, 2020

LENGTH: 4,8

4, 8, or 12 weeks



VISUALISING BIG DATASETS OF 3-DIMENSIONAL CRYSTALS

SUPERVISOR DR VITALIY KURLIN



Dr Vitaliy Kurlin is a mathematician by training, now teaching in Computer Science and collaborating with Chemists in the new Materials Innovation Factory: liverpool.ac.uk/materialsinnovation-factory. Details of the research group and publications are at http://kurlin.org.

EMAIL: vkurlin@liv.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Computer Science

MODULE CODE: COMP298

SUITABLE FOR Geometric and Topological Data Analysis STUDENTS OF: with applications to Crystallography and Materials Science



VISUALISING BIG DATASETS OF 3-DIMENSIONAL CRYSTALS

PROJECT DESCRIPTION

Solid crystalline materials (briefly, crystals) underpin many modern and future technologies from high-temperature superconductors to solar cells and gas capture to tackle the climate emergency.

An ideal crystal is defined by a collection of atoms or molecules in a non-rectangular box that is periodically translated in 3 independent directions. The key challenge in crystal discovery is to quantify a similarity between crystals in a new continuous way to explore "hot spots" and "black gaps" in the space of all theoretically possible crystals.

We aim to map the continuous space of crystals by using geometric invariants (distances, angles) that remain stable under atomic vibrations and should uniquely identify any crystal. Your implemented code can substantially contribute to speedingup a discovery of new materials. More specific example projects are at http://kurlin.org/student-projects.php#potential

The first steps in the project will be to install and start using the Computational Geometry Algorithms Library (CGAL, https://www.cgal.org). The other potentially useful software are Eigen (http://eigen.tuxfamily.org) for linear algebra and Mercury (https://ccdc.cam.ac.uk/Community/csd-community/FreeMercury/) for visualising individual crystals given by CIFs, see https://en.wikipedia.org/wiki/Crystallographic_Information_File.

ADDITIONAL REQUIREMENTS

Programming skills in C++ or Python, excellent communication skills, ability to work in a team and learn new topics.

PROJECT DATES

START DATE(S): Session 1 (June 1, 2020)

 Image: Second system
 July 24, 2020

 END DATE(S):
 August 21, 2020

LENGTH:

8 or 12 weeks



GAS SENSING WITH ZNO THIN FILM TRANSISTORS

SUPERVISOR DR IAN SANDALL



I obtained my PhD in Physics from Cardiff University in 2007 and have since worked for Philips Research in Eindhoven, The University of Sheffield and I am now a Lecturer in Electrical Engineering and Electronics at The University of Liverpool. My research concerns the development and application of semiconductor photonic devices. These are devices that convert electrical signals into light (or vise-versa) and include things such as LEDs, Lasers, and CCD Cameras (as used in mobile phones). My current research is concerned with utilizing these devices to develop sensors for a variety of applications, including medical, defence and astronomical observation.

EMAIL: isandall@liverpool.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Electrical Engineering and Electronics

MODULE CODE: ELEC298

SUITABLE FOR STUDENTS OF: Electrical Engineering

PLACES AVAILABLE: 4

GAS SENSING WITH ZNO THIN FILM TRANSISTORS

PROJECT DESCRIPTION

Over the last few decades, with the rapid development of industrialization and urbanization, the severe air pollution primarily attributed to automobile exhaust and factory emission has become a great threat to human survival and development. Meanwhile, a leakage of flammable and explosive gases may result in loss of life and property damage. So, real-time and effective detection of those harmful gases via using gas sensors is in pressing need at present. Off all the numerous semiconductor gas sensors, semiconducting metal oxide based gas sensors have received wide research around the globe by virtue of their high gas response, excellent selectivity, good portability, and low fabrication cost.

Thin film and nano particle ZnO based transistors are highly sensitive to their surrounding environment. Chemical compounds in the atmosphere are able to bind and modify the surface potential of the ZnO resulting in measurable changes in the transistors electrical performance (i.e. causing a shift in the turn on voltage). As such these devices make promising candidates for low cost and portable gas sensing devices.

As well as environmental and industrial based gases as described above, the ability to monitor gases also has applications in medical diagnosis and treatments. One gas of particular interest is ketone (acetone), this is produced in people with diabetes and as such the reliable and accurate monitoring of ketone in breath samples offers a potential route to develop non-invasive diagnosis for diabetes, eliminating the need for repeated blood finger prick based tests, and long term creating the possibility of utilizing a mobile phone sensor and app to monitor glucose levels.

In this project the student will fabricate ZnO thin film Transistors, via thin film deposition techniques and characterize their electrical properties both under ambient conditions and when exposed to gases such as acetone. The selectivity and sensitivity of the devices will be evaluated, with an aim to determine the optimum device design. **PROJECT DATES**

START DATE(S):	Session 1 (June 1, 2020) Session 2 (June 29, 2020) Session 3 (July 27, 2020)
END DATE(S):	June 26, 2020 July 24, 2020 August 21, 2020
LENGTH:	4, 8, or 12 weeks

GRAPH NEURAL NETWORKS FOR COMBINATORIAL PROBLEMS

SUPERVISOR DR XINPING YI



Xinping Yi (S'12-M'15) has been a Lecturer (Assistant Professor) at the Department of Electrical Engineering and Electronics of the University of Liverpool since July 2017. He received his Ph.D. degree in Electronics and Communications (2015) from Telecom ParisTech, Paris, France. Prior to Liverpool, he was a research associate at Technische Universitat Berlin, Berlin, Germany (2014-2017), a research assistant at EURECOM, Sophia Antipolis, France (2011-2014), and a research engineer at Huawei Technologies, Shenzhen, China (2009-2011). His main research interests include information theory, graph theory, optimisation and machine

learning, as well as their applications in wireless communications and artificial intelligence.

EMAIL: xinping.yi@liverpool.ac.uk

SCHOOL: Electrical Engineering, Electronics, and Computer Science

DEPARTMENT: Electrical Engineering and Electronics

MODULE CODE: ELEC298

SUITABLE FOR STUDENTS OF: Deep Learning

GRAPH NEURAL NETWORKS FOR COMBINATORIAL PROBLEMS

PROJECT DESCRIPTION

IMany real-world problems, such as ride-sharing scheduling for online Taxi services (e.g., Uber, Didi), can be cast into combinatorial optimisation. Such problems are usually challenging to solve, especially when the size of the problem (e.g., the number of taxis) is considerably large. Graph Neural Networks (GNN) have been increasingly applied to solve such combinatorial problems and produce novel and efficient algorithms. This project aims to develop novel GNN architectures and algorithms to solve combinatorial problems such as dynamic task assignment and apply them to real-world applications of ride-sharing Taxi scheduling.

ADDITIONAL REQUIREMENTS

Basic knowledge of deep learning.
 Being familiar with Python and PyTorch.

PROJECT DATES

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S):

July 24, 2020 August 21, 2020

LENGTH:

8 or 12 weeks

Engineering



ENGINEERING PROJECTS



LEAD CONTACT DR MATT MURPHY

The School of Engineering is open to hosting students on summer research projects in any of the research areas within the school, led by our 70 academic staff members.

Students with an interest in a particular area of Engineering can see the activities of the University's 3 research centres on these web pages:

- Centre for Engineering Dynamics
- Centre for Engineering Sustainability
- Centre for Materials and Structures

Students should pick 3 possible research areas of interest or staff members they would like to work with and list them on Mobility Online (the online application) with the area of interest or staff member as the module title. Students should also expand upon their interest in their personal statement. Previous projects have been available in the following areas:

- Engineering Sustainability
- Materials and Structure
- Engineering Dynamics
- Renewable Energy
- Risk and Uncertainty
- Virtual Engineering
- Aerospace Engineering & Avionics
- Nuclear Engineering

- Mechanical & Manufacturing Engineering
- Industrial Design
- Civil Engineering
- Architectural Engineering
- Biomedical Engineering
- Flight Science
- Additive Manufacturing

EMAIL: murphym@liverpool.ac.uk

SCHOOL: Engineering

MODULE CODE: ENG290

DATES: Available for 4-12 weeks during all sessions depending on project and supervisor. Students should indicate which dates they would want to attend in their personal statement.



IMPACT OF SOFT CONTACT LENS PERIPHERAL ZONE DESIGN ON OPTICAL POWER

SUPERVISOR DR AHMED ABASS



Dr Ahmed Abass is a lecturer at the school of Engineering, University of Liverpool. Dr Abass's research is focused on the ocular biomechanics of the human eye. He works in the area of medical devices simulation and manufacturing.

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EMAIL: a.abass@liverpool.ac.uk

SCHOOL: Engineering

DEPARTMENT: Engineering

MODULE CODE: ENG290

SUITABLE FOR Biomedical Engineering STUDENTS OF:

IMPACT OF SOFT CONTACT LENS PERIPHERAL ZONE DESIGN ON OPTICAL POWER

PROJECT DESCRIPTION

This project will involve an investigation component and design component ultimately focused on the impact of soft contact lens "peripheral zone" design on the optical power of the lens.

While there is available research regarding "optic zone" design for soft contact lenses, there has been comparatively little work performed on designing the soft lens "peripheral zone". "Peripheral zone" design primarily affects the positioning of the lens on the eye and has a significant effect on the lens fit for the patient. Improving peripheral zone design practices may lead to soft lens designs that increase patient comfort, particularly for patients with astigmatism that rely on a fixed orientation of the lens for clear vision.

In this project, soft contact lenses of varying peripheral zone designs will be generated as finite element models using MATLAB and simulated on a model of the human eye in FEA software such as FEBio. The simulation results will be analysed by a MATLAB light ray-tracing code to identify the impact of each peripheral zone design on the power of the optic zone of the lens while on the eye. The results will be assessed to identify factors in peripheral zone lens design that minimize the variation in optical power across the optic zone. The results may further be used to generate a contact lens design with a peripheral zone optimal for minimising power variance across the optic zone.

ADDITIONAL REQUIREMENTS

Candidates are expected to use the available resources in the school of engineering, mainly computer labs and the MATLAB software package, in addition to the free finite element software package FE-BIO.

PROJECT DATES

START DATE(S):	Session 1 (June 1, 2020) Session 2(June 29, 2020) Session 3 (July 27, 2020)
END DATE(S):	June 26, 2020 July 24, 2020 August 21, 2020

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LENGTH:

4, 8, or 12 weeks
DETERMINATION OF HUMAN EYE'S OPTIC AXES BY CORNEAL TOPOGRAPHY

SUPERVISOR DR AHMED ABASS



Dr Ahmed Abass is a lecturer at the school of Engineering, University of Liverpool. Dr Abass's research is focused on the ocular biomechanics of the human eye. He works in the area of medical devices simulation and manufacturing.

EMAIL: a.abass@liverpool.ac.uk

SCHOOL: Engineering

DEPARTMENT: Engineering

MODULE CODE: ENG290

SUITABLE FOR STUDENTS OF: Biomedical Engineering



DETERMINATION OF HUMAN EYE'S OPTIC AXES BY CORNEAL TOPOGRAPHY

PROJECT DESCRIPTION

In this project, an innovative algorithm of finding the eye's optical axis from topography data will be explored. The optical axis represents the path of a light-ray that enters and leaves the optical system of the eye along the same line.

While the eye's optical axis may be a theoretical construct, the axis remains an important reference line for the measurement and the analysis of the ocular shape. Its applications include being a geometrical axis for spectacles and other corrective lenses that are manufactured in processes that require a unique axial centreline like a lathe centred on its spindles or an injection moulding machine where centring the two halves of the mould around a geometrical axis is an essential process.

As a line, the optical axis can be identified by two points. Accordingly, the student is expected to find the optimal optical axis of human eyes using the geometrical data of the anterior and posterior corneal surfaces as measured by topography machines. MATLAB Optimisation Toolbox [®] (MathWorks, Natick, USA) will be used for finding the optimal intersection points of the optical axis with the corneal front and back surfaces. Then, a MATLAB code will be used to validate the optimal position of the eye's optical axis that does not refract light rays through a light ray-tracing algorithm. All analysed will be carried out via custom-built MATLAB codes.

ADDITIONAL REQUIREMENTS

Candidates are expected to use the available resources in the school of engineering, mainly computer labs and the MATLAB software package.

PROJECT DATES

LENGTH:

START DATE(S):	Session 1 (June 1, 2020) Session 2(June 29, 2020) Session 3 (July 27, 2020)
END DATE(S):	June 26, 2020 July 24, 2020 August 21, 2020

35

4, 8, or 12 weeks

Environmental

Sciences



CLASH OF THE TITANOMAGNETITES

SUPERVISOR DR GREIG PATERSON



I am a NERC Independent Research Fellow at in the Department of Earth, Oceans, and Ecological Sciences at the University of Liverpool. I graduated with a BSc (Hons) in Geophysics from the University of Edinburgh before moving to the University of Southampton for my PhD on the emplacement temperature of pyroclastic deposits and their ability to record Earth's magnetic field. I have worked in Asia for a large part of my career, in particular, spending more than 7 years at the Institute of Geology and Geophysics, Chinese Academy of Sciences (IGGCAS) in Beijing, before moving back to the UK and NERC Fellow. My research is diverse and I work on a range of magnetic applications, from the fundamental physics of magnetic field in the past to understanding magnetic life, in short, all things magnetic.

37

EMAIL: Greig.Paterson@liverpool.ac.uk

SCHOOL: Environmental Sciences

DEPARTMENT: Earth, Ocean, and Ecological Sciences

MODULE CODE: TBA Geophysics SUITABLE FOR STUDENTS OF: Earth Sciences Environmental Science Geology

CLASH OF THE TITANOMAGNETITES

PROJECT DESCRIPTION

Magnetite is the most well-known natural magnetic mineral, but the magnetic minerals in the majority of rocks are not pure magnetite, they are titanomagnetites. However, little is known about the magnetic properties and behavior of titanomagnetites. In particular, understanding their ability to record and remember ancient magnetic fields is of key importance to all paleomagnetic studies.

For this project, the student will model the fundamental physics (known as micromagnetic modeling) behind how individual grains become magnetized to explore the fidelity of the magnetic memory of different titanomagnetites.

ADDITIONAL REQUIREMENTS

Programing experience is favorable, and some familiarity with Linux/unix would be useful.

PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S):

June 26, 2020 July 24, 2020 August 21, 2020

LENGTH:

4 or 8 weeks



DOES HABITAT RESTORATION SUPPORT THE SUSTAINABLE SUPPLY OF MULTIPLE ECOSYSTEM SERVICES?

SUPERVISOR DR FIONA CULHANE



Dr Fiona Culhane is a lecturer in Marine Biology at the University of Liverpool. She has a background in applied marine ecology, in particular in the assessment of marine ecosystem services and in the assessment of environmental health using benthic macroinvertebrates and biotic indices. She is currently interested in the links between the state of marine ecosystems and how they supply a range of ecosystem services.

EMAIL: f.culhane@liverpool.ac.uk

SCHOOL: Environmental Sciences

DEPARTMENT: Earth, Ocean, and Ecological Sciences

MODULE CODE: TBA

SUITABLE FOR
SUITABLE FOR
STUDENTS OF:Marine Ecology
EcologySTUDENTS OF:Environmental Science
Geography

DOES HABITAT RESTORATION SUPPORT THE SUSTAINABLE SUPPLY OF MULTIPLE ECOSYSTEM SERVICES?

PROJECT DESCRIPTION

This project will show how the state of the natural environment affects human wellbeing, by assessing the contributions they provide to people. The environment supports human wellbeing in multiple ways, such as providing food, a safe climate, flood protection and cultural value. These contributions are known as ecosystem services. In the UK, several intertidal sites have been restored to provide flood protection and wildlife habitat. This project will focus on saltmarsh habitats because these are known to make an important contribution to services such as food supply, carbon sequestration, flood protection and recreation. We will assess state of saltmarsh vegetation, benthic invertebrates and sediments, to understand how biodiversity differs in natural (unmanaged) and restored (managed) saltmarsh habitats in the Ribble Estuary, UK. We will also use survey questionnaires of recreational visitors to assess how they value saltmarsh habitats. We will test whether saltmarshes with different biodiversity states have different capacities to supply six ecosystem services: animal food supply, bird habitat maintenance, carbon sequestration, waste storage, recreation and sense of place

ADDITIONAL REQUIREMENTS

Experience in ecology fieldwork and sample processing (vegetation and/or invertebrates), and/or in carrying out social surveys (questionnaires).

START DATE(S):	Session 1 (June 1, 2020) Session 2 (June 29, 2020)
END DATE(S):	June 26, 2020 July 24, 2020 August 21, 2020
LENGTH:	4, 8 or 12 weeks



RECONSTRUCTING FOOD WEBS USING STABLE ISOTOPES

SUPERVISOR DR RACHEL JEFFREYS



I am a benthic ecologist/biogeochemist. I am particularly interested in deep-sea habitats (>200 m water depth). My primary research focus is food web ecology and organic matter biogeochemistry. My main research emphasis is on how organic matter quality and quantity structures benthic communities/food webs and in turn how these communities process and alter organic matter.

EMAIL: rachel.jeffreys@liverpool.ac.uk

SCHOOL: Environmental Sciences

DEPARTMENT: Earth, Ocean, and Ecological Sciences

MODULE CODE: TBA

SUITABLE FOR STUDENTS OF: Oceanography

Marine Biology Environmental Science Biological Science Ecology





RECONSTRUCTING FOOD WEBS USING STABLE ISOTOPES

PROJECT DESCRIPTION

In this project you will use the stable isotopes of carbon and nitrogen as a tool to investigate food web properties in the deep ocean. You will generate your own data by preparing samples for stable isotope analysis in the LIFER (Liverpool Isotopes for Environmental Research) lab.

ADDITIONAL REQUIREMENTS

Marine Biology, Oceanography or Environmental Science, Biological Science, Ecology, degree programme, or biochemistry/chemistry qualification at A-level

PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020)

END DATE(S): June 26, 2020

LENGTH:

4 weeks



UNDERSTANDING THE CARBON SEQUESTRATION POTENTIAL OF FORESTS

SUPERVISOR DR ANDREW HACKET PAIN



I am a climate change ecologist with a particular interest in forests. My research investigates the relationships between climate and forest functioning, including tree growth (and carbon storage), tree reproduction and forest recovery from disturbance.

EMAIL: Andrew.Hacket-Pain@liverpool.ac.uk

SCHOOL: Environmental Sciences

DEPARTMENT: Geography and Planning

MODULE CODE: TBA

SUITABLE FOR STUDENTS OF: Environmental Science Ecology Physical Geography



UNDERSTANDING THE CARBON SEQUESTRATION POTENTIAL OF FORESTS

PROJECT DESCRIPTION

This project will use tree ring samples collected from mountain forests in Europe to calculate annual aboveground carbon sequestration, and quantify the sensitivity to climate variation. You will build your own datasets through the preparation and measurement of existing tree-ring samples, incorporating full training in the measurement and cross-dating of tree-ring chronologies. You will convert tree ring measurements to carbon increment using allometric methods, and then analyse the year-toyear and long-term variations in carbon storage, and how they relate to climate and other factors.

ADDITIONAL REQUIREMENTS

Laboratory experience would be helpful, but not essential. Some knowledge of tree biology and/or forest ecology will help you in the interpretation of your data.

PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020) Session 2(June 29, 2020) Session 3 (July 27, 2020)

END DATE(S):

June 26, 2020 July 24, 2020 August 21, 2020

LENGTH:

4, 8, or 12 weeks



THE WEAKENING GEOMAGNETIC SHIELD

SUPERVISOR DR GREIG PATERSON



I am a NERC Independent Research Fellow at in the Department of Earth, Oceans, and Ecological Sciences at the University of Liverpool. I graduated with a BSc (Hons) in Geophysics from the University of Edinburgh before moving to the University of Southampton for my PhD on the emplacement temperature of pyroclastic deposits and their ability to record Earth's magnetic field. I have worked in Asia for a large part of my career, in particular, spending more than 7 years at the Institute of Geology and Geophysics, Chinese Academy of Sciences (IGGCAS) in Beijing, before moving back to the UK and NERC Fellow. My research is diverse and I work on a range of magnetic applications, from the fundamental physics of magnetic field in the past to understanding magnetic life, in short, all things magnetic.

EMAIL: Greig.Paterson@liverpool.ac.uk

SCHOOL: Environmental Sciences

DEPARTMENT: Earth, Ocean, and Ecological Sciences

MODULE CODE: TBA

SUITABLE FOR
STUDENTS OF:Geophysics
Environmental Science
Earth Sciences
Geology



THE WEAKENING GEOMAGNETIC SHIELD

PROJECT DESCRIPTION

The strength of our protective magnetic field is in a state of rapid decline, but how long this will persist, how rapid it will become, and what it will mean for modern life remains unknown. To achieve this understanding, we need to understand how the geomagnetic field is generated, but our ability to do this is held back by the uncertainty in records of the ancient magnetic field strength (paleointensity).

We will do this by developing a new model of paleointensity behavior that can be used to estimate the reliability of published results. This model can be calibrated with real experimental data giving applicants the opportunity to combine both numerical and experimental research.

ADDITIONAL REQUIREMENTS

Programing skills are essential, especially familiarity with MATLAB

PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S):

June 26, 2020 July 24, 2020 August 21, 2020

LENGTH:

4 or 8 weeks



History, Languages,

and Cultures



CHILEAN EXILES AND THEIR POLITICAL ACTIVISM IN THE UK, 1973-1989

SUPERVISOR DR MARIEKE RIETHOF



Marieke Riethof has a PhD in Political Science and International Relations from the University of Amsterdam and is Senior Lecturer in Latin American Politics at the University of Liverpool. Her latest research examines the role of transnational solidarity movements and exile in the opposition to military dictatorship in Chile.

EMAIL: mriethof@liverpool.ac.uk

SCHOOL: History, Languages, and Cultures

DEPARTMENT: Modern Languages and Cultures

MODULE CODE: TBA

SUITABLE FOR Latin American Politics **STUDENTS OF:** Modern History



CHILEAN EXILES AND THEIR POLITICAL ACTIVISM IN THE UK, 1973-1989

PROJECT DESCRIPTION

The research intern(s) will help organise and digitise an archive belonging to a Chilean political activist who went into exile in the UK in the 1970s and 1980s. The archive contains documents about Chilean political activism and human rights campaigning in the UK as well as collaboration with other solidarity groups (particularly Central America). The documents are unique because most available archival material focuses on the experiences of British, rather than Latin American, activists in the solidarity movement. This project provides interns with an opportunity to learn how academics use, organise and interpret archival material as part of an ongoing research project.

ADDITIONAL REQUIREMENTS

Approximately half of the archive is in English and the other half in Spanish. An ability to read Spanish is desirable, but not essential.

PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020)

END DATE(S): June 26, 2020

LENGTH: 4 weeks



EDITING, PROMOTING AND SHOWCASING ACADEMIC RESEARCH

SUPERVISOR PROF CLAIRE TAYLOR



Claire Taylor is Gilmour Chair of Spanish and Professor of Hispanic Studies at the University of Liverpool. She is a specialist in Latin American literature and culture, and has published widely on a range of writers, artists and genres from across the region. Her particular geographical areas of interest are Colombia, Argentina and Chile, although she also worked on literature, art and culture from other regions. Within Latin American Cultural Studies, she takes a particular interest in the varied literary and cultural genres being developed online by Latin(o) Americans, especially hypertext novels, e-poetry and net art. She has published numerous articles and book chapters on these topics, and is the co-author of the recent volume Latin American Identity in Online Cultural Production (New York: Routledge, 2012), and author of the recent monograph Place and Politics in Latin America Digital Culture: Location and Latin American Net Art (New York: Routledge, 2014). She is currently

working on an AHRC-funded project focusing on memory, victims and representation of the Colombian conflict.

EMAIL: C.L.Taylor@liverpool.ac.uk

SCHOOL: History, Languages, and Cultures

DEPARTMENT: Modern Languages and Cultures

MODULE CODE: TBA

Communication Studies SUITABLE FOR Media Studies STUDENTS OF: Modern Languages English

PLACES AVAILABLE: 2

50

EDITING, PROMOTING AND SHOWCASING ACADEMIC RESEARCH

PROJECT DESCRIPTION

This project will allow students to try their hand at academic researchrelated skills as these pertain to the dissemination of research findings. They will support the AHRC-funded research project, Women, Victims, and Memory of the Colombian Conflict, gaining real-world skills in working with a live research project. Firstly, they will learn skills in conference organization, helping set conference themes, organise panels, and also in precis writing, as they support authors in writing abstracts. Secondly, they will support one of the publications arising from the project, gaining crucial skills in editing and proof reading, as well as in liaising with authors based in various countries around the globe.

ADDITIONAL REQUIREMENTS

Excellent language skills in English and Spanish are essential for this project. Digital skills, and in particular prior experience of creative uses of blogs or Twitter, would be an advantage. In terms of discipline, the project would be particularly suited to students of communication studies, media studies, and English, as well as Modern Languages.

PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S): June 26, 2020 July 24, 2020

LENGTH: 4 or 8 weeks

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RESEARCHING LANGUAGES AND 'THINGS' ON INSTAGRAM

SUPERVISOR PROF ROBERT BLACKWOOD



Robert Blackwood is Professor of French Sociolinguistics at the University of Liverpool and a specialist in language policy, linguistic landscapes, multilingualism, and digital discourse. He has published numerous articles and book chapters on these topics. His particular geographical areas of interest are France in its widest sense, including territories in the Caribbean Sea, the Indian Ocean, and the South Pacific. He is currently working on a project focusing on multilingual memories, looking at how museums and monuments present collective memories mono- and multilingually.

EMAIL: Robert.Blackwood@liverpool.ac.uk

SCHOOL: History, Languages, and Cultures

DEPARTMENT: Modern Languages and Cultures

MODULE CODE: TBA

SUITABLE FOR STUDENTS OF: Communication Studies Media Studies Modern Languages



RESEARCHING LANGUAGES AND 'THINGS' ON INSTAGRAM

PROJECT DESCRIPTION

Dismissed for a range of reasons, social network services provide invaluable insights into how individuals relate to each other, and what 'things' from so-called real life people draw upon to make connections and to lubricate their daily interactions with others. Building on a project looking at Instagram use as Paris' Orly airport, this project involves building a corpus of data captured from this social network service. The student will learn about the processes of handling Internet data, develop their skills in database management, use their language skills to interpret exchanges between individuals, and prepare their findings for sharing via an academic poster.

ADDITIONAL REQUIREMENTS

Excellent language skills in English and French are essential for this project. Digital skills, above and beyond using social media, would be an advantage. In terms of discipline, the project would be particularly suited to students of communication studies, media studies, and Modern Languages.

PROJECT LENGTH

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START DATE(S): Session 1 (June 1, 2020)
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END DATE(S): June 26, 2020

LENGTH: 4 weeks

53

URBAN REALMS OF MEMORY: READING LIVERPOOL IN THE LIGHT OF PIERRE NORA

SUPERVISOR PROF CHARLES FORSDICK



Charles Forsdick is James Barrow Professor of French at the University of Liverpool. He is currently Arts and Humanities Research Council theme leadership fellow for 'Translating Cultures', a programme of over 120 projects focused on translation, interpreting and multilingualism. He has published on a range of subjects, including travel writing, colonial history, postcolonial and world literature, and the memorialization of slavery. Recent books include The Black Jacobins Reader (Duke University Press, 2016), Toussaint Louverture: Black Jacobin in an Age of Revolution (Pluto, 2017) and Keywords for Travel Writing Studies (Anthem Press, 2019). A member of the Academy of Europe, Charles Forsdick is chair of the editorial advisory board and a non-executive director at Liverpool University Press, for whom he also edits the Contemporary French and Francophone Cultures series.

Between 2016 and 2018, Forsdick led an international project, with partners in France and Australia, on '"Dark Tourism" in Comparative Perspective: Sites of Suffering, Sites of Memory'. This work explored the relationship between memory, place and cultural heritage. Charles's particular focus in the project was on the cultures of penal and convict incarceration in France, the UK, Tasmania, French Guiana, New Caledonia and Vietnam.

A co-edited book of relevance to the proposed project is forthcoming:

Postcolonial Realms of Memory: Sites and Symbols in Modern France, ed. by Charles Forsdick, Etienne Achille and Lydie Moudileno (Liverpool: Liverpool University Press, 2020). (ISBN: 978-1-789-62066-5)

EMAIL: C.Forsdick@liverpool.ac.uk

SCHOOL: History, Languages, and Cultures

DEPARTMENT: Modern Languages and Cultures

MODULE CODE: TBA

SUITABLE FOR
STUDENTS OF:History
GeographySTUDENTS OF:Modern Languages



URBAN REALMS OF MEMORY: READING LIVERPOOL IN THE LIGHT OF PIERRE NORA

PROJECT DESCRIPTION

The project will (i) allow students to become familiar with the work of Pierre Nora on realms of memory, (ii) encourage students to engage with a critique of Nora from the perspective of postcolonial thought, (iii) reflect on the implications of the concept of the 'lieu de mémoire' for a city such as Liverpool, focusing in particular (but not exclusively) on questions of slavery and colonialism, and shifting from a national focus to one that is local, (iv) conduct fieldwork in the city to identify tangible and intangible realms of memory (e.g., museums, monuments, sculptures, cemeteries, key sites [Anfield, Albert Dock, Matthew Street], Scouse/scouse), (v) select a small selection of examples of such sites that will study in depth, and (vi) present their findings in creative ways.

ADDITIONAL REQUIREMENTS

The project will be particularly suited to students of history, geography and/or modern languages, although it would be of interest to any who wish to combine conventional academic study with more practical fieldwork. Creative flair – in terms of an ability to take photographs or record soundscapes – would be an advantage, as would a curiosity about uncovering the hidden, forgotten or disavowed aspects of urban space. Depending on the project developed, there would be opportunities for archival work or interaction with heritage institutions.

PROJECT LENGTH

START DATE(S):	Session 1 (June 1, 2020) Session 2 (June 29, 2020
END DATE(S):	June 26, 2020 July 24, 2020
I FNGTH:	4 or 8 weeks

Law and

Social Justice



CAN THE EUROPEAN COURT OF HUMAN RIGHTS SHAPE EUROPEAN PUBLIC ORDER?

SUPERVISOR DR KANSTANTSIN DZEHTSIAROU



Dr Kanstantsin Dzehtsiarou read for his undergraduate law degree in Belarus. Then he took a MA in European Studies from the University of Sussex. In 2007 Kanstantsin began working on his PhD project 'European Consensus in the Case Law of the European Court of Human Rights' (UCD Dublin, Ireland) which he successfully defended in 2011. Kanstantsin moved to the University of Liverpool in 2015 from the University of Surrey where he has been a lectuer and then a senior lecturer in law since January 2012. He is also a visiting professor at the European Humanities University (Lithuania), he cooperates with international intergovernmental and non-governmental organisations as an expert in international and European human rights His research law. interests spread between

interpretation of the European Convention of Human Rights, reform of the European Court of Human Rights, administration of international justice, comparative and constitutional law.

EMAIL: dzeh@liverpool.ac.uk

SCHOOL: Law and Social Justice

DEPARTMENT: Law

MODULE CODE: TBA

SUITABLE FOR Law, Pre-Law, Human Rights, STUDENTS OF: Political Science



CAN THE EUROPEAN COURT OF HUMAN RIGHTS SHAPE EUROPEAN PUBLIC ORDER?

PROJECT DESCRIPTION

The European Court of Human Rights (ECtHR or Court) has referred to the term 'European Public Order' in over 100 judgments. This number suggests that its deployment is not a coincidence and the Court takes European Public Order seriously. Moreover, the Grand Chamber of the ECtHR is referring to European Public Order more and more often now. At the same time, in none of these judgments has the Court explained what European Public Order actually means and how it can be conceptualised. The Court's references to European Public Order are often inconsistent and highlight various aspects of its meaning. If the ECtHR has an ambition to shape and regulate European Public Order it needs to clarify its understanding of this complex abstract notion.

Students will be involved in selecting relevant case law, analysing legal sources and reviewing publications on the topic. It will also involve some editorial work.

ADDITIONAL REQUIREMENTS

Native English speakers or level close to native; experience in editing and legal research will be preferable.

PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020)

END DATE(S): June 26, 2020 July 24, 2020

LENGTH:

4 or 8 weeks



THE EFFECTS OF PERSISTENT OBJECTION IN INTERNATIONAL CUSTOMARY LAW

SUPERVISOR DR VASSILIS TZEVELEKOS



Vassilis joined the University of Liverpool School of Law and Social Justice in 2016 as a Senior Lecturer in Law. He holds a PhD on Public International Law from the European University Institute, where he also did a Master on Legal Research. Before the European University Institute he studied European Politics at the College of Europe (MA in European Politics) and Public International Law at Paris 1 Panthéon-Sorbonne (DEA). Vassilis did his main studies in Law (undergraduate) at the University of Athens and is qualified with the Athens' Bar. In the past, he has been a visiting scholar at Columbia Law School and a Grotius Fellow for one academic year at the University of Michigan Law School. Vassilis is a general international law lawyer with a special interest in human rights protection. He has

published in various areas, including theory of general international law, European human rights law and the interaction between the two -with emphasis on the system of the European Convention on Human Rights.

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SCHOOL: Law and Social Justice

DEPARTMENT: Law

MODULE CODE: TBA

SUITABLE FOR STUDENTS OF: Law, Pre-Law



THE EFFECTS OF PERSISTENT OBJECTION IN INTERNATIONAL CUSTOMARY LAW

PROJECT DESCRIPTION

One of the two main methods (i.e. sources) in international law for the creation of rules is international customary law. This corresponds to a process leading to the establishment of unwritten rules that owe their legal force to the practice of the members of the society (i.e. states) and to their belief (opinio juris) that their practice has been transformed into a legal duty (i.e. a customary rule) which is breached when society members diverge from it. Persistent objection is a doctrine holding that states that persistently object an emerging customary rule (i.e. a rule in the process of formation) may opt out from it, i.e. the rule is not opposable to persistent objectors.

The student working on this project/area will be asked to examine how international law textbooks (both current and old ones) have treated persistent objection and trace the evolution of this doctrine in these textbooks. Particular attention should be given to: a) which textbooks favour this doctrine, and b) which textbooks discuss the effects persistent objection may generate in the

case of peremptory rules of international law (i.e. jus cogens rules).

ADDITIONAL REQUIREMENTS

Some knowledge of public international law is required. PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S):

June 26, 2020 July 24, 2020

LENGTH: 4 or 8 weeks ADDITIONAL NOTES

The student working on this project will work with Dr Tzevelekos remotely. Students will have in-person communication and support from other administrators and supervisors in the School of Law and Social Justice, as well as the Study Abroad Team, throughout their time in Liverpool.

EUROPEAN CONSENSUS IN THE ECTHR CASE LAW

SUPERVISOR DR VASSILIS TZEVELEKOS



Vassilis joined the University of Liverpool School of Law and Social Justice in 2016 as a Senior Lecturer in Law. He holds a PhD on Public International Law from the European University Institute, where he also did a Master on Legal Research. Before the European University Institute he studied European Politics at the College of Europe (MA in European Politics) and Public International Law at Paris 1 Panthéon-Sorbonne (DEA). Vassilis did his main studies in Law (undergraduate) at the University of Athens and is qualified with the Athens' Bar. In the past, he has been a visiting scholar at Columbia Law School and a Grotius Fellow for one academic year at the University of Michigan Law School. Vassilis is a general international law lawyer with a special interest in human rights protection. He has

published in various areas, including theory of general international law, European human rights law and the interaction between the two -with emphasis on the system of the European Convention on Human Rights.

EMAIL: v.tzevelekos@liverpool.ac.uk

SCHOOL: Law and Social Justice

DEPARTMENT: Law

MODULE CODE: TBA

SUITABLE FOR STUDENTS OF: Law, Pre-Law

PLACES AVAILABLE: 2

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EUROPEAN CONSENSUS IN THE ECTHR CASE LAW

PROJECT DESCRIPTION

The text of the European Convention on Human Rights (ECHR) is in most parts general and abstract. It acquires a specific meaning when it is interpreted in the light of the particular circumstances of a case. One of the methods of interpretation employed by the European Court of Human Rights (ECtHR) is the so-called European consensus method of interpretation. The exact meaning of this term and the function of this method of interpretation are debated in scholarship. It is commonly accepted however that, by means of this method, said Court proceeds with comparative analysis of extraneous sources (including state practice), i.e. of sources that are foreign to the text of the ECHR. The aim of the Court is to identify consensus/trends that allow it to establish particular human rights standards.

The student(s) working on this project will be given a number of ECtHR judgments and they will be asked to: a) identify all references made by all involved actors (such as the parties to the dispute, the Court itself, concurring/dissenting judges etc.) to extraneous sources, and b) assess these references with a view to conclude whether they amount to an application of the European consensus method of interpretation.

ADDITIONAL REQUIREMENTS

Knowledge of ECHR law PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S): June 26, 2020 July 24, 2020

LENGTH: 4 or 8 weeks
ADDITIONAL NOTES

The student working on this project will work with Dr Tzevelekos remotely. Students will have in-person communication and support from other administrators and supervisors in the School of Law and Social Justice, as well as the Study Abroad Team, throughout their time in Liverpool.

Life Sciences



EXPLORING THE DEVELOPMENT OF THE EMBRYONIC CEREBELLUM

SUPERVISOR DR THOMAS BUTTS



I am programme director for anatomy at the University of Liverpool. My research is centred on understanding the development and evolution of the vertebrate brain. In particular, we work on the control of neurogenesis in cerebellar granule progenitors, the largest progenitor population in the brain, using focal genetic manipulation in the developing chick embryo. Deep in the annals of evolutionary history, I read Cell Biology at the University of Durham and subsequently received my PhD from the University of Oxford in the evolution of homeobox genes in animals. Following this, I moved to King's College, London where my interest in the nervous system was

honed, and before Liverpool was a lecturer in neurobiology on the Nanchang Joint Programme at Queen Mary, University of London.

EMAIL: tbutts@liverpool.ac.uk

SCHOOL: Life Sciences

DEPARTMENT: Cellular and Molecular Physiology

MODULE CODE: LIFE398

SUITABLE FOR STUDENTS OF: Developmental Neurobiology



EXPLORING THE DEVELOPMENT OF THE EMBRYONIC CEREBELLUM

PROJECT DESCRIPTION

Our lab studies how the brain develops, particularly the process of neurogenesis in the cerebellum and how this evolves, using sophisticated genetic manipulations of the developing chick embryo. We study the cerebellum as it has the largest neuronal progenitor cell population in the brain, has significantly contributed to the evolutionary history of the brain, and also is a prominent place of origin for the most common paediatric brain tumour, medulloblastoma.

ADDITIONAL REQUIREMENTS

Be interested in embryonic development and prepared to work with chick embryos.

PROJECT LENGTH

Session 1 (June 1, 2020) **START DATE(S):** Session 2 (June 29, 2020)

END DATE(S):

June 26, 2020 July 24, 2020 August 21, 2020

LENGTH:

4 or 8 weeks



SCREENING FOR CELLULAR STRESS CAUSED BY ABNORMAL COLLAGEN

SUPERVISOR DR ELIZABETH LAIRD



Dr Liz Canty-Laird is a Reader (Associate Professor) in the Department of Musculoskeletal Biology at the University of Liverpool, UK. Her research focusses on the role of abnormal type I collagen in inherited and age-related disease and encompasses tissue engineering and stem/progenitor cell studies. Liz carried out post-doctoral research in the Wellcome Trust Centre for Cell-Matrix Research at the University of Manchester, where she also studied for a PhD funded by Versus Arthritis. She holds a BSc in Biochemistry and Biological Chemistry from the University of Nottingham.

EMAIL: eglaird@liverpool.ac.uk

SCHOOL: Life Sciences

DEPARTMENT: Musculoskeletal Biology

MODULE CODE: LIFE398 Life Sciences Biological Sciences Biomedical Sciences Veterinary Science Medicine Pre-Med

PLACES AVAILABLE: 1

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SCREENING FOR CELLULAR STRESS CAUSED BY ABNORMAL COLLAGEN

PROJECT DESCRIPTION

The project aims to determine how abnormal type I collagen can cause bone fragility using laboratory techniques such as Western blotting and/or PCR. Collagen is the major structural component of vertebrate tissues. Collagen mutations result in brittle bones and/or loose connective tissues by detrimentally either affecting collagen tissue structure or the cells that make collagen. Comparing two different models can distinguish between effects of abnormal collagen on the tissue itself or on the cells. Results from this work are important to inform rational treatments for brittle bone disease.

ADDITIONAL REQUIREMENTS

Laboratory skills training e.g. pipette handling and understanding of safe laboratory working (good practice and following risk assessments). Prior knowledge of basic genetics, transcription, translation, protein folding and trafficking would be useful.

PROJECT LENGTH

START DATE(S):

Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S):

July 24, 2020 August 21, 2020

LENGTH:

8 or 12 weeks



Psychology



A DESCRIPTIVE ANALYSIS OF INDIVIDUALS WITH CHRONIC PAIN

SUPERVISOR DR CHRISTOPHER BROWN



Dr Christopher Brown is a neuroscientist and lecturer at the University of Liverpool. His research investigates how brain states influence pain perception and behaviour, with an aim to develop new treatments for chronic pain. He has studied brain processes related to the effects of expectancy, placebo and mindfulness on acute and chronic pain, involving the use of psychophysics, neuroimaging (EEG and fMRI) and statistical modelling.

EMAIL: cab79@liverpool.ac.uk

SCHOOL: Psychology

DEPARTMENT: Psychology

MODULE CODE: PSYC001

SUITABLE FOR
STUDENTS OF:PsychologyNeuroscience
A DESCRIPTIVE ANALYSIS OF INDIVIDUALS WITH CHRONIC PAIN

PROJECT DESCRIPTION

We are currently undergoing data collection data for a large study (target n=165) that aims to understand how the brain's structure and function contribute to pain perception in patients with chronic pain. We are recruiting participants with two types of chronic pain: fibromyalgia and rheumatoid arthritis. During the study visits, participants fill in multiple questionnaires exploring individual characteristics such as demographics, mental health, pain catastrophising and the impact of pain on daily life.

The student will manage the questionnaire database and do some basic statistical analysis exploring our samples demographics, clinical pain diagnosis, mental health and/or pain perception. There will be some flexibility on the research question to allow the student to research current pain literature and tailor the question to their interests. The student will also have the opportunity to observe EEG visits where patients do tasks

whilst we measure the electrical activity of their brain, and MRI visits where we take 'pictures' of the brains structure and function whilst completing tasks.

ADDITIONAL REQUIREMENTS

Knowledge and a keen interest in statistical analysis, including experience analysing data on programs such as SPSS, R or Excel.

PROJECT LENGTH

START DATE(S):

Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S):

July 24, 2020 August 21, 2020

LENGTH:

8 or 12 weeks

MULTIVARIATE MODELS OF MISSING PERSONS

SUPERVISOR DR SUSAN GILES



Susan Giles lectures in Forensic and Dr Investigative Psychology at the University of Liverpool. Her research specialisms include equivocal death and contested document analysis, decision making in missing person enquiries, sex offender risk assessment and programme evaluation. Susan collaborated has academics in psychology, economics, with computing and mathematical sciences to develop a GIS application (CASPER) to assist the police with missing person and self-harm enquiries.

EMAIL: spgiles@liverpool.ac.uk SCHOOL: Psychology DEPARTMENT: Psychology

MODULE CODE: PSYC001

SUITABLE FOR
STUDENTS OF:PsychologySTUDENTS OF:Forensic Psychology

PLACES AVAILABLE: 1

MULTIVARIATE MODELS OF MISSING PERSONS

PROJECT DESCRIPTION

In the UK, from 2011 to 2012, it was estimated that approximately 313,000 missing from home (MFH) reports were dealt with by police (Serious Organised Crime Agency (SOCA), 2013). Other statistics estimate that someone is reported missing in the UK every 2 minutes (NPIA, 2011). This places considerable demand on the police and its partnered agencies (Shalev-Greene & Pakes, 2013). Additional problems arise when we consider that being MFH dramatically increases one's chances of coming to some other form of harm, or being the victim/perpetrator of crime (SOCA, 2013). Police statistics show as many as 750 cases a year will result in a fatal outcome (SOCA. 2013). Also, in times of austerity it is even more important to consider new effective strategies of responding to MFH reports, especially since recent estimations place the overall annual cost of missing people at £700 million (Shalev-Greene et al., 2013). It is not surprising then that the Home Office (2011) has made the improvement of policing in this area a key priority. With concurrent advances in, and the general movement towards, evidence based policing (EBP) the literature has seen an increase in MFH research. Despite this there are still considerable gaps in the literature.

The broad aim of our research approach is to develop the CASPER system. CASPER is an interactive geo-spatial decision support system that aims to assist police decision making in MFH cases. The CASPER software will combine map technology with findings from primary research and will present this trend data to end users to help prioritise search areas, support investigative lines of enquiry and to examine 'what-if scenarios' in new MFH cases. A key anticipated outcome of this work is that this evidence based approach will help police teams to identify those who are most likely to come to harm and to help police forces find vulnerable individuals who are MFH safer and faster.

Working alongside Dr Susan Giles you will contribute to the range of primary research underlying the CASPER system. We have over 20,000 MFH cases to analyse. You will contribute to data analysis and report writing on the following areas:-

- Who goes missing repeatedly and how does this link to harm?
- What are the different ways in which police forces manage their response to missing person investigations?
- What are the spatial behaviours of missing people?

MULTIVARIATE MODELS OF MISSING PERSONS

ADDITIONAL REQUIREMENTS

Knowledge and a keen interest in statistical analysis, including experience analysing data on programs such as SPSS or Excel.

PROJECT LENGTH

START DATE(S): Session 1 (June 1, 2020) Session 2 (June 29, 2020)

END DATE(S):

June 26, 2020 July 24, 2020

LENGTH:

4 or 8 weeks

