THE UNIVERSITY
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Beacon Conference of
Undergraduate Research
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BeaCUR Program

Time	Mins		
8:30am	30	**Registration opens** Ingkarni Wardli Atrium	
9:00am	10	**Welcome and Opening Remarks** Pro Vice-Chancellor (Student Learning) 1022 Lecture Theatre, Horace Lamb	
9:10am	20	**Keynote** **Discovering Research** Christianna Digenis (2016 BeaCUR winner, and ACUR presenter) 1022 Lecture Theatre, Horace Lamb	
9.30am	**10**	**Move to Parallel Sessions**	
		Room 1 Conference Room, Level 7, Ingkarni Wardli	**Room 2** B18, Basement, Ingkarni Wardli
9.40am	20	**How at-risk are you at work? Understanding the relationship between risk perceptions, organisational commitment and employee Information Security Awareness** Andrew Reeves, School of Psychology, Faculty of Health and Medical Sciences	**Using RNA-Seq for Alternative Splicing analysis in repetitive elements: innovative idea or noisy nightmare?** Brittany Howell, School of Biological Sciences, Faculty of Sciences
10.00am	20	**Looking Deeper – Using Deep-Learning to Identify Internet Communications Traffic** Clinton Page, Kyle Millar, Daniel Smit, School of Electrical & Electronic Engineering, Faculty of Engineering, Computer and Mathematical Sciences	**Men's experiences of support following pregnancy loss** Kate Obst, School of Psychology, Faculty of Health and Medical Sciences
10.20am	20	**Validating an improved measurement model for the evaluation of eyewitness identification procedures** Kym McCormick, School of Psychology, Faculty of Health and Medical Sciences	**Deaths in Incorrectly Identified Low Surgical Risk Patients** Charles Jones, Adelaide Medical School, Faculty of Health and Medical Sciences
10.40am	20	**Police Powers to Compel Access to Encrypted Devices and Computer Records** Esther Phipps and Gerald Manning, Adelaide Law School, Faculty of the Professions	**Transnationalism and Diaspora: Examining the impacts of Singaporean migrants on the development of South Australia's tourism industry** Hannah Hia, School of Social Sciences, Faculty of Arts
11.00am	**20**	**Morning Tea** (Ingkarni Wardli Atrium)	
11.20am	20	**Perioperative Chemotherapy for Gastric Carcinoma: Not so 'MAGIC'?** Raghav Goel, Adelaide Medical School, Faculty of Health and Medical Sciences	**Do grapevines have ecological memory of drought stress?** Imogen McNamara, Grace Jiranek, Matthew Howard, Michelle Huckel, Declan Howkins and Gavin Mills, School of Agriculture, Food and Wine, Faculty of Sciences
11.40am	20	**How I Learned to Stop Worrying and Love Consciousness** Harley Morphett, School of Humanities, Faculty of Arts	**Design and Build a Continuous Hydrothermal Liquefaction system** Samantha Scott, Adrian Hoffmann, Nien Yee Too and Stuart Smith, School of Mechanical Engineering, Faculty of Engineering, Computer and Mathematical Sciences

12.00pm	20	**Regulation and utilisation of metals in malaria parasite growth** Isabelle Henshall, School of Biological Sciences, Faculty of Sciences	**When do the rivers run dry? Detecting low flows in the Eastern Mount Lofty Ranges** Matthew Bell, Renae Hawke, Daniel Woods and Marco du Bruyn, School of Civil, Environmental and Mining Engineering, Faculty of Engineering, Computer and Mathematical Sciences
12.20pm	20	**Dissecting the role of a novel protein in malaria disease** Benjamin Liffner, School of Biological Sciences, Faculty of Sciences	**Ant abundance increases with grazing exclusion: response of Formicidae (Hymenoptera) to 90 years of non-native herbivore removal in a semi-arid rangeland system** Joel Driver, School of Biological Sciences, Faculty of Sciences
12.40pm	**40**	**Lunch and Poster Presentations** (Ingkarni Wardli Atrium)	
1.20pm	20	**Keynote** **Research Matters: a personal reflection** Professor Philippa Levy, Pro Vice-Chancellor (Student Learning) 102 Lecture Theatre, Napier	
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		Room 1 Conference Room, Level 7, Ingkarni Wardli	**Room 2** B18, Basement, Ingkarni Wardli
1.50pm	20	**Combinatorial Markov Chains in Candy Crush Enumeration** Adam Hamilton, School of Mathematical Sciences, Faculty of Engineering, Computer and Mathematical Sciences	**The Representation of Femininities in Japanese *Shōnen* Manga (Boys' Comics): An Analysis of the Female Characters of *Naruto Shippuuden*￼** Genevieve Brandenburg, School of Social Sciences, Faculty of Arts
2.10pm	20	**High precision number representation for modern computing** Reuben Sugars, Thomas Chadwick and Yuan-li Chen, School of Electrical & Electronic Engineering, Faculty of Engineering, Computer and Mathematical Sciences	**Mechanism of neuroprotection by mechano-growth factor, a muscle specific isoform of insulin-like growth factor 1** Courtney Subramaniam, Adelaide Medical School, Faculty of Health and Medical Sciences
2.30pm	20	**Higher Dimensional Venn Diagram Analogues** Vanessa Thompkins, School of Mathematical Sciences, Faculty of Engineering, Computer and Mathematical Sciences	**Red/ Near Infrared Light Therapy – protection of retinal pigment epithelial cells from oxidative damage** Prajay Patel, Adelaide Medical School, Faculty of Health and Medical Sciences
2.50pm	20	**'Separate the whore from the pure': Assisted female migration and Crime in South Australia, 1856-1859** Tiana Blazevic, School of Humanities, Faculty of Arts	**Orofacial and dental characteristics in Crouzon syndrome** Alexander Khominsky, Adelaide Dental School, Faculty of Health and Medical Sciences
3.10pm	20	**Beyond justification: the role of parliamentary discourses of queue-jumping in relation to mandatory offshore detention** Riley Calaby, Adelaide Law School, Faculty of the Professions	**Changes in Brainstem Cytokines in Normal Ageing and Motor Neurone Disease** Anuradha Tennakoon, Adelaide Medical School, Faculty of Health and Medical Sciences
3.30pm	**40**	**Networking drinks** (all BeaCUR delegates)	**Judges' Deliberations** (Judges only) 3.30 – 4.00pm B18, Basement, Ingkarni Wardli
4.10pm	10	**Closing Address and Announcement of Prize Winners** Professor Philippa Levy, Pro Vice-Chancellor (Student Learning) Conference Room 715, Level 7, Ingkarni Wardli	
4.20pm	**-**	**Conference Concludes**	

Poster Presentations

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12:40	40	**Within Category Feature Correlations and the Curse of Dimensionality** Cearns, Micah, School of Psychology, Faculty of Health and Medical Sciences
12:40	40	**Using RNA-Seq for Alternative Splicing analysis in repetitive elements: innovative idea or noisy nightmare?** Howell, Brittany, School of Biological Sciences, Faculty of Sciences
12:40	40	**The Relationship between Mental Health Literacy and CAM Beliefs in International Students** Huang, Yunhe, School of Psychology, Faculty of Health and Medical Sciences
12:40	40	**Robust Numerical Implementation of Hydrological Model GR4J** Jiang, Wanying (Athena), School of Civil, Environmental and Mining, Faculty of Engineering, Computer and Mathematical Sciences
12:40	40	**Ticagrelor versus Clopidogrel in Stable Coronary Artery Disease Patients undergoing Elective Percutaneous Coronary Intervention** Jones, Dione, Adelaide Medical School, Faculty of Health and Medical Sciences
12:40	40	**Review of El-Nino Southern Oscillation and the effect of climate change on ENSO** Moran, Jack, School of Physical Sciences, Faculty of Sciences
12:40	40	**Mechanism of neuroprotection by mechano-growth factor, a muscle specific isoform of insulin-like growth factor 1** Subramaniam, Courtney, Adelaide Medical School, Faculty of Health and Medical Sciences
12:40	40	**Contextualising residents' calls for staff assistance: A prototype web-based call-bell system in residential aged care facility** Zhang, Donald, School of Electrical and Electronic Engineering, Faculty of Engineering, Computer and Mathematical Sciences

Keynotes

Professor Philippa Levy, Pro Vice-Chancellor (Student Learning)

Philippa joined the University of Adelaide as Pro Vice-Chancellor Student Learning in April 2015. She previously was Deputy Chief Executive, and Director of Academic Practice, of the UK's body for the enhancement of learning and teaching in higher education, the Higher Education Academy (HEA). At the HEA she led national enhancement strategy and services, including commissioned educational research, across all academic disciplines and in a range of thematic areas such as employability, internationalisation, student retention and success, flexible learning, online learning and 'students as partners'. She also led the HEA's work on a range of national strategic projects in areas including grade point average, teaching excellence, learning gain and college-based higher education.

Phil joined the HEA in 2012, seconded from the University of Sheffield where she continued part-time in her position as Professor of Learning and Teaching Enhancement in Higher Education, based in the Information School (iSchool). Between 2010 and 2012 she served as Head of School and, between 2005 and 2010, as Director of a national Centre for Excellence in Teaching and Learning also based at the University of Sheffield. The Centre ran a substantial £4.85M enhancement programme focusing on inquiry-based learning and undergraduate research across the disciplines.

Phil joined the University of Sheffield as a beginning academic in 1989, and was promoted to Professor in 2009. At the iSchool, she taught in areas including: educational informatics; information and digital literacies; educational/learning issues in information/library systems and professions; aspects of information and knowledge management including leadership and management of information services; professional learning in knowledge-intensive environments. In 2002 she received a University of Sheffield Senate Award for Excellence in Teaching, in the first round of the scheme. Her professional activities include numerous invited presentations, a number of personal consultancies and, in 2009, time spent in New Zealand as a Visiting Fellow sponsored by HERDSA (Higher Education Research and Development Society of Australasia). She is a member of the editorial board of the journal Teaching in Higher Education. She served as Deputy Convenor of the Education panel for the Hong Kong Research Assessment Exercise, 2014.

Christianna Digenis

Christianna Digenis is an honours graduate in Psychological Sciences, and also holds undergraduate degrees in International Studies and Arts from the University of Adelaide. Christianna has contributed to two NH&MRC grants, one on men's satisfaction with bowel cancer screening (Freemason's Centre for Men's Health) and the other on the START study a randomised control trial investigating both the psychological and clinical impact of a new method of fetal monitoring during labour. Christianna presented her honours research on the START study at the Beacon Conference for Undergraduate Research in 2016 and was awarded the prize for best abstract and oral presentation. She was sponsored to attend and present at the 2016 Australasian Conference for Undergraduate Research. More recently, Christianna has been employed through the School of Psychology as a research officer on the START project and has been primarily involved with the study's start up and coordination. She has also started a position at Wirltu Yarlu as a research officer on a number of initiatives and also works on the Gender Equity and Diversity Committee.

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Full Abstracts

Student Parents in Australia: Rethinking higher education policy for the contemporary family context
Bartlett, Elisabeth, School of Social Sciences, Faculty of Arts

Abstract

Purpose/Rationale
Contemporary family life is diversifying rapidly and the pressure of academic life at higher education (HE) institutions is also intensifying. Student parents find themselves juggling two increasingly demanding and dynamic roles. Western research indicates that their experience is characterised by struggle, gender inequality and role conflict. Student parents present with complex support needs and unique barriers related to accessibility and availability of support from partners, family members, institutional staff and the HE institution itself. Limited literature and data in the Australian context and the minimal HE policy related specifically to supporting this group reflects their invisibility and incompatibility with the culture and policies of HE institutions.

Research Question/Focus
Do higher education institutions in Australia adequately support the needs of student parents in the contemporary family context?

Research Methodology/Approach
This study was informed by a social-constructionist framework, engaged a mixed-method approach using a survey (n=10) and interviews (n=3) and utilised Thematic Analysis. Limitations include a one-semester time frame, a low response rate and recruitment was limited to North Terrace Campus of the University of Adelaide.

Significance and Originality of Findings
In accordance with existing literature a narrative of struggle was reported and gender was identified as a defining feature of the student parent experience with the majority of participants being women. Participants reported varying degrees of partner support, very low rates of family support, mixed experiences of support from institution staff and a low perception of support from the HE institution overall.

Participant recommendations for improving supports include access to a Student Parent/Carer Support Plan, child friendly study spaces, emergency crèche facilities and including parental/carer status as part of enrolment demographic reporting. Implementing these recommendations would address the invisibility of the group and bridge the incompatibility between the student and parent roles that contributes significantly to the struggles experienced. Further research about the student parent experience in Australia is required.

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When do the rivers run dry? Detecting low flows in the Eastern Mount Lofty Ranges
Bell, Matthew; Hawke, Renae; Woods, Daniel and du Bruyn, Marco, School of Civil, Environmental and Mining Engineering, Faculty of Engineering, Computer and Mathematical Sciences

Abstract

Australian rivers and streams have some of the most variable flow patterns in the world. Many of these streams are ephemeral and do not flow all the time, especially in semi-arid regions like South-Eastern Australia, where low to no flows occur during the drier summer months. Human activities, including the construction of farm dams, have modified the natural flow regime of many ephemeral streams and reduced the occurrence of small flows, impacting on the health of native flora and fauna. The South Australian Department for Environment, Water and Natural Resources (DEWNR) has implemented a policy of installing low flow bypass devices on selected farm dams in the Adelaide Hills, to return low flows back to the environment. Previous studies assessing the impact of artificial detention on low flows have relied upon the use of a limited number of expensive water level sensors located at discrete points throughout a catchment, usually at the sub-catchment or catchment outlet. While models constructed using this data calibrate well to an outlet, they poorly reproduce the internal dynamics of a catchment. This study aims to improve the method for collecting flow data in ephemeral streams, by installing a series of cheap water temperature and pressure sensors throughout the Bull Creek sub-catchment in the Adelaide Hills. Statistical tests have been performed on the data collected from the cheap sensors to assess how closely they replicate the data recorded by a nearby DEWNR-installed water level sensor. Control tests are also being performed to assess the impact of environmental factors like vegetation density and shade cover on sensor performance. Preliminary findings have indicated that the cheap sensors are effective in detecting flow events, but are sensitive to debris build-up. Current work is focused on determining a threshold for the variation in sensor readings that indicates a flow event.

'Separate the whore from the pure': Assisted female migration and Crime in South Australia, 1854-1859
Blazevic, Tiana, School of Humanities, Faculty of Arts

Abstract

In 1856, the Legislative Government of South Australia claimed that too many assisted female migrants were entering the colony, and would increase crime and 'immorality' within the colony. From 1854 to 1857, the colony of South Australia had received a total of 11,320 single assisted female migrants arrive into the colony. The average immigration rate per year for single women was 1,200.

My research asks the question: did the assisted migrant women cause an increase in crime or 'immorality' in the colony? Further, historians of Australia's colonial period have often made the unsubstantiated claim that female assisted migrants from poor backgrounds were more susceptible to crime. Yet, these same historians have not provided prison records to prove this.

My final report has made extensive use of prison records, Supreme Court records, parliamentary volumes and newspaper articles. By way of close examination and comparison of these records it has tried to establish how many women who immigrated into SA during the period 1854-1857 were involved in crime. The report focuses on the period up to 1859 to analyse the immediate effect of large-scale immigration on crime.

The Adelaide Gaol Register records showed that crime had increased between the years 1854-1859. However, only 58 assisted female migrants from the period of 1854-1857 had committed a crime between 1856-1859. The total female prisoner population of Adelaide Gaol was 401. The female population of the colony from 1855-59 was 122,735, of which there were 15, 557 assisted women migrants. Therefore, assisted women migrants from 1854-57 who committed an offense represented 0.05% of the entire female population. This would not have been enough to cause an increase in crime or make a sufficient impact on the 'morality' of the colony. I conclude that the increase in crime can be more accurately attributed to causes other than immigration. Namely, low wages, bad harvest and saturation of the employment.

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The Representation of Femininities in Japanese *Shōnen* Manga (Boys' Comics): An Analysis of the Female Characters of *Naruto Shippuuden*
Brandenburg, Genevieve, School of Social Sciences, Faculty of Arts

Abstract

This project will analyse the femininities represented within *shōnen* manga (boys' comics) from a gender studies perspective, utilising the *Naruto Shippuuden shōnen* manga series as a case study. *Naruto Shippuuden* is a highly popular manga series both in and outside of Japan. Whereas previous manga studies have focussed on the representation of women and femininities in *shōjo* manga (comics aimed at girls), the study of femininities in mainstream *shōnen* manga is under-represented (Scherer 2015). This project will focus on the representation of femininities in the mainstream *Naruto Shippuuden* manga, which, while they are largely conservative, also offer instances of resistance and agency.

It investigates how prevalent femininities in *shōnen* manga (boys' comics), which are overwhelmingly conservative and one-dimensional, are resisted in *Naruto Shippuuden*.

Michel Foucault's understanding of power and resistance, as pervasive and decentred, is essential for exploring instances in the text where femininity deviates from conservative representations. Using discourse analysis, four characters' actions will be analysed in chapters 454-700 to determine instances of resistance in otherwise conservative representations of femininity.

To support my hypothesis that the female characters of *Naruto Shippuuden* resist dominant representations of femininity, the project analyses the actions of four female characters: Sakura, Tsunade, Tenten and Temari. My research found that Sakura and Tsunade most frequently resist the prevalent conservative femininities of *shōnen* manga through their actions on the battlefield as warrior-medics. Tenten and Temari resist through their 'tomboyish' personalities and disinterest in the stereotypically 'feminine' concerns of love and relationships. By highlighting resistance in the female characters of *Naruto Shippuuden*, this research adds a level of complexity to the literature that overwhelmingly claims that female characters in *shōnen* manga are conservative and stereotypical.

Beyond justification: purposes of parliamentary discourses of queue-jumping in relation to mandatory offshore detention
Calaby, Riley, Adelaide Law School, Faculty of the Professions

Abstract

Since 2013, people arriving by boat in Australia to seek asylum without a visa have been subject to mandatory detention offshore under sections 189 and 198AD of the Migration Act 1958 (Cth). This research presentation examines how mandatory offshore detention is justified in the Commonwealth parliament through discourses of queue-jumping. Both major sides of Australian parliamentary politics have broadly supported the policy of mandatory offshore detention despite ideological differences. The aim of this research is to investigate how justifications for mandatory offshore detention formulated from diverse ideological positions can be sustained. A subsidiary aim is to inform the project of generating counter-discourses. All explicit references to 'queue-jumping' made by parliamentarians in the 45th parliament were accessed in Hansard, and classified according to whether they tended to support or dispute that asylum seekers coming to Australia engage in 'queue-jumping'. Those supporting the existence of a 'queue' were further classified as liberal (drawing upon Mill and Johnson) or conservative (drawing upon Burke, and Kelada's work on features of Australian conservatism). The content of specific instances of parliamentary speech was then examined to determine how the policy of mandatory offshore detention was justified in each ideological context. It was found that liberal discourses of queue-jumping contained two distinct justifications of the policy: harm-based arguments wherein coercive measures are justified to prevent harm caused by 'queue-jumping' asylum seekers to 'genuine refugees'; or by attempting to exclude asylum seekers from liberal subjecthood. Conservative discourses tended to focus on the supposed affront to national values constituted by 'queue-jumping', and establishing 'queue-jumpers' as a deviant other posing danger. The identification of three distinguishable discourses of queue-jumping holds implications for the generation of counter-discourses: rather than treating the discourses as monolithic, it may be more effective to address discourses of queue-jumping separately according to their ideological context.

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Within Category Feature Correlations and the Curse of Dimensionality
Cearns, Micah, School of Psychology, Faculty of Health and Medical Sciences

Abstract

Categories are a way of carving up the rich correlational structure of the world. For example, dogs are a useful category because things that have four legs, fur, wagging tails, and barking, form a coherent set.

Within the domain of category learning, the curse of dimensionality states that as categories acquire more features, the size of the feature space and thus the number of examples necessary to adequately learn the category grows rapidly.

For example, adding more features to our dog example, such as length of fur, size etc, creates exponentially more feature combinations, resultantly requiring much higher levels of cognition to accurately classify what we are viewing as a 'dog'. This problem is compounded by other unnecessary features in the environment that don't inform our 'dog' category. Therefore, learning the category 'dog' should be difficult, however, this is not the case.

What my research question asks is, how do people figure out which features are relevant for category classification? My hypothesis proposes that people are attuned to information about which features are highly correlated with each other, and use this as an indication that those features are relevant.

To test this hypothesis, participants will be presented with two conditions and two stimuli for classification in each condition. In one condition, the features of the stimuli will be correlated with each other and in the other, they will be uncorrelated. Within each condition, non-category predictive features will be added in increments of four up until twelve are present, to emulate the presence of non-category predictive features that are experienced in real-world categories. It is expected that participants will make more accurate categorization decisions as dimensionality increases in the correlated condition. Around 300 participants will be selected from Amazon Mechanical Turk, a platform for recruiting participants for human intelligence tasks.

Ant abundance increases with grazing exclusion: response of Formicidae (Hymenoptera) to 90 years of non-native herbivore removal in a semi-arid rangeland system
Driver, Joel, School of Biological Sciences, Faculty of Sciences

Abstract

Koonamore Vegetation Reserve is a 90-year-old experimental herbivore exclosure (390ha) located in a semi-arid, chenopod-dominated rangeland. The removal of non-native mammalian grazers has had a significant effect upon the vegetation community within the reserve, however the effect on native fauna is unknown. We predicted that the restorative effect of grazing exclusion has also extended to one of the dominant groups of invertebrates in this system; ants (Hymenoptera: Formicidae).

We investigated: (1) how significant is the influence of grazing upon ant abundance; and (2) how much influence do other environmental covariates contribute to the grazing impacts?

We used a paired pitfall sampling approach across 10 ha of the exclosure, with ten 'stations' located at randomly selected distances along the boundary fence. Each station featured a cluster of five pitfalls at a randomly selected distance (20–100m) inside (n = 50) and outside (n = 50) the exclosure. Pitfalls remained in place for 3 days/nights in December 2016. Specimens were collected, counted and identified to order (and family for Formicidae). The following environmental covariates were also surveyed at each pitfall site using 1x1m quadrats: ground cover, ground cover density, soil texture, ant nest presence, ant trail length and trail traffic.

A total of 18,130 invertebrates were collected and identified; 98% (17,801) of which were ants. Ant abundance was 3.02 times higher within the grazing exclosure (p = 0.00236). This suggests that grazing has a significant impact upon ant abundance in semi-arid rangeland systems, however, further analysis of the relative influence of environmental and ant-associated covariates is being explored and will be presented. These preliminary findings may be significant as precursors to long-term studies into the unforeseen effects of grazing. We recommend that future study investigates the impact of grazing upon overall system productivity and how ants may be used as bioindicators to predict this.

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Perioperative Chemotherapy for Gastric Carcinoma: Not so 'MAGIC'?
Goel, Raghav, Adelaide Medical School, Faculty of Health and Medical Sciences

Abstract

Aim
A retrospective study of patients with gastric cancer was undertaken to assess the survival rate and lymph node status after pre-operative chemotherapy (POCT) in comparison to those who did not receive POCT.

Background
Gastric carcinoma remains the leading cause of cancer related deaths. In 2006, the MAGIC trial showed a 13% improvement in 5-year survival rate with POCT (36% vs 23%) for patients with gastric cancer and since then, this approach has been adopted for treatment. However, the advantages seen in a trial setting may not be evident in the wider community based clinical practice, especially if the treatment cannot be provided to all patients. Thus, this retrospective study analyses the clinical outcomes of POCT protocol in South Australia for the past 10 years at tertiary medical centers.

Methodology
Medical and pathology records of all gastric carcinoma procedures were reviewed from 2006-2016 after obtaining approval from the Central Adelaide Human Research Ethics Committee. Pathological details, number of lymph-nodes resected, reasons for non-administration of POCT, complications, recurrence and survival data were analysed using paired T-test, Chi2test and Fischer's exact test where applicable.

Results
There were 74 patients who underwent surgical resection of gastric carcinoma where 28 patients received POCT and 46 patients were not deemed eligible after comprehensive multidisciplinary evaluation. In majority, POCT was declined due to comorbidities (32.4%).

Combinatorial Marker Chains in Candy Crush Enumeration

Hamilton, Adam, School of Mathematical Sciences, Faculty of Engineering, Computer and Mathematical Sciences

Abstract

Besides being one of the most popular mobile phone games of the last few years Candy Crush has also opened up many fascinating questions in the field of mathematics. In The best Writings on Mathematics (2015), Toby Walsh was able to prove that the problem of achieving a certain configuration in the game using only a finite number of moves belongs to a category of problems called NP Hard. In 2012, Dana Rowland released a paper titled Candy Crush Combinatorics. In this paper she was able to enumerate the number of positions in a candy crush grid which were stable in the game (no three consecutive elements in each column or row is the same colour) for grids with 2 or less rows. At the end of her paper she left counting the number of stable Candy Crush positions for arbitrarily large grids as an open problem.

In my research I was able to use Discrete Time Markov Chains to develop a counting technique which determines the number of stable candy crush positions, so long as the grid is not too large. I was also able to develop a technique that works for arbitrarily large grids to a high degree of accuracy. Both techniques involve modelling the assignment of various coloured candies to a rectangular grid as a stochastic process which evolves over time. This stochastic process is easily describable using a Markov chain and thus probabilities of certain events happening can be easily calculated. This novel counting technique may be extendable to other problems in graph colouring, a highly active area of research in discrete mathematics, as well as other problems in applied mathematics which focus on the random growth of elements in a mesh graph such as the percolation threshold of materials or the evolution of cellular automata.

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Regulation and utilisation of metals in malaria parasite growth

Henshall, Isabelle, School of Biological Sciences, Faculty of Sciences

Abstract

Purpose/Rationale
Malaria is a mosquito-borne disease caused by Plasmodium spp. parasites that globally causes >400,000 deaths annually, primarily in children. However, an effective vaccine remains elusive and resistance to current therapeutics is spreading, highlighting the need to understand Plasmodium spp. biology in greater detail. Divalent metal cations are vital in biological processes and essential for many proteins, yet their utilisation and regulation by Plasmodium falciparum, the most lethal form of malaria, is poorly understood.

Research Question/Focus
Although metal ions are essential for P. falciparum a clear understanding of divalent metal cation usage and homeostasis is lacking. Through characterising P. falciparum metal ion utilisation and regulation, we will define key components in metal ion homeostasis and identify new therapeutic targets that take up, move and store divalent metal cations.

Research Methodology/Approach
Growth media with reduced metal ions and chelators were used to investigate the impact of reduced bioavailable metal ions on P. falciparum growth, as measured by high accuracy Flow Cytometry assays. Highly sensitive Inductively Coupled Plasma Mass Spectrometry (ICP-MS) analysis to define the level of zinc and copper in parasite growth medium has been performed to gain insight into the source of P. falciparum's metal ions.

Significance and Originality of Findings
Prior to this investigation, P. falciparum's requirement for divalent metal cations and biological source was poorly defined. Thus far, I have shown that zinc and copper chelators abolish P. falciparum growth, confirming their importance for survival. However, media containing two-fold less zinc and copper has minimal effect on growth. This data indicates that essential zinc and copper required by the malaria parasite is either; (i) bound tightly to a media component, or (ii) obtained directly from host red blood cells, contradicting previous studies. Preliminary ICP-MS analysis of growth media suggests albumin, a common serum protein, may be P. falciparum's major metal ion source, providing a new line of investigation.

Transnationalism and Diaspora: Examining the impacts of Singaporean migrants on tourism development in South Australia
Hia, Hannah, School of Social Sciences, Faculty of Arts

Abstract

Purpose/Rationale
This research contributes to scant literature on the effects of migration on tourism. Traditionally, migration and tourism have been examined as discrete bodies of research, but temporary migration and circulation accelerated by transnational and technological factors have blurred such categorical lines. Migration and socio-economic policies have encouraged the growth of diasporic communities. This is reflected by the changes in demographic makeup of migrant communities in Australia. Employing transnationalism as the conceptual framework, this paper seeks to examine the significance of diasporic linkages on tourism development using the case study of Singaporean migrants in South Australia (SA).

Research Question/Focus
In what ways do Singaporean migrants contribute to tourism and other associated sectors in SA? To what extent do Singaporean migrants contribute to economic revenue and employment of the tourism industry in SA?

Research Methodology/Approach
A two-pronged methodological approach was applied:

1. Mapping of Singaporean migrant distribution in South Australia (SA);
2. Quantitative analysis to estimate the Singaporean tourism revenue generated over a proposed time period (2009-2016) and the numbers of full-time equivalent jobs created by this migrant group; GIS mapping will be used to visualise the socio-economic and demographic characteristics of Singaporean migrants and tourists in SA.

The concentration of Singaporean migrants by Local Government Area (LGA) level will be identified. Time-series data from the International Visitor Survey (IVS) and labour force data sourced from the ABS will be used to evaluate the economic impacts of Singaporean tourists from 2009-2016.

Significance and Originality of Findings
This study addresses the knowledge gap in current research on the economic impact of Singaporean migrants, a minority but emerging migrant group in destination countries. Methodologically, the study seeks to identify significant socio-economic and demographic characteristics of a particular diaspora group to understand the relationships of migrants and tourism.

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Using RNA-Seq for Alternative Splicing analysis in repetitive elements: innovative idea or noisy nightmare?
Howell, Brittany, School of Biological Sciences, Faculty of Sciences

Abstract

Transposable elements (TEs) are mobile segments of DNA occupying nearly half of the human genome. L1s are the most abundant class of TE in the human genome, occupying 17% of its mass. TEs move from site to site replicating via an RNA intermediate which allows their rapid amplification. Through insertion mutagenesis and large scale structural variation, TEs have greatly influenced genome evolution.

Alternative splicing (AS) has contributed to genome evolution through the expansion of transcript diversity. In human, AS takes place in over 95% of genes which results in the disparity between the number of genes (26,000) and the number of human proteins (more than 90,000). The study of AS within L1 elements, has been limited to a study by Belancio et al. (2006) showing that L1s are capable of AS in vitro.

The purpose of this research is to evaluate the possibility that AS takes place in L1 elements. It is hypothesised that host genomes employ AS as a last attempt to regulate the proliferation of L1s. In this analysis I introduce a novel approach developed for AS detection in TEs. I aligned reads to the genome and devised an approach to detect split reads as evidence of splice junctions. Potential introns were detected in 12 L1s in the human and 92 L1s in the mouse. L1s containing the introns were found to be members of the most recently active families in both human and mouse.

The detection of AS in L1s has many implications for our understanding of L1 evolution. The most obvious hypothesis is that AS is used by the host to disable L1 proliferation. Further research could use a genome based approach to detect AS in retrotransposed elements. Such an approach would form a more comprehensive understanding of the frequency of AS in L1s.

The Relationship between Mental Health Literacy and CAM Beliefs in International Students

Huang, Yunhe, School of Psychology, Faculty of Health and Medical Sciences

Abstract

Background
Mental health literacy (MHL) refers to a person's knowledge and beliefs that helps identify, prevent and manage mental disorders. MHL studies involving people from non-Western countries found differences in causal beliefs and preferred interventions across cultures. Research conducted in several countries has shown that the public often favours self-help and complementary and alternative treatments (CAM) over conventional interventions such as psychotherapy and medication. Examples of CAM include acupuncture, hypnosis, Traditional Chinese Medicine and many others, which vary widely in available evidence for effectiveness. CAM use for mental disorders is linked with severity of symptoms, awareness and access to conventional treatment in several countries. There is evidence of ethnocultural differences in beliefs and uses of CAM, though not explicitly linked with mental health. In relation to migrants, acculturation may also influence their beliefs towards mental health and CAM. The present project aims to explore whether the relationship between MHL and CAM beliefs differs in international versus domestic university students in Australia.

Method
An online questionnaire was advertised to university students through social media. Participants were asked to read vignettes describing a person with mental illness, identify the problem, then rate potential causes and interventions on their appropriateness. Participants were also asked to complete the Complementary and Alternative Medicine Beliefs Inventory and Stephenson Multigroup Acculturation Scale.

Results
The survey received 120 completed responses from domestic and international students. It is hypothesised that there is a positive relationship between MHL and CAM beliefs, but the association is weaker amongst international students.

Discussion
The study could provide further understanding into factors affecting mental health beliefs in international students. This would allow universities and service providers to better implement strategies to improve international student mental health help-seeking outcomes.

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Robust Numerical Implementation of Hydrological Model GR4J

Jiang, Wanying (Athena), School of Civil, Environmental and Mining, Faculty of Engineering, Computer and Mathematical Sciences

Abstract

Water is essential to human society and the entire ecosphere. Accurate streamflow predictions are therefore highly desirable for floods, droughts and water security. These predictions are typically obtained using mathematical hydrological models, which embody our current understanding of the water cycle. The application of hydrological models usually consists of 6 major steps: data collection, model selection, numerical implementation, calibration, validation and actual forecasting. This work focuses on reducing the modelling uncertainty arising from the numerical implementation. The hydrological model used in this project, GR4J, is a daily lumped rainfall-runoff model used for operational forecasting in Australia and France.

This project has the following aims: (1) Implement GR4J using robust numerical techniques; (2) Establish the benefits and limitations of robust numerical solutions in practical application contexts. The published GR4J equations are converted into state-space form, ie, into a system of first-order differential equations, and solved numerically.

The explicit Euler and implicit Euler time stepping techniques are considered in this work. From literature review, the explicit method is widely-used within hydrological community, but has poor stability and its effectiveness has been questioned for detrimental impact on calibration process. The implicit method generally controls error growth better and is favoured in this work.

Both numerical techniques will be tested using historical data from the Maimai, Lacmalac, Hesperange and Scott Creek catchments, and their numerical accuracy and computational efficiency will be compared. The working hypothesis is that the implicit Euler implementation of GR4J significantly reduces predictive errors when compared to the explicit Euler implementation. This work will help hydrologists reduce computer and mathematical limitations of their models and allow stronger focus on hydrology itself.

Deaths in Incorrectly Identified Low Surgical Risk Patients
Jones, Charles, Adelaide Medical School, Faculty of Health and Medical Sciences

Abstract

Background
The American Society of Anesthesiologists (ASA) classification system was developed for assessing anaesthetic risk, but is often used to estimate surgical death risk. Patients with low ASA grades (ASA 1 or 2) are expected to have better surgical outcomes than patients with higher ASA grades (ASA ≥4). This study examined the surgical death summaries in patients with low ASA grades, to investigate possible factors in unexpected deaths, in addition to evaluating the use of ASA grades by clinicians.

Methods
We examined patient data from the national surgical mortality audit of Australian hospitals. The investigated population was patients listed as ASA grade 1 or 2 by surgeons (n=124) in the 2010-2015 period. We excluded patients at extremes of age (<20 or >60) which may confound results. We also excluded acute trauma cases and neurosurgery cases as deaths are expected in these patients. The remaining cases (n=71) were separated by cause of death, and course to death summaries examined for common features, and the four most common causes of death were selected for further analysis resulting in (n=23) patients.

Results
60.8% of examined cases had a reported ASA grade lower than ASA guidelines would suggest. Of the four groups examined (Pulmonary Embolus, Bowel Infarct, Sepsis and Necrotising Fasciitis) all had ≥50% of ASA grades assigned misapplied.

Conclusions
ASA grades appear to be misunderstood in the reporting of patient surgical risk. Many patient summaries list patients with severe systemic disease or expected deaths as ASA 1 or 2, contrary to the intended use of this classification system. Improved education on the use of the ASA grading system would be beneficial to clinicians. A potential limitation is that despite an initially large sample population, only n=23 cases were suitable for this study. These results could be improved with a larger sample population.

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Ticagrelor versus Clopidogrel in Stable Coronary Artery Disease Patients undergoing Elective Percutaneous Coronary Intervention
Jones, Dione, Adelaide Medical School, Faculty of Health and Medical Sciences

Abstract

Background
In acute coronary syndrome, treatment with ticagrelor as compared to clopidogrel reduces the rate of adverse events. Whether this benefit extends to stable coronary artery disease (CAD) patients undergoing elective percutaneous coronary intervention (PCI) is unknown.

Methods
The 12-month outcomes of stable CAD patients discharged with either clopidogrel or ticagrelor after elective PCI were compared using the Coronary Angiogram Database of South Australia (CADOSA), a registry of consecutive patients undergoing angiography/PCI in South Australian public hospitals. Patients between January 2012 and December 2015 were included. Unplanned hospital readmissions and all-cause mortality were captured via administrative datasets. Quality of life at baseline and 12-months was compared in 43 eligible patients using the Seattle Angina Questionnaire (SAQ).

Results
The study cohort included 755 patients comprising of 83% discharged on aspirin + clopidogrel and 17% on aspirin + ticagrelor. Clopidogrel patients were older (67y±0.4 vs 65y±1.1 years, p<0.05), and more likely to receive a bare metal stent (24% vs 12%, p<0.01). Adverse outcomes at 12 months were adjusted for age and stent type. All-cause mortality was similar between clopidogrel and ticagrelor patients (1.1% vs 0.8%, p=0.97). Hospital readmissions for chest pain (18% vs 22%, p=0.27) or other cardiac diagnoses (11% vs 13%, p>0.05) were also similar between clopidogrel and ticagrelor patients. Myocardial infarction occurred in 1.8% and 1.5% (p=0.84), and major bleeding events in 1.1% and 1.5% (p=0.67), of clopidogrel and ticagrelor patients respectively. SAQ scores were similar between the two groups.

Conclusion
In real-world practice, one-fifth of elective PCI patients are prescribed ticagrelor. Readmissions for chest pain post-PCI are frequent. Ticagrelor appears equally safe as clopidogrel in terms of clinical outcomes and bleeding risk; however, whether ticagrelor provides additional benefits in this population requires a randomised trial.

Orofacial and dental characteristics in Crouzon syndrome
Khominsky, Alexander, Adelaide Dental School, Faculty of Health and Medical Sciences

Abstract

Rationale
Crouzon syndrome is a common genetic craniofacial disorder, characterised by craniosynostosis (the premature fusion of one or more sutures in the skull) and midfacial hypoplasia (short midface). It can lead to life-threatening neural, respiratory and feeding complications in children, affecting speech, orthodontic and psychosocial outcomes. Management of Crouzon syndrome can involve multiple invasive surgeries that can have a debilitating impact on the child and their family. FGFR2 mutations are a known cause of Crouzon syndrome and a necessary first step in understanding how patients will respond to treatment is better characterisation of the association between the genotype (genetic make-up) and phenotype (observable characteristics).

Focus
We used a genetically-engineered mouse model to investigate the role of FGFR2 mutations in the development of the orofacial and dental phenotype.

Methodology
Forty mouse skulls, representing two genotypes (Crouzon syndrome and wild-type) and two sexes (males and females) (n = 10 in each group) were used. Maxillary, mandibular and dental morphology were compared between groups by analysing relevant landmark-based linear dimensions in three-dimensional micro-CT reconstructions.

Results
Compared to wild-type, Crouzon maxillae and mandibles were generally smaller, however mandibular parameters showed greater variation. Teeth were significantly narrower mesiodistally, however taller in crown height. Crouzon mice displayed bilateral bifid condyles in all cases and expansive bone lesions around mandibular incisors in about 25% of cases.

Significance
This study provides new insights into the effects of a FGFR2 mutation on the orofacial and dental phenotype. This research has the potential to improve clinical management of Crouzon syndrome, as the relationships between the maxilla, mandible and teeth, is critical in achieving successful functional and psychological outcomes. The new discoveries of bifid mandibular condyles and expansive bone lesions indicate complex actions of FGFR2 molecular pathways. Establishing baseline orofacial and dental features will assist in the development of more predictable and targeted molecular-based therapies for affected patients in the future.

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Dissecting the role of a novel protein in malaria disease
Liffner, Benjamin, School of Biological Sciences, Faculty of Sciences

Abstract

Malaria is a mosquito-borne disease caused by Plasmodium parasites, and is responsible for the deaths of ~400,000 children annually. Currently, there is no vaccine that protects against severe disease in infants, and spreading insecticide and antimalarial drug resistances pose serious threats to the long-term efficacy of malaria control and prevention. Considering this, more comprehensive insight into malaria biology is needed to identify novel drug targets and inform vaccine design.

With the hope of addressing these issues, I functionally characterised a protein, provisionally termed Plasmodium falciparum Rhoptry Outer Membrane Protein (PfROMP). Previous studies suggested PfROMP might play a role in the blood-stage of the parasite lifecycle, which is responsible for all clinical symptoms of malaria.

Using genetically manipulated parasites, I studied the effects of loss of PfROMP on parasite viability and survival. Additionally, I utilised these parasites as tools to identify when during the lifecycle the protein was expressed and where within the parasite it was found; to aid understanding of its function.

I determined when and where within the parasite lifecycle PfROMP was expressed, showing it localises to the membrane of a secretory organelle during the merozoite stage of the lifecycle; where the parasite invades human red blood cells (RBCs). Additionally, I showed that PfROMP is highly evolutionarily conserved, indicating an important function. Furthermore, my results demonstrated that a ~75% reduction in PfROMP expression resulted in a ~50% reduction in parasite growth.

Subsequent analyses showed that this growth inhibition was due to an inability of parasites to bind to and invade RBCs, restricting parasite survival in the disease causing blood-stage. These findings highlight a key protein in merozoite invasion of RBCs; a vital process in parasite biology, which if inhibited prevents malaria disease. Additionally, as its loss resulted in significant parasite death, this highlights PfROMP as a novel antimalarial target.

Validating an improved measurement model for the evaluation of eyewitness identification procedures

McCormick, Kym, School of Psychology, Faculty of Health and Medical Sciences

Abstract

Eyewitness misidentification has been shown to be a major contributing factor in over 70 per cent of DNA exonerations in the United States. Thus the fallibility of eyewitness identification has put into question the probative value of such evidence. Since 1980, efforts have been made by social psychologists to develop a measurement tool – the diagnosticity ratio – that might support the evaluation of identification procedures within laboratory settings. However, major criticisms regarding the validity of this statistic have been raised, and efforts to introduce a valid and more flexible measurement model has begun. It has been suggested that such a model might be sourced from other fields of study, such as detection, recognition and decision making, which have continued to rigorously test such models for over 60 years. These models fall within two classes – those that assume information is processed across a small number of discrete states, and those that assume it is processed across a continuous gradient of evidence. Each of these models provide different predictions of conditional second forced-choices, and it is these predictions that this study will test. My study used a 2 (short vs long study exposure) x 2 (low vs high expectation) x 2 (target present vs target absent) between-subjects experimental design. Online participants (N = 2,008) completed an eyewitness identification and a forced rank-order task after viewing a video depicting a non-violent crime. Empirical support was found for a continuous model of eyewitness identification, with rates of conditional second choices supporting the prediction of these models and being significantly different from those predicted by discrete-state models (χ^2 (3, N=1012) = 29.24, p < .001). This finding is expected to further improve the rigour in the evaluation of eyewitness identification procedures, thus reducing the high costs associated with implementing methods that add questionable value.

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Do grapevines have ecological memory of drought stress?

McNamara, Imogen; Jiranek, Grace; Howard, Matthew; Huckel, Michelle; Howkins, Declan and Mills, Gavin, School of Agriculture, Food and Wine, Faculty of Sciences

Abstract

Drought stress in perennial crops can lead to reductions in growth, productivity and crop quality. The intensity and duration of drought is predicted to increase with the progression of climate change. Preliminary studies suggest that species such as nettle (Urtica dioica L.) show characteristics suggestive of being able to remember historic episodes of drought, referred to as 'Ecological memory'. A relatively unresearched field, ecological memory is postured to occur due to changing epigenetics and protein metabolites.

In this study, we investigated whether Vitis vinifera cv. Thompson Seedless grapevines had ecological memory of drought stress. The experiment was conducted using varying periods of induced drought stress on several 2 year-old vines with no history of such stress. Measurements included stomatal conductance, stem water potential and shoot growth for the vines exposed to drought stress as well as those vines which remained well-watered. Once the vines reached a pre-determined value of water loss, indicative of water stress, the plants were maintained at this level for increasing periods of time (from 2 to 8 weeks). The readings used to determine daily water use showed that the vines exposed to stress for 6 weeks or more reduced their daily water uptake by more than 10%, compared to the control vines, when returned to field capacity. The data indicates that post-drought stress vines are capable of making more efficient use of available water. This suggests that grapevines may have ecological memory of drought stress.

While results presented here appear encouraging, this presentation will also critically analyse the findings, specifically addressing the possibility of plant hormone control over water loss. Implications of our results for growers include the potential to improve crop water use efficiency and vine tolerance to drought through management practices that carefully induce water stress.

Review of El-Nino Southern Oscillation and the effect of climate change on ENSO
Moran, Jack, School of Physical Sciences, Faculty of Sciences

Abstract

El-Nino Southern Oscillation (ENSO) is one of Earth's major climate drivers and is the primary source of climate variability over the tropical Pacific. ENSO has a resounding impact on Australian and global climate, driving severe weather and extensive precipitation anomalies.

The purpose of this research is to review the current understanding of El-Nino Southern Oscillation and how global warming is predicted to affect the stability of the system.

The majority of research involving ENSO is conducted using climate models. Climate models are highly intricate mathematical simulations which produce detailed predictions on the current and future state of the environment. The models used in ENSO research have climate change conditions applied to the data allowing researchers to predict the result of global warming on ENSO.

A significant increase in extreme ENSO events has been observed in the last 80 years and current models suggest that global warming will result in increased intensity of ENSO events and ENSO driven precipitation anomalies over western and central Pacific Ocean.

Several models predict similar outcomes on the behaviour of ENSO under the influence of global warming although conclusive evidence for one behaviour is yet to be found.

The variation between studies is due to the limitations inherent in climate models. This review focused on studying the outcomes found in different climate models.

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How I Learned to Stop Worrying and Love Consciousness
Morphett, Harley, School of Humanities, Faculty of Arts

Abstract

In this paper I argue that consciousness can be explained in physical terms and does not require an appeal to anything mystical or non-physical. In particular, I will examine visual perception and describe one answer, namely, the recurrent processing theory of consciousness; this theory appeals to the computational relations between areas of the visual cortex and emphasises the concepts of awareness and attention. Information process theories of consciousness, of which this is one, suffer from several general problems. The one problem I focus on here is the problem of qualitative character. The solution I offer concerns not what it is like to have a particular conscious experience but instead how conscious experiences differ in the first place. Once a mechanism of differentiation is established it should be clear that the purely physical can give rise to a qualitative experience. So with these things in mind, I will first briefly describe what is meant by consciousness. Second, I will discuss how the recurrent processing theory is a foundation for a purely physical theory of consciousness. Finally, I will fill in one of the recurrent processing theory's gaps with an appeal to a structuralist theory of representation. I will conclude that while the theory requires much work it does provide us with some explanatory purchase on the very slippery subject that is phenomenal consciousness. My methodology is multidisciplinary and textual, spanning philosophy, neuroscience, psychology, and computer science; further, I track various arguments, both for and against, across those disciplines and found common agreement that the brain functions as some kind of computer. I hypothesise that if consciousness is founded in brain activity, brain activity is computational, and computation is representational, then consciousness must be representational. Recurrent processing provides both the brain and computational aspects and lends itself well to a structuralist representational account of the content of this computational process.

Men's experiences of support following pregnancy loss
Obst, Kate, School of Psychology, Faculty of Health and Medical Sciences

Abstract

An unexpected pregnancy loss is a potentially overwhelming and distressing experience for expecting parents, and unfortunately, it is not uncommon. In Australia, approximately 1 in every 177 babies are stillborn, and up to 15-20% of all recognised pregnancies will end in miscarriage. High levels of emotional distress immediately following a pregnancy loss are common, with enduring levels of distress and grief occurring for one in five parents. A number of guidelines for support providers have been produced to inform the quality of care practices and improve psychological outcomes for families. However, the majority of the literature and subsequent care guidelines focuses largely on women's experiences, given that the physical loss requires more obvious healthcare and support for recovery. Due to this, research pertaining solely to men's experiences and psychological outcomes is significantly limited, especially in the Australian context. Using thematic analysis of qualitative interviews with both bereaved fathers and pregnancy loss support providers, this study aims to explore Australian men's experiences of both formal and informal supports received following a female partner's pregnancy loss. This paper will present preliminary findings, including an outline of the barriers and facilitators to accessing services. Analysis conducted thus far indicates that fathers do have a need for emotional support following a loss, however the specific structure varies, suggesting that support providers need to be flexible in the services offered. Moreover, many male participants who accessed available support services reported that they were largely satisfied, while others were largely unaware of services, perceiving an unavailability of appropriate support options. The paper concludes by noting that although some men may find support groups and individual counselling helpful, others may benefit more from informal support options, such as having another trusted male to confide in, or the opportunity to 'give back' and help others in their situation

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Looking Deeper – Using Deep-Learning to Identify Internet Communications Traffic
Page, Clinton; Millar, Kyle; Smit, Daniel, School of Electrical & Electronic Engineering, Faculty of Engineering, Computer and Mathematical Sciences

Abstract

Recent years have shown an unprecedented reliance on the Internet to provide services essential for business, education, and personal use. Due to this reliance, coupled with the exponential growth of network traffic data being generated, there has never been a greater necessity for effective network management techniques. As the diversification and volume of traffic being generated increases, network management is becoming exceedingly difficult. One key component of network management is the ability to identify the types and quantity of traffic flowing through a network, termed *network traffic classification*. For example, what are the different types and how much web, email, video streaming, online gaming, etc application traffic flow between two network end-points.

Traffic classification assists in maintaining and improving the quality of service and detecting security threats throughout the network. Previous traffic classification techniques are limited by the use of non-standardised port numbers (e.g. growth of mobile apps) and the encryption of traffic contents (e.g. secure VPN communications or net-banking). To tackle these challenges, we propose using Deep-Learning techniques for network traffic classification.

Deep-learning is a machine learning technique that draws inspiration from the anatomy of the human brain. Deep learning has excelled in many feature and pattern recognition tasks. This paper investigates the viability of using these techniques for traffic classification with a focus on both network management applications and detecting malicious traffic in a cyber-security context. The parameters of our deep learning models are selected based on literature studies and empirical modelling. Our investigations employed the UNSW-NB15 synthetically generated traffic dataset in various input formats. Our results thus far show that a highly accurate classifier can be created using the first 50 bytes of a TCP/UDP flow as inputs into a deep neural network. This compares favourably to the first 1000 bytes employed in similar research.

Red / Near Infrared Light Therapy – protection of RPE cells from oxidative damage

Patel, Prajay, Adelaide Medical School, Faculty of Health and Medical Sciences

Abstract

Objectives
Age-related macular degeneration (AMD) is an irreversible blinding condition affecting 20-25 million people worldwide. Although not completely understood, it is believed to be related to oxidative stress of retinal pigment epithelium (RPE) cells in the macula. Red/near-infrared light therapy (R/NIR) has shown beneficial effects to tissues, particularly after oxidative insults. Our primary objective was to assess whether R/NIR was beneficial to RPE cells subjected to oxidative stress. Positive data could lead to R/NIR being utilized in AMD therapy.

Methods
Primary rat RPE cultures were first exposed to R/NIR via laser (wavelength 670nm, 90s, 100mW/cm2; range of energy settings), to determine possible cytotoxicity. RPE cells were assessed for integrity and induction of stress proteins by double-labelling fluorescent immunocytochemistry. In subsequent investigations, cells were treated with the laser and left for either 1 or 24 hours before being subjected to different concentrations of the oxidative agent, tert-butyl hydroperoxide (tbH), for 3 hours. Cell viability after all treatments was determined via methylthiazol tetrazolium (MTT) assay.

Results
RPE cells maintained structural integrity and displayed no change in expression of cellular stress markers after exposure to R/NIR, defining that the laser was not cytotoxic. When comparing cells subjected to oxidative stress with or without R/NIR laser, there was a tendency for the former-treated cells to have a greater survival rate. For example, at tbH concentrations of 10ÂµM, more cells were alive, however, comparison of the two did not reveal statistical significance (P =0.55).

Discussion
Our study found no significant difference in survival from oxidative stress between RPE cells treated with or without R/NIR laser. However, we did reveal a tendency for R/NIR-treated cells to be less affected; ongoing studies will investigate this further. Importantly, the laser was found to be safe to use on RPE cells, perhaps opening the way for clinical R/NIR therapy.

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Police Powers to Compel Access to Encrypted Devices and Computer Records

Phipps, Esther and Manning, Gerald, Adelaide Law School, Faculty of the Professions

Abstract

The purpose of this presentation is to investigate the consequences of the recent legislative proposal to introduce a criminal offence for failing to comply with a data access order. This offence would criminalize individuals that refuse to provide the password used to access encrypted devices suspected of containing illicit material. The key justification is to prevent individuals possessing child exploitation material from using encryption to conceal evidence and escape prosecution.

Our research includes examining the rapid growth of encryption, scrutinizing analogous offences in domestic and international jurisdictions, and identifying legal and practical implications. Our sources include legislation, judicial decisions, legal journals, international and domestic reports, and parliamentary materials. Our methodology involves an analysis of these materials to assess problems encountered by inter-state and international law enforcement agencies, and potential legal or non-legal solutions.

The findings demonstrate that encryption is capable of defeating police investigation, however also reveal issues surrounding introduction of the proposed offence. Introduction would abrogate the common law privilege against self-incrimination, infringe upon individual's privacy, allow police to make opportunistic finds unrelated to the investigation, and imprison individuals based upon mere suspicion.

Furthermore the offence has the potential to be abused. The scope of its application is not limited to child exploitation offences, and it merely requires the 'rubber stamp' of a judicial member to be binding. Our research is limited in its scope, because ascertaining the exact extent to which encryption hinders police investigation is incredibly difficult as police are unlikely to identify increased search powers as unnecessary. Other practical issues include deniable encryption, how to apply the defence of reasonable excuse to the offence, and prioritizing disclosure to facilitate victim identification.

Ultimately, we find that a decision must be made as to whether the sacrifice of fundamental legal privileges is justified by increased community safety.

How at-risk are you at work? Understanding the relationship between risk perceptions, organisational commitment and employee Information Security Awareness
Reeves, Andrew, School of Psychology, Faculty of Health and Medical Sciences

Abstract

Cyber security incidents pose a significant threat to the information technology systems that allow businesses to run effectively. Ninety-five percent of security incidents involve human error, leading businesses to invest greater resources into training their staff to be aware of, and avoid, these risks. Businesses are increasingly looking to information security awareness (ISA) as a way to gauge the current proficiency of their staff in information security contexts. This study captures ISA by examining an employee's knowledge of, and attitude towards, best-practice information security behaviours, as well as their commitment to these behaviours. The purpose of this research is to investigate how employees' ISA relates to how personally at-risk they feel from cyber threats, how they perceive these threats, as well as how committed they are to their organisation. The project involves administering an online questionnaire consisting of measures for ISA, Organisational Commitment, Perceived Personal Risk, and other risk perceptions, over the web-based survey platform Qualtrics, to 250 working Australians. Information security awareness is measured by the Human Aspects of Information Security Questionnaire (HAIS-Q). To date, the relationship between the HAIS-Q, risk perception and organisational commitment is yet to be examined. Findings supported the hypothesis that organisational commitment and risk perception predicted ISA.

However, this differed based on the risks examined. Demographic variables (e.g., age, gender, and information security training) also significantly predicted variance in ISA across all risks examined. By identifying the contexts in which perceived personal risk and organisational commitment become significant predictors of information security awareness, this research has the potential to inform the development of information security training, aiming to enhance employee ISA. Furthermore, this research can enable businesses greater insight into the areas of their workforce that may require further information security training

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Design and Build a Continuous Hydrothermal Liquefaction system
Scott, Samantha; Hoffmann, Adrian; Too, Nien Yee and Smith, Stuart, School of Mechanical Engineering, Faculty of Engineering, Computer and Mathematical Sciences

Abstract

Purpose/Rationale
The need to transition from fossil fuels to alternative renewable energy sources and to reduce their impact on our environment is becoming crucial. Hydrothermal liquefaction has a promising future as it converts organic matter into biocrude, which can be further refined into liquid fuels. A major hurdle is to design a system to make the process continuous, allowing it to be performed at the industrial scale needed to become a viable substitute for fossil fuels.

Research Question/Focus
1. Based on the results acquired from the constructed prototype, how much potential is there for an industrial scale continuous system?
2. Can the system be functional when subjected to changes in biomass input, residence time, varying reaction temperatures and pressures on the biocrude oil yield?

Research Methodology/Approach
The Hydrothermal Liquefaction (HTL) process involves heating a biomass slurry at subcritical conditions, under temperatures of 250-375℃ and pressures of 200-300 bar. Continuous and batch systems were previously tested successfully by several research institutions, which inspired the preliminary design of the system. Heat transfer within the reactor is modelled using Computational Fluid Dynamics (CFD) software and estimation of various feedstock properties performed using MATLAB. Initial testing of the prototype will use a sugar solution feedstock and a High Performance Liquid Chromatography (HPLC) pump. The aim is to test the system by altering residence time in the reactor and observe its effect on yield quality.

Significance and Originality of Findings
The results from the CFD model indicate that there is potential to predict the heat transfer rates achieved in the reactor, and the optimal flow rate to provide an ideal residence time. As construction is currently underway, many issues regarding the feedstock, such as consistency in viscosity and solid concentration, are yet to be addressed and will be further considered during the testing phase of the project.

Mechanism of neuroprotection by mechano-growth factor, a muscle specific isoform of insulin-like growth factor 1

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Abstract

A muscle specific isoform of insulin-like growth factor-1, mechano-growth factor (MGF), has been shown to rescue adult motoneurones in experimental models of neurodegenerative diseases. Therefore, MGF has great therapeutic potential in the treatment of such diseases. However, both the receptor and downstream signalling pathways by which MGF act are unknown.

Two key signalling pathways activated by neurotrophic factors are the phosphatidylinositol 3-kinase (PI3K) pathway and the extracellular signal-regulated kinase 1 and 2 (ERK 1/2) pathway. These both result in activation of the mammalian target of rapamycin complex 1 (mTORc1). It is possible, therefore, that MGF acts via PI3K, ERK 1/2 and mTORc1. This study aimed to identify (i) the downstream signalling molecules activated by MGF during motoneurone rescue and (ii) the location of the currently unknown MGF receptor.

In an experimental model of motoneurone death, MGF injection to the site of injury significantly increases rat motoneurone survival rates when compared to controls. To test whether blocking signalling molecules in the mTORc1 pathway affects MGFs action in this model, MGF and either rapamycin (mTORc1 inhibitor), LY294002 (PI3K inhibitor) or AZD6244 (ERK 1/2 inhibitor), was injected to the site of injury (n=6 rats/group). The number of motoneurones surviving the insult was than determined stereologically. To study the distribution of the MGF receptor, the pattern of binding of biotin-labelled MGF to sections of muscle- and nervous- tissue was undertaken.

None of the inhibitors blocked MGF-mediated neuroprotection. Surprisingly, rapamycin plus MGF promoted motoneuronal survival over and above that seen with MGF alone. There are no results for MGF binding, as the study is still in progress.

The present findings indicate that MGF may not act via the signalling molecules commonly associated with other neuroprotective factors. In addition, they suggest that rapamycin, either singly or in combination with MGF, promotes significant adult motoneuronal survival.

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High precision number representation for modern computing

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Abstract

Floating point is a number format used widely in computational arithmetic today. There are issues with the floating point standard which a recently developed number format, "Unum" claims to solve. These problems include accuracy, rounding errors and unnecessary redundancy. A hardware implementation of Unum 2.0, along with case study applications, gives real world data to assess whether Unum holds the claimed advantages over floating point.

Our research question is, "How does Unum 2.0 compare with IEEE 754 floating point arithmetic in terms of area on a chip, computational speed, and numerical accuracy?"

To address this question we have: developed a software specification model of the Unum arithmetic unit; verified the correctness of the specification model; and designed a hardware architecture for the unit. Over coming months we plan to: evaluate the numerical accuracy of the Unum arithmetic using the software model in case study applications; implement the hardware design using logic synthesis tools; and use the synthesis results to estimate chip area, speed, and power consumption.

To our knowledge, there have been no hardware designs for Unum 2, while its creator has made claims that such an implementation would out-perform existing floating point designs. It is an important contribution to the knowledge in the field to test these claims.

Changes in Brainstem Cytokines in Normal Ageing and Motor Neurone Disease
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Abstract

Rationale
Age-related increases in inflammatory status, as measured by elevated levels of pro-inflammatory cytokines, have been implicated in the development of age-related neurodegenerative diseases including Motor Neurone Disease (MND). However, recent studies in rats have revealed that elevated inflammation associated with healthy ageing may promote motoneuronal survival. In order to clarify these apparently contradictory roles of inflammation in MND, changes in 27 cytokines have been compared here in healthy ageing and in MND.

Focus
1. To characterise age-related changes in human brainstem cytokine levels
2. To determine whether ageing and MND brainstem are characterised by different brainstem cytokine profiles
3. To determine the neuroglial cell types that express inflammatory cytokines

Approach
27 cytokines(IL-1α, IL-1β, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, IL-13, IL-15, IL-17A, TNF-α, IFN-Y, FGF, G-CSF, GM-CSF, IFN-Y, MCP-1, MIP-1α, MIP-1β, Eotaxin, PDGF-1β, RANTES and VEGF) were analysed using multiplex technology in fresh frozen post-mortem brainstems of MND patients aged 60-68 years (n=6), and compared with those of ageing controls aged 48-86 years (n=6) and young adult controls aged 20-33 years (n=6). Immunocytochemistry was used to co-localise selected cytokines to neuroglia.

Results
Levels of IL-1β and IP-10 were higher in brainstems of ageing controls compared to young adult controls (p=0.017 and p=0.020 respectively). Moreover, MIP-1β levels were higher in brainstems of ageing controls compared to young adult control brainstems (p=0.006) and decreased in MND brainstems compared to that of ageing controls (p=0.023). Immunocytochemistry showed that astrocytes were the source of MIP-1β.

Significance
There is evidence from animal studies that MIP-1β is neuroprotective. The increased levels of MIP-1β with normal ageing found here may therefore be neuroprotective, whereas lower levels in MND may be associated with age-related motor neuronal degeneration. This suggests that modification of levels of specific cytokines may be a therapeutic strategy in MND.

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Higher Dimensional Venn Diagram Analogues
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Abstract

Why do we rarely see Venn diagrams that use circles to compare more than three sets? In fact, any 'Venn diagram' comparing more than three sets in two dimensions using only circles is not a Venn diagram at all, as it cannot contain all possible logical intersections of the sets and their complements. This is a consequence of the way in which circles intersect.

Various methods of creating Venn diagrams for four or more sets in two dimensions using shapes other than circles have been devised. However, these generally lack the pleasing symmetry and simplicity of Venn diagrams created from circles. We consider a different approach: constructing Venn diagram analogues by intersecting spheres in higher-dimensional spaces. The resulting objects share many properties of two-dimensional Venn diagrams created using circles, making them an interesting subject of research.

We generalise Venn diagrams created from circles to higher-dimensional spaces by intersecting spheres, and explore the geometry of the resulting objects. In particular, we claim that in k-dimensional space, it is possible to intersect up to k + 1 spheres in such a way that they meet all requirements to be a Venn diagram other than two-dimensionality, and that k + 1 is the maximum number of spheres with which this can be done.

In pure mathematics, unlike most disciplines, all research is done exclusively through the use of deductive reasoning. We used accepted methods of proof which use deductive reasoning to derive our results.

We have proved new results about higher-dimensional Venn diagram analogues which hold for spaces of arbitrary dimension. We have also found a general formula for the number of regions formed when n spheres are intersected in k-dimensional space, which may be useful for proving further results about these objects. Our results may have some relevance to parts of topology.

Contextualising residents' calls for staff assistance: A prototype web-based call-bell system in residential aged care facility

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Abstract

Which one of the three caregiving activities, namely, making a cup of tea for Mrs Smith, lifting Mr Light from floor, or attending to a bed-bound resident, Mrs Bailey, with high body temperature, needs to be prioritised if you work as a care staff in an aged care facility? If you think the answer is obvious, imagine making the same decision out of three room numbers shown on your deck phone. What if Mr Light is out of his room, and Mrs Bailey does not know how to use call-bell? Without the aid of specific, individual and contextual information, such as the real-time location, situation (e.g. having fall) and bodily condition (e.g. abnormal body temperature) of the resident, staff prioritising of care tasks and responding to emergencies become a stressful challenge. This study is to address such a challenge by developing a prototype web-based call-bell system capable of collecting, transmitting and displaying the individual and contextual information of the residents with/without the resident activating the call-bell. Staff performance in term of response time to residents' calls and emergencies can be improved when the residents' call-bells are contextualised and the unrecognised needs of residents for staff assistance are detected. Using the eLabtronics Inventor's kit and Wi-Fi chip, the Care on the Go WristBell is at this stage made and tested as a prototype wearable nursing call-bell specially designed for mobile and fragile residents. An alarm can be activated by an accelerometer (fall), a thermometer (detecting high/low body temperature), or a push-button. Staff will be alerted by a buzzer and a flashing dot on the webpage using either desktop/laptop in the nurse station or portable devices such as smartphone or iPad. The next stage objective is to show the real-time location of the resident on the webpage when the alarm is activated.